PERFORMANCE ENGINE:
IMMERSIVITY, ARTIST & AUDIENCE

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for the degree of Doctor of Philosophy

BRUNO MARTELLI
BA (Hons) Central St. Martins
College of Art & Design

School of Media and Communication
College of Design and Social Context
RMIT University

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I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Bruno Martelli 22 March 2019
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VT
Ruth Gibson
- Chapters that contain extracts from recent jointly-authored texts include:
  Chapter 2 - ‘Fifth Wall’ (Gibson, R. and Martelli, B. 2018)
  Chapter 9 - ‘Towards a De-Territorialised Field of Dance’ (Brown, C., Gibson, R. Roche, J. 2019)
  Chapter 11 - ‘The Bronze Key: Performing Data Encryption’ (Gibson, R., Martelli B. and, Kozel, S. 2018)

- Chapters that contain extracts from Ruth’s writings include:
  Chapter 6 ‘Eyes to See Nobody’ (Gibson, R. 2017)
  Chapter 11 ‘Crypto/Choreography Soma/Spy’ (Gibson, R. 2018)

Bruno Martelli
Chapters that contain quotes and extracts from recent jointly authored texts include:
  Chapter 01 - ‘Fifth Wall’ (Gibson, R. and Martelli, B.2018)
  Chapter 04, 06 - ‘MAN A - The Weird Giggle: Attending to Affect in Virtual Reality’ (Gibson, R., Martelli B. and, Kozel S. 2018)
  Chapter 06 - ‘The Bronze Key: Performing Data Encryption’ (Gibson, R., Martelli B. and, Kozel S. 2018)
TABLE OF CONTENTS

132 RUIN LUST
135 PLANET OF THE APES
136 AUTHENTIC PLACES
136 CAMOUFLAGE + COSTUME: CONCEALING COLOURATION
139 PRINTS MADE FROM PERFORMERS
140 CONCEALED PERFORMANCE
141 GHILLIE
141 WINTERSPACE
144 WE ARE HERE AND WE ARE EVERYWHERE AT ONCE
145 EARLY PROCESS
146 WHAT IS AN AVATAR?
147 THE FPS VIEW
147 PERFORMER AVATARS

07 NEW PERFORMANCE SPACES
152 POST STAGE
152 LIVE STAGE TO THE INTERNET
154 SCRATCH DANCERS + RANDOM CODE
155 THE SWAP TO INSTALLATION & GAME ENGINE SPACES
156 MAN A
158 3D FORMS & MAN A
160 EPHEMERAL MEDIA & MAN A
160 PERFORMERS IN MAN A
162 RAGTIME & MAN A
165 MAN A VR
166 THE BRONZE KEY: PERFORMING ENCRYPTION
166 VR DRAWING, MAKING THE BRONZE KEY
171 CAPTURE THE FLAG
172 VECTOR LINES
172 DRAWING SPACES

08 CONCLUSION
182 A WHISPER NOT A SHOUT
186 REPRESENTING SITE

REFERENCES

APPENDIX
01–62 Gibson/Martelli Images
ABSTRACT
Working with live simulation, performance capture, installation and video, I collaborate with artist Ruth Gibson to create immersive experiences, linking technology and choreography. Examining figure and landscape, I aim to discover new performance spaces. Many projects explore haptic interfaces and recreations of environments, immersing the viewer to enhance the experience of the artwork.

I challenge my skills sets and by learning new tools labour to understand how a system operates, affecting my process. I can fail in the studio and take risks in exhibition in order to find a future potential. Interactive works demand different engagements - the formats Ruth and I use encourage audiences to embark in our work.

The background to the research is that since the 1980s artists have been creating interactive worlds with Virtual Reality, Artforum Magazine recently featured ultimate Generation X'er, author Douglas Coupland talking about VR:

It's the ultimate hot medium, it hijacks both your reptile brain and your frontal cortex, as well as your vestibular system.  
(Coupland and Birnbaum 2017)

It seems timely to consider how my original and current artistic investigations dovetail and expand this emerging area. For over 20 years, my practice has created novel experiences, gaining new knowledge by means of innovative
practice and through the outcomes of those experiments — installations, artefacts and exhibitions, sharing the results. I approach projects, situated in these ‘virtual spaces’ as an opportunities to expand ideas, testing them through exhibitions escaping from theoretical beginnings. Developing new technology is not my end goal; I aim to create experiences — artworks that resonate with the audience.
01
INTRODUCTION
COLLABORATIVE PRACTICE

The collaborative practice I share with artist Ruth Gibson focusses on new approaches to combining technology and choreography with an emphasis on site-specific, virtual and augmented experiences. Through the examination of relationships between figure and landscape, we collaborate to discover new performance spaces. Our projects explore haptic interfaces and physical recreations of CG environments to question how the sense of dislocation and immersion can enhance the viewer experience.

Since 1995 our practice has never seemed to fit neatly into any particular category — we’ve resisted conventions, and we’re happy with that. We pursue alternative models and are early adopters of technology, which continues to inform our language. Operating outside the norm, we hope that the future of our collaboration is something alive, ever-changing, not fixed. Out of fashion, although sometimes hitting trends along the way, on the whole, we search for an original voice.

Over the 24 years of working together, we have drawn on the distinctive methodologies and strengths derived from our education, training and practice to create a new Third Space for making. This third space is not, therefore, a synthesis of two methods; it is both something more and different. Ruth is a dancer and choreographer with particular expertise in performance and a specific focus on her dance technique, Skinner Releasing Technique. I am an
artist concerned with visual communication, legibility and form, trained as a graphic designer at St Martins College in London.

We have always collaborated and also with others: dancers, choreographers, designers, programmers, technicians and possibly most significantly musicians. I will stress the importance of sound in our work, always present in numerous projects, we have worked with numerous sound artists, and it is this area where control resides with the musician — we exercise only the lightest of touches. Audio is such a deep and complex subject that unfortunately, it falls outside the scope of this writing and therefore mentioned briefly.

I am curious about the idea of new performance spaces and sensorial navigation. Moreover, how to bring together the artwork and the audience, creating a new experience for them in immersive space. We all have a sense of our body in the real world, but what of this sense of our body in a computer-simulated reality? How can we cultivate and integrate kinaesthetic intelligence into immersive environments? Leading me to ask fundamental questions through my practice:

- How can we engage the audience?
- How can we represent sites?
- How can we create a total artwork?
- Can we give viewers a sense of place?
- How do we connect real and virtual spaces?
- Can we rematerialise the digital?
- Finally, how can we cultivate and integrate kinaesthetic intelligence into immersive environments?

Challenging our skills sets by learning new tools we labour to understand how a system operates, which affects our processes. We can fail in the studio and take risks in an exhibition to find future potential. Interactive works demand different engagement — the formats we use encourage audiences to embark in our work. New technology is our occasional vehicle, and it’s not knowing that drives us. Interaction intertwined with physical thinking is always central; we are curious about these new performance spaces and sensorial navigation. We all have a sense of our body in the tangible world — we are all experts in
movement — we all have a kinetic sense.

The underlying proposition of my practice is that immersive performative articulations of space, reposition audiences in relation to artworks and a number of my projects, which I will detail shortly do just this. In our early stage works there was the separation between the audience and the performer on stage — a distance between them, likewise in the art gallery there is a physical space between the roped-off painting and the viewer - a sign and the presence of a guard suggest that you can look but not touch. With immersive installations, the viewer can literally be inside the artwork and by employing interactivity become, in some sense, in control of their own experiences.

At the same time as I began to recognise this separation between the audience and the artwork, I was metaphorically pressing my nose against the cool glass screen of technology and wanting to be inside the pixellated spaces of the digital domain, passing through the window of the screen to the other side. I think this desire gave my practice a push into a more immersive mindset. I’ll talk more about immersion shortly but returning to the proposition, it is about ways of bringing the audience into the same mental state as the artist, stimulating & simulating to produce physical and imaginary effects in real and nonsensical places — The difference in affect is the divide I’m trying to bridge.

In this essay, I aim to trace the lineage of body/technology relationships through our work, marking significant shifts and changes and reasons behind them. Our story, our history, our overview may identify points about performance engaging with new media in the 21st century. Some of this evolutionary path influenced by our distinctive individual practices coming together and falling apart.

Chapter 1. The Introduction presents the reader with my collaboration with Ruth Gibson and the beginning of my interest in VR and sets out my research interests.

Chapter 2. Gives context to other artists, the Community of Practice, working in or adjacent to, my field and introduces some of the discourse around game art practice.
Chapter 3. Defining multiple modes of immersion, I explain, What is this VR thing? I write about the VR goldrush and how this and the rise of what has become to be termed surveillance capitalism forms a background for much of my work.

Chapter 4. This chapter Simulation - what’s that? defines simulation and explains how computer game engines can create 3d environments that resemble real places. It relates simulation to games and introduces the person experiencing the simulation — the user, leading to the creation of user experiences and giving including numerous examples from my practice. Interaction transforms passive viewers into active participants and in some cases, performers of the work.

Chapter 5. Examining Landscape + Figure, live-action moving image works serve to remind the viewer of the simulacral immersive computer environments seen earlier. The chapter expands into how a landscape can become almost a central character in a work and moves onto the age-old fascination of artists with ruins. It introduces the concept of camouflage as a microcosm of landscape and brings in the concept of performer avatars.

Chapter 6. This chapter focusses on the central idea of the New Performance Spaces where performance, released from the theatre, can create a new experience, bringing together audiences and artworks. A parallel is drawn between evanescent performance and the transient digital — catching performances to retain something of the live.

Chapter 7, In Conclusion, I draw strands of the practice together and explain the contributions to knowledge.

BEGINNINGS - OSMOSE
Since the 1980s, artists have been creating interactive worlds with Virtual Reality. In 2014 Facebook purchased VR headset maker Oculus Rift for $2 billion. Artforum Magazine featured ultimate Generation X’er, author Douglas Coupland talking about VR:
Once you’re in it, you’re really in it... You become it, it becomes you. VR seems like its the logical endpoint of a data-bombardment process that started with Gutenberg.
(Coupland and Birnbaum 2017)

Bearing this logical endpoint in mind, it seems timely to consider how our original and current artistic investigations dovetail and expand this emerging area of practice. For over 20 years, we have created new experiences - gaining new knowledge using experimental methods and through the outcomes of those experiments - artefacts and exhibitions, share the results. We approach our projects, situated in embodied experience and performance in new spaces as opportunities to expand our ideas, testing them through exhibitions to escape from theoretical beginnings. Working with new technology is not our end goal; we aim to create experiences, artworks that resonate with the audience. VR refreshes expectations, offering new avenues for an original interface and environment design, concurrent with a growing interest in the integration of somatic-based movement practices within the domain of performance practice.

In 1995 Char Davis made a work for VR called Osmose. The piece had a minimal showing because viewers needed to make individual appointments to see the work. Shown at the Serious Games exhibition, I recall breathlessly arriving at an upstairs room in the UK’s Barbican Centre in 1997 after biking down from my studio in Clerkenwell. The piece consisted of a heavy, clunky headset and chest harness that I was strapped into by a gallery assistant. By the time my eyes had focussed, I was transported into an ephemeral world of translucent forest shapes and glowing text. The piece used breath control, exhaling causing the viewpoint (and as I quickly came to appreciate, me) to sink, conversely inhaling caused me to float up, gently leaning changed the direction of drift. By the time I had got the hang of all this sensorial overload I was hooked, Gibsonian Cyberspace had finally arrived!

This piece was pivotal for me in that it was: immersive, interactive and compelling — it made me want more! Here was a transformative technology - the physical effects of the breath controller lasting long after the experience was
over, resonating as a body memory. This effect is one of the main points in my interest in immersive environments - the transference of the kinaesthetic sense to the user and how this makes a digital environment seem real. Finally, it is in a gallery, rather than at a conference or in trade show setting — it wasn’t a novelty or a technical demonstration, it was Art.

I aim to undertake original investigations to gain new knowledge using innovative practice and through the outcomes of these experiments, which are artefacts and exhibitions, share the results. I approach projects as an opportunity to expand our ideas — testing them in exhibition, so that they may escape from their theoretical beginnings. Working with new technology is not the end goal. I aim to create experiences — artworks that resonate with viewers.

KEY WORKS
Throughout the dissertation, I discuss archetypal works drawing from an extensive catalogue, which I group into three strands here to draw out their essential features. (Note: The small number following titles of works refers to page numbers in the Gibson-Martelli images appendix, eg. White Island 38)

1. **White Island**, SwanQuake, Vermillion Lake and In Search of Abandoned are all immersive simulations. The works confront the viewer with landscapes —constructed environments and the individual works speak to ideas of void spaces, wilderness, architecture. They are visual tableaux that explore multi-dimensional realities, the content of which become different to each beholder as interactivity affords different journeys through each work — the methods of immersion, and the installation allows users to become performers of each work. Each of these works is created using a computer game engine and affords the viewer or player a first-person viewpoint. For example, **White Island** simulates the doomed arctic voyage of explorer S.A Andréé in 1897 - users cast into his hydrogen balloon attempting to control it against the capricious polar wind. Viewed inside a VR headset the arctic scenery rendered in a limited colour palette, low-polygon style, the simplicity of the landscape is a counterpoint to the rich surround soundtrack of hyperboreal winds. The experience is
enhanced by a novel rope interface and wind simulation via an array of fans.

2. Works from the MANA project: *Big Bob*, *Huff & Puff*, *Ragtime*, *MANA VR*, are a series of investigations into expanded performance — creating opportunities for users to experience a performance at home or in a gallery or other public spaces. Optical illusion, camouflage and costuming together with mobile apps and two and three-dimensional works present the audience with avatar figures, stylised forms which are animated using improvised performances, captured from real life, bringing a warm human touch to the cool digital.

Inspired by machine vision, QR codes, and Dazzle camouflage, the MANA project has seen us develop, since 2014 and throughout the PhD, numerous artworks. These artworks experiment with forms include large-format digital printing, simulations and sculptures. The pieces widely exhibited in galleries, museums, as both public artworks and in private buildings as wall-sized installations. The MANA project synthesises earlier stage experiments - attempting to escape the confines of the theatre to expose new stage spaces and bringing *ephemeral* sensibility to the conventional *permanent* digital. The project becomes a laboratory to experiment with a number of our ongoing concerns, including camouflage, public art, figuration, and creating new audiences. In the first works in the series, I experimented with creating large monochromatic, bold, zigzag prints to act as Augmented Reality tracking markers revealing concealed motion-captured performances in the form of abstracted avatars which appear via a custom MANA App. The works, freely disseminated as Apps for both Apple and Android devices, with unlimited edition prints available online alongside numbered editioned prints & virtual environments for sale in commercial galleries.

3. Video works - *We Are Here And We Are EveryWhere At Once*, *Ghillie*, *We Are Made of Starstuff*, *Where the Bears Are Sleeping* etc. are concerned with the figure/landscape relationship. Presented as *real* counterpoints to the simulation works or as standalone pieces they place performers into *avatar* roles where the uncanny figure is a foil to sublime nature. Film locations repurposed from their sources, hinting at narrative depths which
instead of a conventional story instead hint at a fabricated reality, being unable to distinguish the authentic from the imagined, the pure from the mediated. Typically, We Are Here And We Are EveryWhere At Once is a three-channel video installation that features the performers experimenting in the motion capture lab. Other films show the performers in the landscape of New Zealand, incongruously wearing the same motion-capture suits. They restage movement material and ‘ritualistic’ movements used for calibrating in the mocap lab. The installation typically features multiple films which are presented in a random order, breaking with narrative. A compelling soundtrack created by a local (to New Zealand) collaborator - manipulated sound created from objects discovered in the landscape. Two portrait monitors show fisheye close-ups taken from facial motion capture cameras, affixed to the performers’ heads. The portraits act as bookends to the landscape, a conceptual framing device which situates the landscape films in a post-natural state outside of conventional depictions of nature.

Taken together, these three strands of work contrive to uncover the new spaces for performance where liminal places are created for the viewer to inhabit, occasionally becoming an active participant. Various other projects The Bronze Key20–21, Ruined19, Golem18, Capture the flag10–11, XYZ while skirting around these topics, are all digital and physical artefacts which question the weaponisation of technology and the nature of truth and artifice by revealing something of their making process or the environment. These works have all been created throughout the research project and are responses to the new knowledge gained.

A NOTE ON COLLABORATION
Throughout the exegesis, when referring to the collaborative practice and works with Ruth Gibson I will use we and our, when using I that will be my position.
02
COMMUNITY OF PRACTICE
NEW MEDIA

Artists & researchers have begun investigating the digital in multiple forms, including computer-generated environments alongside experimental games & virtual reality experiences. There are a plethora of new media festivals and virtual reality projects in both film festivals and contemporary art shows, VR arcades are springing up worldwide, and there are more opportunities for digital artists to engage with a wider public. In the art world, traditional galleries are opening up to the idea of showing art produced on or with a computer.

Recent examples include the blockbuster Electronic Superhighway survey show at Whitechapel Gallery (Kholeif 2016) and the Ian Cheng exhibition at the Serpentine Gallery. Cynically, some big-name artists have been encouraged to produce work outside their regular practice to cash in on the emerging trend, for example, Jeff Koons, Marina Abramović and Anish Kapoor — not usually known for digital work, were commissioned to make VR pieces for Acute Art (Hollender 2017). The trend has been both good & bad — bad because curators with a shaky idea of technology can get easily swayed by neoliberal concepts like AI and Big Data and then exhibit it — which, with predictable backlash, is then unfavourably reviewed. Jonathon Jones writing in the Guardian on Ian Cheng’s show says — ‘art is always human, or nothing at all. Cheng forgets this, and his work is a techno bore.’ (Jones 2018). It’s this kind of negative attention which makes it harder for other artists working in the medium as the signal-to-noise ratio shifts.
On the flip side, big names and the attention they bring help with normalisation from slightly staid galleries. Earlier in our career, Ruth and I spent considerable time justifying our technics to galleries, met with either incomprehension or disdain, — this is now getting easier because names like Koons making forays into the digital space help to bring other digital work in from the cold. What was once the preserve of the specialised New Media festival now sits alongside traditional art forms in an Art Fair and therefore former digital artists can be, well, just, artists. The problem now is that there is a lack of informed criticality because the digital artform is so new (even though artists have been working with computers for 20 years or more, it’s been happening more or less under the radar). The digital tends to be polarising (a marmite medium) and has an ‘easily’ produced superficial gloss. Curators and reviewers, like the rest of us, are media over-saturated and may focus on the superficial qualities of the work. On the other hand, as artist Alan Warburton says in his 2017 Video essay Goodbye Uncanny Valley:

...we might be able to, move past reductive concepts like retro graphics, surrealism, vaporwave or gross-out media and encourage a popular discussion about power, technology and images in the 21st C... artists here demonstrate that seductive digital surfaces speak more about this age of technology when they fall apart revealing their construction at the hands of imperfect people and imperfect machines. (Warburton 2017)

Throughout the PhD, as you might expect, my focus has shifted, becoming increasingly self-reflective as my work transitions from producing with the digital to exploring the idea of being digital.

COMMUNITY OF PRACTICE

So who is in my community of practice? It’s actually hard to pin down completely because it’s shifting around so quickly, but here are a few cornerstone examples:

John Gerrard
John Gerrard is a former sculptor who has been using game engine toolsets to create real-time simulations that displayed in galleries - currently, represented
by Thomas Dane gallery (John Gerrard - Works n.d.). His work is in some ways traditional — objects for sale — many works comprise custom-built screens with inbuilt PC’s, forming a standalone art object. Gerrard’s work firmly sits in a photorealistic school of animation, seen on screen, various mundane sites are replicated meticulously, creating hyperreal portraits of actual places. The works tend to have many formal properties, consistent sky ground ratio, similar palette, continuous circling camera rotation, seen as a group the works share many of the same characteristics. Unlike Gerrard I don’t have a studio of technical types working for me, so cannot approach his production quality. Early on I dabbled with hyperreal imagery, which is often the end goal of computer graphics more real the real — I have moved on from this style because it’s not easy to produce without a team/budget and also it can feel a little flat. What I mean is that the hyperreality can seem a little lifeless with everything modelled — there is no room for imagination. Nowadays I am interested in the non-realistic. Another important distinction between Gibson/Martelli and Gerrard is that even though his work boasts real-time properties, it is non-interactive, functioning as a durational video animation — which does not need to concern itself with unpredictable user input. The audience is supposed to watch these pieces rather than experience them. (We’ve show alongside him in the Politics of Amnesia II exhibition at the Cafe Gallery Project in London, curated by Richard Ducker in 2015)

Dan Pinchbeck
A former AHRC Researcher, Dan Pinchbeck has created openworld games enabling the user to travel around sprawling environments uncovering hidden narratives. This kind of gaming experience has become known in the trade — and let’s face it, it is a trade, as a non-game. A non-game is precisely the kind of experience we have created however we deny narrative and explicitly don’t have end goals, so I would argue that our work does not fit entirely alongside this - because of the lack of any gameplay - the aim is merely to experience & explore the environment. Again Pinchbeck is creating photorealism, with meticulously detailed environments.

I use similar toolsets, however, Dan’s studio, The Chinese Room, is now developing for the PlayStation4 with a large team of animators and designers
The Chinese Room
"Everybody’s Gone to the Rapture" 2015 PS4 Game

John Gerrard Farm
& Sow Farm 2015
simulation
and is using the standard game distribution platforms. In contrast, our virtual environments are designed as exhibition artworks, rather than home gaming experiences for casual or hardcore gamers. We knowingly realise that different audiences will apply different sets of value judgements and we’re looking for a different kind of appraisal and appreciation. As it turns out, sadly, The Chinese Room studio recently closed its doors, a victim of its own success. The recent article in Eurogamer (Yin-Poole 2017) is an extensive exposition of the pressures that the studio came under despite or maybe because of, having to develop commercially and the difficult transition the team made from an early exploratory game-art practice into that of a commercial studio, with a completely different set of pressures applied. One of the essential things to remember is that commercial games are massive businesses - developers are under enormous pressure to recoup the vast investments that parent companies put into them which sit uncomfortably next to the whimsical designers remaining true to their dreams — a fate that thankfully Ruth and I have avoided.

**Joseph Delappe**

Joseph Delappe is an artist and educator who creates sculpture & game-art performance interventions. His archetypal work *Dead-in-Iraq* uses the chat function in the Americas Army online game (an FPS shooter game developed by the US army for use as a recruiting tool). ‘He logs on to the game and does nothing. While other online players around him simulate war - and eventually shoot him - he types into the program’s chat interface - typically used for gamers to strategize with one another - the name of each service person killed in Iraq’ (Clarren 2006). In another piece, *Gandhi’s March to Dandi in Second Life* (Delappe 2008) he re-created Mahatma Gandhi’s famous 1930, a 240-mile walk across India to protest the British Salt Tax in virtual world Second Life. He used a treadmill to walk the 240 miles of the original & simultaneously his steps controlled his avatar in Second Life - it is a live & virtual reenactment. Afterwards, he created artefacts including 3d prints & cardboard sculptures.

His work shows a strong political viewpoint, critiquing military and the underlying political systems and is also concerned with the technological tools used in making the work. We use many similar methods to DeLappe, however, one of the fundamental differences between our practices is that he uses pre-
COMMUNITY OF PRACTICE


Joseph DeLappe Elegy: GTA USA Gun homicides 2018 game mod
existing assets as source material whereas I mainly prefer to use the toolsets to make everything from scratch — I’m not creating mods or re-purposing a game to tell a different story, and this isn’t a criticism by the way. Joe’s recently launched project *Elegy: GTA USA Gun homicides* (Delappe 2018) is a perfect example of this. The project takes the statistical data about gun homicides scraped from the Gun Violence Archive and uses a cunning mod of the *Grand Theft Auto V* game to form a self-playing data visualiser in which a continuous tracking shot moves past pedestrians on the sidewalk who are all shooting at and killing each other. The number of deaths reflecting the real world statistic.

**Alan Warburton**

Animator Alan Warburton creates digital animations and sculptures exploring and referencing contemporary culture. He exposes the hidden 3d production process. In his animation *Z* (Warburton 2012) the short film is comprised of *z-depth* images, an image type that only exist in computer animation, revealing how far away objects are from the virtual camera. A series of tracking shots traverse an empty series of ghostly scenes. Alan’s projects are revealing and revelling in their making processes. Many other works also look behind the digital curtain of the high-end 3d production process, exposing simulations and techniques that are usually unseen by the end consumer of computer graphics. Like me he is fascinated by the craft of the digital and uses this as a material in the making, his work revealing process to comment on its own *thingness*. Unlike my own practice Alans work is mainly non-interactive — interaction with objects is implied

**Harun Farocki**

Harun Farocki was a German video artist and filmmaker (1944 – 2014) who in the later part of his life began making computer animations which ‘seek out the boundaries of the game worlds and the nature of the objects’... ‘The worlds have an apron and a backdrop, like theatre stages, and the things in these games have no real existence. Each of their properties must be separately constructed and assigned to them.’ (Farocki 2015) His work often uses controversial subject material, ranging from Vietnam Era napalm use by the US army in *Inextinguishable Fire* (1969) to conflict & videogames during the second war in Iraq in *Serious Games I-IV* (2010). Farocki’s *Parallel* cycle in four parts
focusses on the rules and grammar and virtual construction techniques of computer animated worlds. He writes:

*Computer animations are currently becoming a general model, surpassing film. In films, there is the wind that blows and the wind that is produced by a wind machine. Computer images do not have two kinds of wind.* (Farocki 2015).

Farocki’s latter works slot neatly between Warburton and DeLappe’s practices in that they are both examining the techniques and are critiques of, the animation and videogame worlds.

**INDIES**

This political side is prevalent in many independent games designers, escaping from commercial pressures, to use gaming as a means to explore ideas such as identity, sexuality and minority issues including **Robert Yang** and **Anna Anthropy**. Both Anna and Robert Yang through publishing and teaching empower new generations to use these tools to create work that harnesses the power of the medium, entering the third space between games and art with a robust, inclusive message, worlds away from the typically male-centred gamer world. Robert Yang’s work is rendered in a high-end style which would not be out of place in a modern AAA game whereas Anthropy’s low-fi aesthetic is at once charming and friendly. A book jacket quote for Anna’s book *Rise of the Videogame Zinesters: How Freaks, Normals, Amateurs, Artists, Dreamers, Drop-outs, Queers, Housewives, and People Like You Are Taking Back an Art Form* by Leigh Alexander, editor of games website Gamasutra sums it up:

*Anna gives the world of video games a crucial perspective from her seat of authority within outsider culture, and illustrates how essential it is for the space to empower voices of all kinds if it is to evolve.* (Anthropy 2012)

Many others could be either confused game makers making art games, or confused artists making game games. An example is two-person studio **Tale**
Harun Farocki:  
PARALLEL I-IV 2014  
Video, col., sound, 7 min.  
(Loop)

Robert Yang  
Succulent  
2015 interactive music video game

Anna Anthropy  
Gay Cats  
Go To The Weird Weird Woods 2015 video game
of Tales with their Cathedral in the Clouds — which they say are a series of ‘virtual dioramas intended for contemplation’ (Samyn n.d.) and others including Proteus by Ed Key & David Kanaga — a delightful low resolution ‘audiovisual wilderness exploration game/plaything’ (Bateman 2018). These indie makers don’t have the partisan edge of Yang et al., but still point to an original thought process which rejects the more formulaic moves of the games industry.

GAMES ≠ ART

We use many of the same tools and techniques as game designers and are therefore influenced by trends and tendencies in video gaming - which lead to both updated and new toolsets which may open up possibilities for creating novel experiences, both stylistically, which can mean the visual appearance but also the types of game mechanics, which are in turn leading to the modes of interaction. For example, when we began working on SwanQuake in 2006, the engine did not feature the complex material shaders available now, so if we want we can now make a much more complex material than was previously possible.

We have occasionally been grouped in with the art-game makers, but I would attempt to resist that categorisation because from my point of view:

a.) I am not trying to elevate the status of games to art. This can of worms continues to be an epic debate in the world of games which has been raging for years, possibly started by the American film critic Roger Ebert, who famously declared in 2010 that ‘Video games aren’t Art’ (Ebert 2010). I don’t have anything against videogames however I tend to agree with Ebert. The one obvious difference is that you can’t win an art, but you can win a game — games have rules, objectives and specific endpoints — the definition of what a game is, as opposed to open-ended play. Often the success of a computer game is measured by the number of downloads or if it receives critical acclaim in the press. These don’t make it art. In the same way, games which are issue based e.g. Before I Forget which is concerned with dementia (Wen 2018), or aim to take the audience through an emotional journey, e.g. Journey (thatgamecompany 2012) doesn’t make them art either, no matter how pretty the art style. I don’t
Tale of Tales Cathedral in the Clouds 2015 Transmedia project

Ed Key & David Kanaga Proteus 2008 video game
subscribe to the school of thought that somehow artgames as a category or ‘indie games with particularly high cultural and artistic status’ (Parker 2013, 41) are somehow superior to other games, like a low culture/high culture split. Instead, I agree with interdisciplinary media and digital scholar Felan Parker who writes that art games are ‘a discursively constructed site of struggle and cooperation over meaning and value’ (Parker 2013, 42). I see games overall as a complete contemporary expressive form, different from, but of equal worth to other forms of expression. Trying to make games into art is pointless because already ‘contemporary artistic practice doesn’t discriminate specific media or specific form.’ (Molleindustria 2011)

The fact that the medium is young compared to early film to excuse its problems (sexism, promoting violence, bad dialogue, loot boxes, shonky plot, uncanny valley, Gamergate) is also futile. The accelerated rate of evolution in hardware and software means that the games industry, (and that’s how they talk about games, as an industry), should possibly be measured and considered in internet years rather than calendar years. Internet years are commonly held to be in a 7:1 ratio with real-time, therefore if the first widely available arcade computer game Computer Space arrived in 1971, then computer games have been around for 329 (internet) years, therefore youthful excess or naiveté is no excuse!

b.) We are not making games. That’s not to say our artworks are not for sale, some of the galleries we exhibit in are commercial and have sold various artworks. We have not shown widely in the traditional new media circuit of festivals & galleries, i.e. Ars Electronica, SIGGRAPH, FILE, Laboral, TenderPixel, FACT etc.

OTHER ARTISTS
Aside from solo exhibitions, when we have exhibited with other artists, we do not fall into the company of our community of practice directly instead we are with artists that share common concerns around subject material or interests rather than techniques or media. For example, group shows we have exhibited in include broad themes including dystopia and science fiction: Smoke on the Water, This Is Where We Came In, Islands, the military:
Politics of Amnesia II, geometry, abstraction, pattern, glitch: Shape_shifters, Splintered Binary and finally nature: Tales from the Forest. Many of the other artists that we have shown with share a concern with the digital however they are painters, sculptors, printmakers using traditional art forms which are employed to examine ideas of the digital. These ideas not necessarily grouped with the post-internet — the sets of ideas and modes of interaction following on from the internet, coming from discussions about net culture which flow from the widespread take-up of the net in people lives, exposed by online orgs like Rhizome. Instead, I think that these artists we exhibited with are thinking about the digital as an aesthetic or a way of making or being that can be referred to, which reflects contemporary life. (For example, multidisciplinary artist Caspar Sawyer has made artworks like Emily from a series of ultra-magnified images of digital screens, uncovering the underlying LED elements which are ‘highlighting the reality of the screen and dislocating the sense of familiarity’ (Sawyer 2016)
03
WHAT IS THIS VR THING?
**WHAT IS THIS VR THING?**

This section explains what I mean by *Virtual Reality* and *immersion*, placing them in context of the mess that is the contemporary tech-company-driven-landscape, including something of the predictable *techlash*. I write about the VR *goldrush* and how this is all forming a background for much of our work.

At the time of writing, Virtual Reality has been having a bit of a moment, from breathless pieces in the newspapers, to advertising execs closing in for the kill, it’s probably worth spending a little time talking about what VR and immersive technology actually is — after all this is second time around the block*. We see images of the VR users sporting the elaborate goggles and hand controllers that characterise current VR equipment. VR is best described by scholar Brenda Laurel:

> I felt myself to be immersed in a virtual world in which I could take action. The definitive goal of achieving sensory immersion in a virtual environment, including a sense of presence, relies on a combination of factors working in concert. (Laurel 2013)

She sets out a useful number of qualities for an experience to be virtual reality including:

- *A complete surround environment.*
- *depth perception and motion parallax.*
WHAT IS THIS VR THING?
The ultimate display
The Sword of Damocles
created by Ivan Sutherland & Bob Sproull in 1968

• Spatialised Audio.
• Tracking participant’s direction of motion (distinct from the gaze direction)
  — ‘Eyes reveal gaze, the pelvis almost never lies about direction of movement.’
• The participant’s sensorium as the camera.
• Natural gesture and movement.
• Affordances for narrative construction.
• The principle of action. (Laurel 2016)

*First time around the block — I’m really talking about the 1980’s when Jaron Lanier coined the term Virtual Reality. (Kahn 2011). A programmer, writer and researcher he founded the VPL research company in 1985 going on to develop VR devices including the Data Glove, Data Suit and the Eye Phone (Ha!) - incredibly expensive these devices were but at least they were products you could actually buy, that existed outside of research labs. Brenda Laurel was also part of an earlier group developing VR at Atari. This is really not even the first time around for VR as Ivan Sutherland & Bob Sproull created a Head Mounted Display (HMD) back in 1969. The graphics were wireframe and the giant weight of the steampunk ceiling-mounted machine inspired the suitable name for the imposing ultimate display — The Sword of Damocles (Harry 2013). There are many other devices obscuring the origin of virtual reality including of course the good old View-Master from 1939 but I will leave this history lesson for another time.

IMMERSION

What do I mean by immersion? I mean an experience that actively engages the senses and may alter your perception, leading you to believe that you are in another place or are having some bodily sensation. Many people talk about books or films as being immersive, my colleague, researcher Alex Woolner suggests that the phrase absorption might better describe VR environments. He writes—

immersion, implies an environment that surrounds us at every point, like a stone dropped into water, might be better replaced with ‘absorption’ which more accurately describes the visual transportation that takes place when a user puts on a headset and starts to manipulate VR space. They remain
WHAT IS THIS VR THING?
physically immersed in the Real World, subject to the constraints of gravity and oxygen, whilst their attention is absorbed into the Virtual, primarily via the eyes. (Woolner 2017)

However, books, films and games are all very absorbing — you may easily forget the passage of time, but still remain in the same place. This is Narrative immersion as defined by Ernest Andrews (Andrews 2004). He goes on to define other flavours of immersion - Tactile immersion - here the participant performs skilled tactile operations and Strategic immersion which is basically what chess players experience. In Virtual Reality immersion is the perception of being present in the non-place of the virtual. Char Davies neatly writes about the virtual visitor being the immersant and talks about immersion in very different terms to game play—

*The immersant will realize she has entered a non-Cartesian place, very unlike the ‘real world’: here, everything is dematerialized and semi-transparent—there are no solid surfaces, no hard-edges, no separate objects in empty space. Instead, the immersant can see through everything—through the body of the tree, the ground, the roots below.* (Davies 2004, 89)

VR Researcher Mel Slater famously describes what he terms the place illusion — ‘the strong illusion of being in a place in spite of the sure knowledge that you are not there’ (Slater 2009, 3555) — noting that this experience is further enhanced by the plausibility illusion which is caused by the direct realistic responses of the virtual world to your physical movement, when for example, bending down to look under a table causes the virtual perspective to shift correspondingly, all this in spite of you knowing that you are not really there. Strong plausibility leads to the suspension of disbelief, the stronger the suspension of disbelief the greater the sense of presence in the virtual world — really it’s a spatial immersion. Slater says the place illusion is about how the world is perceived, or simply ‘Am I there?’, the plausibility illusion is ‘what is apparently happening is really happening (even though you are sure it is not)’. or ‘Is this happening?’.

This plausibility is certainly helped if there are no interruptions from the outside world, for example bumping into things, or hearing external sounds.
Marco Gillies talks about another state of virtual reality called *magical interaction* where the basic truth that virtual reality should behave just like the real world in order to maintain plausibility, has another option, where interactions not possible in the real world can occur, because after all, there is no point in the virtual endlessly simulating the real. These *magical interactions* mean that

*VR should be about having experiences that we cannot have for real, and that includes going beyond the laws of physics.* (Gillies 2018)

Gillies uses the *SuperHot VR* game as an example, here players can control time through motion, slowing movement slows time, so a motionless game player can look around a completely still scene in order to outwit enemies. This is not in any way what happens in the real world, Gillies continues — *‘The time control interaction doesn’t feel artificial in the way a computer interface does, and of course, it doesn’t feel like real life. It actually feels very magical.’*

When I talk about immersion: forgetting the passage of time, being swallowed up or absorbed, dropped like a stone into water, believing the world and being sure it is not real at the same time, — all of these things are what I mean.

**FLOW STATES**

Once fully immersed, the next goal in enhancing the experience is to get the user to experience a *flow state*. Described by Mihaly Csikszentmihalyi (Me-High Cheek-sent-me-high) in *Flow: The Psychology of Optimal Experience* (Csikszentmihalyi 2008), a flow state is one where an athlete or other, performs with total concentration, at their peak best, without effort. The self-conscious recedes into the background as focus is fully on the current activity, this can be experienced by anyone doing anything if they are properly concentrating. The flow state has a number of characteristics described by sports psychologists Ravizza, Garfield & Bennett including:

* • Total immersion in the activity
* • Feeling of being in complete control
• Time space disorientation (slowed down)
• Unique temporary involuntary experience
• Focused on present
• in the cocoon
  (Ravizza 1977), (Garfield and Bennett 1985, 165)

Jeanne Nakamura and Csíkszentmihályi put it even better, identifying six factors:

• Intense and focused concentration on the present moment
• Merging of action and awareness
• A loss of reflective self-consciousness (i.e., loss of awareness of oneself as a social actor)
• A sense of personal control one’s actions; that is a sense that one can in principle deal with the situation because one knows how to respond to whatever happens next
• A distortion of temporal experience, (typically, a sense that time has passed faster than normal)
• Experience of the activity as intrinsically rewarding, such that often the end goal is just an excuse for the process
  (Nakamura and Csikszentmihályi 2001, 90)

Only a combination of all of these aspects can be called a flow experience. Psychologist, Kendra Cherry identified other elements from Csikszentmihályi and I think these two extras are important for creating immersion:

• Immediate feedback
• Feeling so engrossed in the experience, that other needs become negligible.
  (Cherry 2015)

These flow state factors play well, and into, Laurels essential qualities of virtual reality mentioned earlier, aligned as they are with immersion.
WHAT ABOUT 360º VIDEO?
Being fully immersed in a world and able to have some influence, naturally using gesture and movement, is how Laurel defines VR. These qualities set it apart from 360º video, which is being described by many nowadays as virtual reality. For example the Guardian Newspaper’s own ‘Virtual Reality Studio’ (The Guardian 2017) presents a number of 360º films. One of the bugbears of the 360º video format is that you are at the mercy of the camera position, viewers can’t walk around. 360º video has its own very special set of qualities that need to be dealt with distinct from VR — telling a story, focussing the viewer on the action, dealing with jump cuts and so on. There are however many interesting implementations of 360º video including Dinner Party an ‘interracial couple’s alien abduction in VR’ (Trout 2017). This movie is based on a true story and features a combination of real film and and CGI. The film ‘screenings’ take place in a physical set of a dinner party to mirror some of the onscreen action, and the camera view moves during the experience. The second half is mainly CGI and effects overall is has great sound design. However like much 360º the viewer is almost always just that, a viewer, there is no interaction.

THE TECHLASH
Nowadays our practice is happening against the background radiation of the ‘techlash’ (Richter 2018) — this is a mainstream push back against tech bros — the mostly white, male, technological workers and entrepreneurs in the tech industry and the casual way that an increasingly few Silicon Valley companies are concentrating power, in the form of our data and money to then casually misuse against us. This is completely contrary to many tech companies jingoistic enabling mantras — remember when Google dropped ‘Don’t Be Evil’ (Basu 2015) anyone? promising us what is, clearly not, the ‘fully automated luxury communism’ (Bastani et al 2019, 50) that could be available. VR, in particular, seems to come from a place where, as John Perry Barlow wrote in 1990—

*the presence of such unclaimed vastness seems to elicit territorial impulses from psychic regions too old to recognize the true infinity of this new frontier. Disputes appeared like toadstools in the rich new soil of cyberspace.* (Barlow 1990, 38)
EMPATHY AND THE RISE OF SURVEILLANCE CAPITALISM

Filmmaker Chris Milk’s sees VR in another way, as the Empathy machine - he talks about viewers ‘feeling humanity in a deeper way’ (Milk 2015) after viewing his 360º film about Syrian refugees — ‘you empathise in a deeper way’ he continues, explaining, ‘its not just a video game peripheral, it connects humans to other humans’. A more immersive empathy experience may be director Alejandro G. Iñárritu’s CARNE y ARENA (Virtually present, Physically invisible) (2017), here a short 6 ½ minute virtual reality sequence for one person enables the viewpoint of immigrants crossing into the US. Users have physical experiences moving barefooted around the large installation space which simulates the desert. Shown at the Cannes Film festival, the experience closes with the viewer being shot at by border guards. Empathy flows from a strong immersion. However, the empathy both creators talk about may be mistaken sympathy, and these experiences could be seen as somewhat voyeuristic.

Contrasting with the ultimate empathy machine VR is also the ultimate surveillance machine, the ‘VR headset is the perfect panopticon’ (McMullan 2015). By its very nature and design, VR systems are all about working out where you are looking (in order to display visual content) and of course, rendering what you are looking at in the virtual world. This information can easily be tied back to the inevitable online accounts which users are forced to set up, as each platform comes its own-brand built-in shop. Contrast this arrangement with contemporary digital /optical devices like cameras or binoculars which are merely acting as mute tools. Upgrades or new models of headsets will presumably go further, introducing individual eye tracking say in order to deliver better looking virtual worlds. This will be of great interest to advertisers and Jaron Lanier would agree, writing in Dawn of the New Everything: A Journey Through Virtual Reality —

Thirty Eighth VR definition: The ultimate way to capture someone inside an advertisement. Lets hope it’s done as little as possible. (Lanier 2017, 219)

Bearing in mind that Facebook’s business model is selling your data then widespread Virtual Reality represents the ultimate data-mine. In Shoshana
WHAT IS THIS VR THING?

Friman. 2005
Inside one of the prison buildings at Presidio Modelo, Isla de la Juventud, Cuba - the nightmare ruin is a reminder of Jeremy Bentham's Panopticon - the all-seeing surveillance prison.

CARNE y ARENA 2017
Alejandro G. Iñárritu
Zubof’s book *The Age of Surveillance Capitalism* she argues that the ‘surveillance capitalism unilaterally claims human experience as free raw material.’ (Zuboff 2019, 9). I’m going to talk a little about both empathy and privacy in relation to my own work shortly in the NEW PERFORMANCE SPACES section.

**FACE AND GAIT RECOGNITION**

Currently, there are many concerns in the non-virtual area of digital privacy both in light of the revelations of ex-NSA spy Edward Snowden and the increasing frequency of data leaks ranging from email passwords to credit card details. (For an astounding visualisation of the sheer amount and scale of leaks, the information is beautiful website features a constantly updated diagram of ‘losses greater than 30,000 records’ (McCandless and Evans 2018)). The 2018 Cambridge Analytica Facebook data manipulation debacle gives one pause to consider how even the most innocuous information is twisted around. In Malmö, with our collaborator Susan, Ruth and I discussed increases in computer horsepower, making it possible for a surveillance state to search security camera feeds to recognise faces and track people. Admittedly face recognition hasn’t worked out too well in the UK, with both South Wales and The Metropolitan Police admitting that ‘the wrong person (is) picked out nine times out 10’ (Dodd 2018). Even so, this is part of a trend where the State sees an increase in surveillance as a price that we must pay for increased ‘security.’ Common or garden face recognition tech can be defeated if the subject wears a hat, faces away from the camera, or wears the anti-surveillance clothing which is now for garments such as scarves which can blow out a photo-flash image.

What is truly frightening is that it is now becoming possible to recognise a targets gait, which is basically their walking pattern. Unlike facial, gait recognition negates the need to have a frontal view and can be achieved by either cameras or footstep sensors. (The earliest movement-based security system is the classical Japanese nightingale floor which sounds like birdsong when walked on, keeping inhabitants safe from Ninja assassins. The prime example, in this case, is Ninjo Castle in Japan.)
WHAT IS THIS VR THING?
Everyday applications of gait recognition technology are not so far off now, ‘a video image of only two strides is sufficient to identify a person with a high rate of accuracy, based on arm swings, length of stride and other characteristics.’ (Japan Times 2018). Possibly this A.I. assisted method may be defeated by the simple analogue approach of putting a stone in your shoe.

A recent Wired magazine article explains how Oculus inventor Palmer Luckey has set his sights on scooping up homeland security border control contracts in the US with a sinister optical ‘smart wall’ (Levy 2018) that harnesses AI to differentiate animals, vehicles and people. Millions of dollars will be invested to stop people moving.

**GOOGLE AND THE WHITE HEAT**

We shouldn’t forget two of ‘Techs ‘Frightful 5’” (Manjoo 2016) — Google and Microsoft and their entry into VR space. Unlike the Playstation VR headset neither of offering is specifically aimed at the gaming type market. Further distinctions become apparent in the early advertising for their systems. Microsoft’s Hololens cool blue blueprints and planning overlay foretell a future where headsets are employed by steely-eyed engineers and architects creating futuristic vehicles and cities. This is VR as a business tool. Google, on the other hand, depicted a girl skipping through the sunny streets of a Nordic city, stopping on the steps of the church and presumably needing to check out the location of the nearest café, she casually slips on the goggles and enters wonderland. This is VR as a lifestyle accessory, ‘comfort over technology’ (Pierce 2017). The virtual realm is never too far away, always accessible — unlike the work/life split of the Hololens advert. (Some readers may recall the much hated Google Glasses — augmented spectacles that could overlay location and person-specific information onto the world. This gave rise to a new type of creepy brogrammer who surreptitiously checks up on people when meeting them in a bar say, by sneakily examining at their Facebook profile. This and the fact that basically the glasses were also a camera continually sending a live feed to Google gave rise to the term ‘Glassholes’ (Schuster 2014) - thankfully Google ended the experiment to begin work on other headsets.)
WHAT IS THIS VR THING?

Magic Leap One
Headset 2017
Low-cost lifestyle VR goggles like the Google *Daydream* aim to become the gateway drug into the Virtual world presenting extremely low barriers to entry. In a way the creators can, of course, claim that they are increasing accessibility — indeed our MANA VR ³² (2015) project was initially developed for the humble Google *Cardboard*, picked because of the low cost and the ubiquity of mobile phone users who slip their phone into the viewer. (For Google VR serves as a great reason to upgrade a phone, the headsets successor, the *Daydream* requires a nippy VR optimised processor and therefore the latest phone, while the headset itself remains relatively cheap). MANA VR for the cardboard was originally an experiment to test the mobile VR system. In practice, the headset is perfect for quickly showing VR to people in the strangest locations and our piece without advertising or press has been downloaded several thousand times from. The download stats encourage me to think that there are both people with the right equipment and a desire to try unusual VR experiences.

Needing new hardware is a designed-in feature of the latest AR tech known as *ARKit* and *ARcore* from Apple and Google respectively. Both are markerless augmented systems which do wonders with the internal phone sensors, but in order to gain access, you do need to upgrade your phone. Big tech firms here have taken a leaf from the videogames industry — the latest games with the shiniest explosions need the latest video cards leading to the current situation where a £600 Nvidia graphics card today is worth £30 three years later and won’t play any games. In the headset market, the new kid on the block is the Magic Leap, an augmented reality wearable PC headset similar to the Hololens. Magic Leap has had literally billions of investment dollars poured into it ‘Magic Leap Leads $1.1 Billion Wave of VR and AR Investment’ (Gaudiosi 2016) and gone on to generate plenty of frothy column inches see ‘Hypervision’ (Kelly 2016). This constant churn of hardware poses a dilemma (mainly financial) for us as artists — do we jump ship to the latest bandwagon untried technology to appear next-gen or stick with tried and tested technology that won’t be bleeding edge in a few months. Virtual realities by artists, while rare compared to regular art forms, are being seen in artfairs now, representing something of a volte-face for some curators and galleries, who not been seen dead with this type of work a few years previously, however now this door is open, it remains to be seen if it is stays open.
WHAT IS THIS VR THING?
‘What a time to be alive.’ The Simpsons (Dietter 1988)

NO TECHNOPIA?
VR Technology promises a utopia, but how many times have we heard this? And how did it work out? The real problem is that wealth and capital are being concentrated in the hands of an increasingly small number of monopolies that do not necessarily have our best interests at heart, and it’s simple for them to throw us shiny baubles from time to time. Tim Sweeney from EPIC Games (the developers of the Unreal Engine) sums it all up in Rolling Stone magazine:

It would be really tragic if we let the future metaverse, that binds all humanity together into shared online environments, were a closed platform controlled by a giant corporation...As always, they’d use it to spam you with advertising, they’d use it to gather information about your private life and sell it to the highest bidder, and they’d act as the universal intermediary between all users, content creators, and transactions, ensuring that everything has to be approved by them. (Suellentrop 2017)

Against this background it is somewhat unclear how to operate with a clean conscience after all I am potentially popularising the very thing I have a problem with. Trying not to sound glib I feel that artists must use the tools of the oppression in order to understand how to grapple with the inherent contradictions in the larger context. Almost every project mentioned in this document uses surveillance technology in some form, from White Island which employs VR to Viking Shoppers using infra-red security cameras, to MANA which makes use of mocap. I am conscious that much of this toolset developed through the ‘Military-entertainment complex’ (Lenoir and Caldwell 2018), as far back as 1990 John Perry Barlow wrote about military VR research, ‘Heads up displays and looks that kill were their speciality’ (Barlow 1990, 37). However the technics can be turned a little from their primary purpose — computer game engines don’t always have to be for shooter games, CAVEs’ don’t have to be used for military simulations and so on. As artists we must know what Jacob Applebaum says—
Resistance in an age of mass surveillance requires the ability to see as surveillance states do. It requires understanding different methods of surveillance from the intimately physical to the abstract and electronic. It requires that we consider all possibilities even if they seem remote, to understand the realms of what is possible and of what may be unlikely. It is up to us to understand these systems and to ensure that we work together in solidarity to build new infrastructures that encode the liberties that we hold dearly. Things seen as possible by some will be considered as inevitable but this is a lie: there is no inevitable system (Applebaum 2016, 157)
04
SIMULATIONS – WHATS THAT?
SIMULATION

Over the course of the PhD journey, I realised how simulation is a fundamental concept in my practice. In order to visualise and create interactive worlds, I use computer game engines which can create 3D environments which resemble real places. Many of these artworks concerned with the memory of places which are occasionally inhabited by doppelgangers — digital doubles. Working with a variety of tools and techniques to create these works and the effect they have on users leads me to simulation and what it is and what it means. Leading on from this is the user — the person who is experiencing the simulation — I will expand on what this user experience is and finally, I explore the differences between play and games.

SIMULATION... KEY CONCEPTS

Simulation — the action of pretending or deception that’s good enough to trick you. The OED online says simulation is ‘a false assumption or display, a surface resemblance or imitation, of something, or the technique of imitating the behaviour of some situation or process...by means of a suitably analogous situation or apparatus.’ A great example of a simulation given by the University of Chicago is the humble office fire drill which has ‘all the outward appearance of an orderly escape from danger but none of the danger itself’ (Sandoz 2003). Media theory is concerned with the concept of the simulation and the interaction between the real and the original, Baudrillard writes about simulations and
pretending (dissimulation). “Whoever fakes an illness can simply stay in bed and make everyone believe he is ill. Whoever simulates an illness produces in himself some of the symptoms” (Littré) Therefore pretending, or ‘dissimulating’ leaves the principle of reality intact...whereas simulation threatens the difference between true and false, between real and imaginary.’ (Baudrillard 1983 P3).

Deluze on the other hand raises an artwork beyond representation to a point where it is equivalent to the original, so effectively the original no longer has greater value or power and is destroyed. In computer games, simulations are commonly used to represent or recreate or mimic, behaviours occurring in real life, in order to make the game world behave convincingly. For example, physics is simulated and part of that is gravity, a dropped box falls to the ground and depending on the simulation, it may bounce or break apart according to preset parameters. Audio effects can likewise be simulated — a dripping sound can be given a real-time echo and falloff so that approaching the sound source causes an increase volume lending atmosphere to a game set in an underground cavern for example. Ambient sounds in FPS games may be heard with a surround sound system, giving a convincing simulation of being realistically positioned, like hearing a bird singing, high up in a tree.

GAME AS SIMULATION

Overall the total computer game itself is a simulation. Ludologist Gonzalo Frasca defines a videogame as a particular way of structuring simulation defining it thus: ‘to simulate is to model a (source) system through a different system which maintains (for somebody) some of the behaviours of the original system.’ (Frasca 2003, 223) For Frasca it is not just about the audiovisual qualities, a simulation must model some of the behaviours of the original — so that input into the system causes a reaction of some sort — operating a joystick causes something to move in the simulation for example. The issue I have with games is that the action follows a narrative arc, often aiming to give the player a big ending, bringing the simulation back into a narrative arc that Frasca is trying to avoid. Games are typically constructed so that players following the rules end up the winner, this goal is the correct goal; that goal is the wrong goal. Brenda Laurel writing in Computers as Theatre also advocates Aristotelian closure— ‘a progression from possibility to probability to necessity taking place over time,
the end point becoming the source of the users pleasure’ (Laurel 2013, 85) — for her human-computer interaction is a type of storytelling. My work has avoided goals, attempting to create Laurel’s ‘carefully crafted uncertainty’ (Laurel 2013, 79) where there is always plenty of room for the imagination to fill up. Gaming vs play and bending, breaking or creating rules in games, is discussed a little later on.

In terms of game environments, Frasca writes— ‘simulation is only an approximation... it does not announce the end of representation: it is an alternative, not a replacement’ (Frasca 2003, 233). While VR may skilfully use ‘technics to create a simulation, it does not destroy the original because it is not generally considered a simulated reality because participants are never in doubt about the nature of what they experience’ (Frasca 2003. A simulated reality would be, for example, the metaphysical hypothesis Nick Bostrom proposes, ‘are you living in a computer simulation?‘ (Bostrom 200, 243) where it is an almost mathematical certainty that we are all simulants living in a giant ancestor simulation which has been created by posthumans.

**BODY MEMORY & SWANQUAKE**

Experimenting with early game engines *Quake, Doom, Halflife,* and their respective level editing software: *QERadient, Doom Builder* and *Valve Hammer Editor* in the 90s I modelled the National Media Museum in Bradford (formerly The National Museum of Film Photography and Television) as a playable *Quake* (Carmack & Romero 1996) multiplayer environment for a videogames exhibition. Working from the architectural plans, I spend a long time building and testing the environment. When I finally visited the real museum I twigged that I was able to find the museum staff offices because of a ‘body memory’ (Casey 2009, 147) arising from repeatedly navigating around and about the computer game version I had created. The lightbulb moment was recognising that even my low resolution, low fidelity model, when seen from a first person viewpoint could reasonably simulate an actual place successfully. Game levels in videogames like *Unreal Tournament* (Sweeny and Bleszinski 1999) feature with fantastical constructions of castles and tunnels, I had not grasped that they were good simulations too — because I had no experience of real tunnels and castles for
SIMULATIONS - WHAT'S THAT?

Film set of The Assassination of Jesse James by the Coward Robert Ford in 2009
comparison. Design guidelines for multiplayer Unreal maps advise scaling up doorways and corridors to heroic proportions so bulky player characters with massive guns can run at full-tilt around the level ensuring fluid gameplay, without getting stuck in a corner. During the design of the SwanQuake (2007) environment I likewise paid a lot of attention to door heights and widths — many iterations were tested, comparing with real-world doorways. This attention to detail was in service of accurate scaling rather than facilitating fast gameplay. The intention was to simulate the material parts well enough to give the viewer a way to accept the unreal parts of the landscape. This plays into game designer Toby Gards idea of consistency — maintaining that in order to create a successful i.e. convincing game environment it is necessary for game world objects to be logically consistent with each other — the example of bad design he gives is of ‘French road signs on the streets of Chicago.’ (Gard 2010) here is a similarity to Mel Slaters VR plausibility illusion but more of that later...

FILM SETS & VERMILION LAKE
Researching Vermilion Lake (2011) we were lucky enough to visit the set of The Assassination of Jesse James by the Coward Robert Ford (Dominik 2007), the long-titled film about outlaw James played by Brad Pitt. The set, constructed on a farm in Alberta, Canada, overlooks the Rocky Mountains offering unobstructed 360º vistas from where no modern-day objects break the illusion of the 1882 setting of the film. The crew have built a village of houses, including the centrepiece James house. This wooden house is perfect in every detail inside and out, from hand-blown glass windows to the detailing on the door hinges. This simulation is perfect, the house going beyond a simulation as it fully functions as a dwelling, we take tea on the porch. Standing on the boards looking downhill frames the other houses. What was fascinating was walking around the back of the houses, and seeing the buildings instantly sliced off, where the camera cannot see. Standing in one spot, it is easily possible to believe you have travelled back in time, the Baudrillardian difference between true and false equals zero. In another spot it’s obvious the whole thing is fake — moving between these two viewpoints there is a moment when they balance equally, the fake and the real — and this between viewpoint is what really fascinates me.
SWEET SPOT
The fake/real viewpoint or moment is what I consciously attempt to uncover in my practice, and this is one of the discoveries during the PhD — that there is a sweet spot where it is possible to perceive the simulation & the means of production at the same moment. The sweet spot is the same species of pleasure that comes from understanding that you are being fooled, like watching a magic trick or a theatrical special effect, the awareness that this is only an illusion, but enjoying it anyway. This mode of enjoyment explains the proliferation of breakdown VFX videos for effects movies, showing actors first against greenscreens, now with backgrounds dropped in. Widespread and popular they do not explicate anything — viewers are left knowing that something, was made somehow and that it is a fake, but doesn't it look great! The simulation is uncovered and laid bare.

VERMILION LAKE
In the Vermilion Lake installation the viewer initially sees a full size black & white wooden house. Closer inspection reveals the house is a shell. The plank surfaces are printed textures, the windows images of glass. The house is a 1:1 reproduction of a 3d computer model which in turn is based on a genuine Canadian cabin. Inside the house, a bisected rowing boat connects with its projected virtual half, seen onscreen. The viewer can physically row, moving the viewpoint around a simulated lake system. This environment is rendered non-photorealistically in monochrome, echoing the house model which makes an appearance on the lake shore. The monochrome colour scheme intended to remind gallery visitors that the house is a quotation of a house. This installation, conceived initially as a VR experience uses projection due to practical and budgetary constraints. (It was not possible at the time, to rent a headset, let alone buy, this was before Oculus Rift headsets became available ). Virtual Reality was meant to allow visitors to navigate by looking over their shoulder—as in a real rowing boat, where rowers sit facing backwards from the direction of travel. VR would also have fully immersed the player, however, the single channel projection employed had other advantages — allowing two people to share rowing duties and afforded other spectators inside the cabin the chance to see
both the rowers and their navigation around the environment. In practice, the projection solution turned out to be a wise choice, as during the exhibitions tour to five galleries there would have been unacceptable waits if it were a single user experience. This whole installation hit the desired *sweet spot* — the mechanics and resulting illusion are simultaneously visible.

**EXTERNAL COMPARISONS and SWANQUAKE**

One easy way that a simulation, no matter how fantastical, can become a believable place is if there is nothing external to compare it too. For Baudrillard, the simulation is a process where reality becomes usurped. This only works when real-world comparisons are not possible — we know a videogame is unreal because when we on a screen and we can glance away and compare it to the tangible world. Take away the external world, and suddenly the game world becomes the only reality. Ruth and I have experimented with this in various installation settings, at the *AURORA* festival in 2007, *SwanQuake*, which I will describe shortly, was projected at large scale into a black box gallery. The low poly environment became a creepily immersive experience for unsuspecting gallery viewer, especially when accompanied by Adam Nash’s unsettling soundscape, reproduced by a surround sound system. Johannes Birringer describing the work in *Data Art & Interactive Landscapes* in *SwanQuake* the *user manual* writes—

*..we are now transported inside this imaginary land...inside vistas of an uncanny nature-architecture, neither real nor natural but entirely constructed.* (Birringer 2007, 48)

The illusion maintains because the piece existed in its own darkened room, the large image mesmerises and has no competition. Careful presentations of this piece continued to employ isolation in order to enhance verisimilitude. Creating this kind of illusion is one of the main reasons I began working with gallery installation rather than using conventional methods of distribution like the Steam platform. (Steam is software that organises your PC games library with an online shop enabling you to browse and buy more games). Initially I wanted as many people to experience the work as possible, it then occurred to me to limit
distribution, because I would lose control of how someone at home viewed the artwork — for example, seeing it on a monitor in a bedroom without the support of the surround audio would diminish the experience. (On the other hand, works like MANA deliberately seek to address this kind of casual consumption by producing a free mobile App.)

Large-scale projections are striving to reach the full CAVE experience. Here synchronised stereo rear-projection into a box surrounds the viewer with 3d images. Usually, the user wears a pair of high-end glasses that separate images into left and right eye views plus a tracking system constantly adjusts the viewpoint giving the wearer a correct perspective view. A CAVE installation blocks external signals which helps the viewer buy into a simulation. The major advantage that VR headsets have over CAVEs (apart from cost) is that obviously they block the external view in every direction. Because of this, low resolution and crappy visuals can win out every time. However, I like the CAVE, because in order to see, users merely slip on a lightweight pair of glasses, no wires or bulky headsets. Moreover, users can see other people beside them. CAVEs are impossible to photograph — the corners, which are imperceptible to CAVE users show up in the picture. When a CAVE is not available, and when viewers can see the screen edges, other tricks must be attempted to subvert the eyeline, and the V22 Gallery SwanQuake installation is an excellent example of this...

**SWAN QUIKE**

The Swan Quake artwork is concerned with the quest for self-identity in an immersive constructed environment. In the work Ruth plays herself multiple times as a troupe of ghostly avatars — the narratives of dance playing out in a series of interlinking voids. The general themes are the body, architecture, urban landscape and revealing & concealing. Loops are used here as a motif for the entrapping behaviours associated with compulsion, obsession and anxiety.

SwanQuake:House exhibition at V22 gallery was installed at our request in the basement instead of the white cube galleries above. A converted Edwardian house in the East End, the gallery basement was formerly rooms for the servants — interconnected with old fireplaces, creaky floorboards and walls thick with peeling paint. SwanQuake was rear-projected onto a modified dressing table,
the dresser mirror replaced with a screen and a trackball and buttons built into the dresser top. Interconnecting material and digital realms I modelled the basement rooms, adding them to our computer environment (adding the exhibition spaces to the artwork was a recurrent theme). Visitors would be able to explore the physical room — and the photorealistic virtual recreation. Images of rough plaster and brick, photos of the real place subsequently used as texture maps in the game environment are physically reproduced fullscale as wallpaper covering the false walls concealing the original. The real is de- and re-materialised, the intention that gallery visitors initially buy into the idea that the room is what it appears. Getting closer than a few feet, pixels in the texture image become apparent, revealing the artifice, situating the physical room in game space, by extension converting viewers into game avatars — echoing the scene portrayed in the digital environment. Dim lighting and a low polygonal light switch model complete the effect. During the exhibition visitors who noticed the fake room, in a room seemed to experience a moment where they began to doubt the reality of any of the rooms — this simulation doubling (real and inside the PC) enhanced the immersive qualities of the work — the perceived simulation extending inside and outside of the dressing table screen. Writing about the installation in *Keeping it Real: Encountering Mixed Reality in igloo’s SwanQuake: House*, Sita Popat describes her experience:

> The paint is peeling to expose the brickwork, and the small rooms look dark and damp. My skin crawls, as the visceral feedback from the basement matches the visual cues from the virtual world. I flick my eyes up into the corner of the physical room and then back into the virtual room, and the two look almost identical. I shiver. (Popat 2012)

The simulation contrasted with the real, features in many larger solo exhibitions which present a moving image landscape work and a simulated version of the same topography, abstraction sitting side by side with the actual, deliberately inviting comparison. These moving images serve to remind viewers that the electronically created simulations, while convincing when taken at face value, do not stack up against the rich complexity of nature — the polygonal artificiality immediately apparent when compared either conscious or unconsciously. Why would we want to do this with our audience? Mainly because I want to bringing
the audience to a delicious point where they are aware they are fooled by a simulation but still want to continue eating it, becoming aware of the simulation itself.

**WHAT IS USER EXPERIENCE?**
I talk about the user experience all the time. The conventional or *classical* understanding of the user experience is that it is what happens when you click on a button on a website or a game. You are not clicking a button, it is a picture of a button, and it is your mouse that is receiving your finger motion and turning that into clicks. The interaction here is really in itself a kind of virtual reality, where physical interactions get translated into the digital via the metaphor of the interface. *UX designers*, as they are known, like to talk about something called *user journey* and use words like *usability, ergonomics, performance* and *accessibility*.

> User experience - commonly called UX was popularised in the mid-90s by Don Norman, a design professor at UC San Diego. In 2007 he noted the term had become imprecise as a consequence of widespread use. (Naimark 2018)

This is the technological part of the user experience. It can include physical interaction with the interface which can sometimes give haptic feedback so there is something you can feel in real life, that extends out from the virtual. At the simplest level, this is the rumble you get in an Xbox game controller. Later I will talk about a rope interface...

**VR INTERACTIONS**
In VR there is the user experience which is to do with interaction and navigation. This navigation is different from the *navigation* of a website or a user interface—however, this UI navigation may also be there. In VR movement is fundamental to how users feel present — Neimark conveniently groups VR interactions into five typologies, I’m sure in the future there will be more:

> **Rotational Navigation** - or looking around- really the essential 360° video experience.
**Positional Navigation** - or Moving Around - here you can move in space, and the perspective consistently responds. Some large scale spaces using backpack PCs get around the limitation of a small tracking volume. Some navigational schemes require the viewer to teleport from place to place, or the users control some a vehicle or simulate walking, pressing a button to move forward. Driving a vehicle can be very good at causing motion sickness (DiRT Rally VR I’m looking at you! (DiRT Rally VR 2016))

**Predetermined Transformation** - this is basically chose your own adventure style branching paths - again an interactive movie.

**Freeform Transformation** — here 3d models in the world are inter-actable. You can pick them up and throw them, for example, or fire a bow and arrow, or inversely pull yourself up with your hands to simulate movement like rock climbing in The Climb. (Crytek 2016)

**AR, MR, Social and Live** — This is a growing area with various multiuser chat spaces becoming available like VRChat (Gaylor and Joudry 2017). Here users can move around in social spaces and draw together, talk and share files. One of the biggest attractions seems to be the opportunity to try on avatars, changing body shape and scale, then seeing yourself as your avatar in a virtual mirror.

Char Davies once again, is particularly good at creating an interactive navigation system:

>To navigate within Osmose and Ephémère, all one needs to do is breathe—breathing in to rise, out to fall—and shift ones centre of balance and lean in order to change direction.’(Davies 2004)

**USER EXPERIENCE IN MAN A VR**

These are all technical means and methods that the user undergoes to have an experience but also I include what the user feels and their emotional response
— their subjective experience. I will give an example of a Susan’s experience of \textsc{man a vr} to try and explain what I mean—

\begin{quote}
As he approached my position in VR space he became larger, slightly larger than me, I let the side of my shoulder and face touch the surface of his body. I leaned in, perceiving a sort of density... and then he danced through me eliciting a little shock that this was possible, that for a moment I thought I was penetrating the surface of his black and white body when he continued to move, and he passed through my body. This play of density when none existed was more than a perceptual phenomenon, but it was not exactly haptic either (in the sense of haptic or tangible computing). It was of intensity. An exchange of affective intensity can yield a dense quality, a sort of palpable charge that may at times register as an electric shock but might also be a thickening followed by a release. (Gibson, and Martelli 2018)
\end{quote}

I would like to imagine that there is something in the work that the user can get out of it, that goes beyond the act of interacting with the work, some artistic experience that they take away with them, something that causes some reflection, and this goes back to my experiences of \textit{Osmose}. Participants noted that ‘people experience a heightened awareness of self-presence—paradoxically consisting of both a sense of freedom from their physical bodies and a heightened awareness of being in their bodies at the same time.’ (Davies 2004 ,102)

What I am interested in, when I talk about the \textit{user experience} are both the intangible effects of experiencing our work, and the apparent mechanics that produce it. Because of feedback from users in comment books, articles and journals, Ruth & I have a sense of the experience of the user which transcends technological novelty. Sita Popat writing about \textit{White Island} in \textit{Missing in Action: Embodied Experience and Virtual Reality}—

\begin{quote}
...We knew conceptually that it was an illusion, but the physical and the virtual were conflated in our embodied responses to the environment...
\end{quote}
(Popat 2016, 368)
**TOTAL EXPERIENCE**

The various flavours of user experience, interactive, navigational, sensorial are all bound together in the overall framing experience — if there is one. In some installations, we have had complete authorship over how a visitor enters the gallery, and this frames the overall experience of the artwork, beginning even before they have arrived at the artwork itself. The entrance transition sets the tone — *is there a film outside or is a visitor met by someone, or are they handed instructions or a map. When they enter, is it singly, or are they sent in batches, do they have to turn their phone off? Do they travel down a corridor, or file into a small annex then into a larger area?*

This transitioning is vital in setting them up for the experience because it can shake them out of their prior mental state— they might be just going down the high street looking at shoes, then thinking to pop into the gallery — this transition can engage their mental filters and confound expectations. In the gallery lighting, sound levels and furniture also affect the tone and mood of the experience. Consider the difference between sitting in rows in a cinema in the dark looking at a film on a screen or watching moving images beamed onto a giant balloon. The architectural setting is essential to, it is a different experience seeing work in a white cube gallery compared to a ruined basement.

The reverse of this idea is the *site-specific* artwork, where the art responds in some way to the location. Once the visitor is actually inside the gallery then there is the further arrangement of artworks - are they grouped, do they make one large construction or separate pieces, are they obvious or in some way concealed or obfuscated and then finally the actual artworks and their forms. All these ideas speak back to the *Wagnerian* total theatre immersion of the *Gesamtkunstwerk*, the idea of the *total* or *universal* artwork which can have, or strives for, components from many art forms, or can signify total control over the architecture, including furniture and landscape. Wagner used this idea in essays about his operatic works, and I think it has a resonance with mixed or multimedia installations today. When I’m talking about user experience I mean the combination of all of these ideas.

Virtual Reality this time around seems to be sticking and having some *market*
penetration, the immersion it affords for home users mean that it may become a means of distributing our artworks — as gallery based VR installation tends to have issues to do with queuing and tech support which detracts from the experience, unless carefully managed. Home VR users will already have some understanding and familiarity with the technology. VR is not a novelty for them - they can fully enter into the experience.

PLAYERS + USERS + VIEWERS
I should probably mention something here about the player, participant, audience, user, visitor and viewer, which are all terms that Ruth and I use interchangeably as these roles shift around. For many of our pieces, there is some interaction, where the gallery visitor is not merely a passive viewer but transformed into an active participant. Understanding this transformation is one of the aims of the PhD, and this is talked about in the next section.

INTERACTION + PLAYER / PERFORMERS
Interaction, when to do it, when not do it, what it might mean? With interactivity the user can make (within the constraints of the piece), choices about what they look at, where they navigate to, where they want to navigate to and how long they spend at a particular place. They also have to choose to not interact. Agency of the viewer changes how they think and feel about the piece. This is different from watching a moving image work where even though there is change, the viewer has no control. Being able to have some influence over what happens, gives the experience value. Empirical evidence gleaned from gallery comment books and direct user feedback mentions how great this feels and how the sense of control is liberating.

Interaction may lead to higher levels of immersion, not only because of increasing the plausibility of a virtual environment but also transforming a passive viewer into an active participant and in some ways a performer of the work. Changing the relationship of the active participant to other viewers as they become spectators of the interaction with a work — putting them in the role of a second order spectator that Steven Benford defines with Gabriella Giannachi
in *Performing Mixed Reality* (Benford and Giannachi 2011). This is a different level to the *first order spectator* — the person who is the actual participant in the work. The presence of a spectator can act as both a catalyst or stimulus for a user to *perform* the work for the benefit of others possibly having an instructional effect or helping others overcome shyness about trying the interaction. Watching another visitor controlling an interactive piece gives a flavour of the work without being put on the spot. Build on this theory, Ruth and I have experimented with interfaces that use both single and multi-player controls. Multi-user interaction appears to be enjoyable for visitors.

In my own game-playing experience, I am used to the PC First Person Shooter (FPS) control scheme of mouse and keyboard — consequently I am hopeless at any console game with a regular gamepad. To check out the latest console games, I go to my friend’s house and get him to play, and I take the role of effectively, a back seat driver telling him what to look at and where to go. In this mode, with him playing, he is *performing* the game for me, and I love this mode of gameplay, opposite to the common *Player versus Player* (PvP) multiplayer game type, the shared co-operative gameplay here is more significant than the individual experience.

*Players becoming performers* acts as a nudging mechanism in a gallery, the unconscious pressure from others stopping any one user from monopolising the piece. The nudge helps with dwell time - the amount of time a viewer spends with a work. The conventional relationship with art overwhelmingly tends to be one of passive absorption. Contemporary accounts puts the average amount of time a viewer spends looking at an artwork in a museum to be between *15 to 30 seconds* (Rosenbloom 2014), which would make sense in a big museum where there are many works — indicating a desire to get a broad overview by seeing everything, rather than take a deep dive. Counterintuitively museums want to *decrease* dwell time as the amount of time people spend looking at exhibits reduces overall visitor throughput, museum directors might rather prefer visitors to arrive at the gift shop as quickly as possible.

An example of a dwell time problem is the Barbican’s *Watch-Me-Move* exhibition — a giant touring survey show covering the entire history of animation. With multiple exhibits and hours of video to watch, a staff member unofficially
explained that average visitors spent 4 hours in the gallery, with large numbers of people to get out at the end of the day — my own experience was that I easily spent 5 hours, went back two more times and still did not see everything. However, sometimes its not up to the visitors. Immersive installations like Yayoi Kusama’s well known touring Infinity Mirror Room (2017) exhibition has staff moving ‘viewers along after only 30 seconds per visitor per room—or roughly as long as it takes to power up an iPhone.’ (Finkel 2017). The big number blockbuster spectacular shows, unfortunately, want to prioritise quantity over quality. Interaction completely challenges the viewer/artwork relationship and leads to prolonged engagement. We have witnessed people queuing to experience our work — and for solo shows including VISITOR have heard accounts of people spending upwards of 45 mins with the piece.

In VR immersion is already total so the need for interaction may decrease and subsequently many VR experiences are relatively passive. This is necessarily a bad thing, often in a computer-generated world I just want feel the immersion and not have to do any work, as much interaction is effectively like being in a Skinner box where like a lab rat, pulling a trigger on demand grants a reward or avoids a punishment. One of the drivers to create our gallery installations is the liberating idea that the viewer is free to leave at any time, I dont want to force anyone to have to endure something they don’t want to. It is challenging to create something engaging for longer periods while also catering to time-pressured visitors, so even a short engagement rewards.

The spectacle offers the image and never the reality. It is form without substance. Like the good entertainer it is, it leaves you wanting more. It does not satisfy. It cannot satisfy. It does not aim to satisfy. It offers only the dream of satisfaction. (Law 1979, 8)

A VR user is sucked into cyberspace through the eyeballs, unfortunately for the rest of us they are not literally teleported away, their fleshy parts remain behind, in Gibsonian meatspace, for the rest of us to contemplate. The VR user is both present and absent.

Sometimes for the rest of us, the absent VR user presents a great spectacle
We get to watch on TV,
Ruth experiencing VR
as they attempt to grapple with unseen virtual objects, occasionally ducking or falling to the floor. Char Davies neatly solves the problem of the absent immersant by using a lamp to throw the users shadow onto a screen that waiting viewers could observe, neatly setting up the next person for the experience.

**VR INSTALLATIONS AND IN SEARCH OF ABANDONED**

Occasionally contemporary VR installations take the easy way out, showing the user viewpoint on a monitor — I normally resist this because I believe that it somewhat misses the point entirely - it is like reading about food, it does not fill you up. Periodically however the gallery is too large to get away with a single headset, because big galleries tend to like a spectacle. For the *In Search of Abandoned* installation at Quad Gallery in the UK, we devised a 5m wide custom double screen, similar in appearance to a giant laptop. The piece was beamed into the darkened gallery and could be seen from the far end of the gallery when visitors turned around from the entrance corridor we built for the show. As visitors approached they were handed glasses to observe the projection in stereo, then advance, finally taking the controls — a short journey that slowly converts a passive viewer to an active participant. Following our standard method, no instructional text was provided as I believe that the experience should be obvious or it should become apparent with a little experimentation. Over the course of the research, I have come to discover that relying on an externality can break the immersive experience.

**MULTIUSER SPACES**

In a current series of experiments, I have begun looking at live performers controlling avatars in multiuser VR worlds. Here a VR user sees both prerecorded and live avatars controlled dancers. It is, of course, possible to *beam* in mocap data from a remote location, but what happens when performer and audience are in the same place? This will open an opportunity for both mediated and unmediated interactions. A further stage is to think about if there should, or could be many audience members and how to visualise them for each other, and if this multi-audience is a benefit. There are few
SIMULATIONS - WHAT'S THAT?

In Search of Abandoned
2013 Installation setup
QUAD Gallery 2014

Notes:
Hi spec PC with Nvidia QUADRO cards in MOSAIC mode running dual QUAD buffer stereo

Visual: The virtual environment is running in 'Vised' in a 2 screen CAVE configuration.

Audio: PC is streaming OSC data via ethernet to MAC mini running "SuperCollider" patch to produce the audio. (World position data streams from virtual environment to control sound parameters. Digital audio travels to Genec speakers via audio interface cable.

Interface:
Wheel turns rotary encoder - Arduino converts to mouse scrollwheel input
Microswitches attached to each piston are wired to 2 joystick buttons
Joystick lever movement also used
Joystick and Arduino plug into small USB hub in wheel box
Active USB extension leads connect to PC
PC sees joystick as interface & mouse wheel
contemporary examples at the time of writing that can be examined, in Matt Collishaws *Thresholds* (2017), users in the simulation are represented as glowy white blobs. For Ruth and I, this was the most inspiring part of the installation. Unfortunately, there is no way to interact with others apart from talking and bumping into them. Giles Jobain’s *VR-I* (2017), has a five-strong audience inhabiting slightly uneasy looking avatars, while gigantic figures loom over them in one scene, in other scenes the figures are tiny eventually lifesized as the virtual location shifts around. The performances are prerecorded mocap files, so interactions with the audience are all scripted, however, the overall *VR-I* experience is excellent. I feel that there must be an opportunity for compelling improvised interactions between users and performers. This speaks back to my other works where all of the recorded mocap has been of improvised movement in order to preserve a sense of liveness. For the waiting participants, physically present costumed performers and audience members interacting can form another *second order spectacle*

*All that was once directly lived has become mere representation*
Guy Debord (1967, 5) *The Society of the Spectacle.*

**INTERACTION - THE FIRST PERSON SHOOTER**

As we have seen there are many ways a user can interact with a simulation —but for many, the first interaction with a virtual environment is with a videogame, and in the spectrum of videogames, one of the most common genres is the *First Person Shooter*. Here the player is represented by an onscreen avatar that remains mainly unseen — viewed from a first-person perspective; the player can see their character’s hands, usually holding some type of gun which can be fired to dispatch endless hoards of enemies. The FPS is a satisfying method of interaction, where a click of the mouse immediately rewards the player with a hail of bullets streaking towards the enemy, with accompanying sound and visuals. On a PC the FPS viewpoint is steered by what is known as *mouselook* - the mouse moving around rotating the viewpoint correspondingly. Pressing the W, A, S, D keys moves the player forward, left, right or backwards, depending on where the player is facing. Other keys control further movement, running, ducking and sliding. Console FPS games differ, using buttons to control action
SIMULATIONS - WHAT'S THAT?

Quake 1996
first person shooter
video game,
\textit{id software}
while a thumbstick replacing the mouse. The tight action/feedback loop between player action and the instant result tickles the pleasure centres of the brain resulting in a flow state which can become rather time consuming and addictive. First Person Shooters give a great sense of agency, the first-person movement gives the ability to control the environment, and the view of it, seen as if through the eyes of a person in the world, from their perspective. The player appears to inhabit the body of the character they are controlling, in turn giving a great sense of presence in the game world. The FPS gaze reminds me of Hitchcock’s continuous take in films like *Rope* (Hitchcock 1948) the effect is of building tension as the viewer does not glance away. The FPS view is similarly uninterrupted by cuts or shifts of perspective. The first person view is of course controlled by the player who can also decide what to look at and for how long. In most FPS games, however, there are too many enemies, so few chances for a lingering look.

**WHERE’S ALL THE DATA? FPS MODDING**

The early influential game that got many players hooked into the FPS genre and pushed it fully into the mainstream is *id Software’s* 1993 smash hit *Doom*. Here a beleaguered space marine must fight all the demons of hell, or something like that — but who cares, it was violent, satanic and it has been estimated was played by over 15 million people. The game had network gaming for multiplayer, impressive 3D graphics and maybe most importantly of all could be modified and customised by users at home, thanks to the data files being conveniently wrapped into archives called WADs (short for *Where’s All the Data*). *Doom* spawned numerous sequels and ushered in through many gameplay clones the whole FPS genre. Originally designed for the PC, in 1997 a source code release helped it to be ported over to other devices, (most pointlessly onto an ATM machine in 2014),

The monster fighting marine avatar had one limitation and that was his inability to look up or down, the camera whilst first person, was not fully controllable. A later game by *Id*, *Quake* (1996) enhanced the viewpoint giving the genre fully polygonal 3D graphics, instead of the 2.5D sprites of *Doom* whilst supporting 3D acceleration with OpenGL. *Quake’s* online multiplayer mode became wildly
popular, cementing this cornerstone of the FPS genre. Like *Doom*, *Quake* and its contemporaries gave a new power to the player, the power to alter the game itself. Modifications or *Mods* as they became known, ranged from simple tweaks of the character appearance (*skins*) to total conversions (*TC*) where all of the original game assets are replaced, and sometimes core features of gameplay. This superpower that game designers bestowed onto players allowed them in some cases to release completely new games. The only feature that remains identical is the underlying *game engine* — the software that is used to design and run the game. The potential to get your hands on this amazingly powerful software which could do so much more than creative software like Adobe Photoshop can not be understated and led to many other non-game uses including medical and architectural visualisation and of course, military simulations.

It is against this background of modding and the FPS viewpoint that I began to create the ‘*dreamworlds that our viewers could inhabit*…’ (Evans-Thirlwel 2017)

**DIFFICULTY INCREASES IMMERSION**

For some players however certain types of interaction can lead to laziness if the system itself can be *gamed* — just as an experienced *Wii Tennis* player can launch volleys with a flick of the wrist from the sofa, the easiest interfaces require the least interaction. This leads to a disconnect between the sim and the user. One possible method to reverse this for interaction design is to make interfaces more difficult — the idea being that discomfort & ‘*difficulty increases immersion*’ (Benford et al. 2012). Benford and his team go further than the obvious thrills from rollercoasters or bungee jumping where anticipation is followed by extreme physical sensation and finally relief combining to give a thrill. Benford argues that the ‘*uncomfortable feeling of suspense .. arises through the anticipation of dangers to come*.’ In a narrative drama, if the viewer knows something the protagonist does not it ‘*demonstrate(s) a complex relationship between pleasure and suffering that, if carefully designed, may stimulate powerful emotions*’. Stated plainly, ‘*the fun part of entertainment relies on a far richer gamut of sensations that just pleasure alone.*’ (Benford et al. 2012). Benford proposes that possibly darker themes may be better engaged by engineering uncomfortable interactions which may reduce trivialisation and
increase empathy. Later on they chart how various uncomfortable interactions may be delivered in practice, and whilst these do not map exactly onto what I have experimented with, close fits categorised by them are discomfort through control where the classical HCI concern of the control residing with the user is overturned and Surrender(ing) control to the machine where the machine (in my case, the VR simulation system) influences the experience whether the participant likes it or not. And these ideas all lead into the idea of haptics in the next section.

HAPTICS IN USE: VERMILION LAKE & WHITE ISLAND

Haptic interfaces extend touch into the virtual. For Vermilion Lake this concept manifested itself as a physical rowing boat interface complete with oars. The oars mechanically connected two repurposed exercise bike mechanisms. When the oars are out of the simulated water the only resistance is from inertia. In the water the friction inherent in the exercise bikes kicks in, providing a huge impedance to movement — the water effect convinces because it has analogue properties, resistance increases as the oar is further under the simulated water surface. A fine degree of control can be attained as the user can both propel and steer the boat and just like a physical boat, it’s possible to row backwards. After ten minutes of rowing, users may end up with sore backs and blisters. The difficulty of rowing around the virtual lakes and rivers prevents users from monopolising the installation while encouraging repeat visits as rowers will not be able to reach all places in one session. Combined with appropriate audio cues and ambient bobbing of the camera, the interface provides a powerful simulation, helping users to buy into the environment. Sita Popat writing in Placing the Body in Mixed Reality:

_Vermilion Lake inspires a sense of place that is unique and specific to the individual visitors encounter with the installation, since it is fundamentally real... the process of negotiating or journeying on the waterways is both a means by which the visitor can engage with the mixed reality environment and a conceptual end in itself. Getting lost and finding ones way in that alien landscape are central to the phenomenological qualia underpinning._
Vermilion Lake 2011
concept sketch for
VISITOR exhibiton
Apthorp Gallery,
Artsdepot London
the site-specificity of the work. (Popat 2015, 369)

Our *White Island* VR installation further explores the uncomfortable interaction to add immersion. The interface is a rough hemp rope, fitting with the evocation of the Victorian balloon journey. The user straps on an Oculus VR headset and uses the cord to set the sails on the balloon controlling the angle to the prevailing wind and ascension/descension. The rope is tightly clamped between strong springs to maintain tension. The balloon is at the mercy of a (simulated) fierce arctic wind — adjusting the sails allows steering away from the wind, however, control over the direction of the balloon is difficult to maintain because of the shifting air currents. To descend the rope must be pulled upwards, because of the springs this is quite hard — hemp isn’t so easy on the hands either, touch here is important, something solid and tangible for the users to hold, anchoring them in the balloon basket. Anchoring helps avoid the dreaded simulator sickness that is caused by camera movement not felt in the body, the balloon tendency to *yaw*, which seems to be the main nausea-inducing simulated motion, seems to be is avoided by this. Furthermore, the final version of the installation has an array of 8 fans arranged in a circle around the user. The fans are controlled by a micro-controller and relays which sample wind direction data from the sim as a control input. Usually, three fans are blowing cold air onto the users back, as the wind direction switches around the active fans circle to the side and even the front. The balloon languidly turns to face away from the prevailing wind direction as the active fans rotate back. The fans take a moment to spin up and down and so the physical wind change happens smoothly at the same time as the viewpoint wheels. With a surround sound audioscape of howling arctic wind, creaking basket and flapping sail sounds, it presents a convincing simulation that the user is in the balloon basket. The rough tactility of the rope and the naturalness of interaction adds to the *feel* of the balloon which, like the terrain itself, is visualised as a low-polygon model.

*The roughness of the rope in my hand and its resistance to free movement (attached at top and bottom) gave me a physical reference point that I found psychologically comforting and physically stabilizing.* (Popat 2016)

The rope doesn’t allow for a huge amount of control, it is leagues away from
SIMULATIONS - WHAT'S THAT?

White Island 2014
technical setup diagram
for 80ºN QUAD gallery,
UK 2014-15

Notes:
- PC’s with high spec graphic cards: dual GeForce GTX 480 Nvidia cards in SLI mode
- Visual: PC 1 runs the Oculus Rift. PC 2 runs copy of virtual environment. Virtual environment is running in multiplayer mode and PC 2 connects as client. It has custom camera controllers to give 3rd person viewpoints around environment. (not implemented at QUAD)
- Audio: 5.1 Surround sound from Xoner PC card comes out of optical cable
- Interface: Rope held in tension between 2 springs. Attached to top spring proximity sensor and accelerometer. Proximity measures up/down, accelerometer measures left/right. Sensors attached to arduino. Interface self-calibrates when plugged in, arduino running in keyboard mode gives keypress
- Fans: Mounted on metal ring. Attached to Arduino/relay setup. Virtual environment streams direction data to Processing patch which sends commands to Arduino to turn relays on and off which give virtual wind from fans (not implemented at QUAD).
the ease of the traditional FPS schemata. Actuation is handled by proximity sensors and accelerometers, fully analogue and because of the balloon inertia, it handles very slowly, the tendency of users is oversteering, adding to the feeling of being out of control, at the mercy of the capricious wind. The goal of the perfect interface is to bring the player into a flow state where action becomes unconscious and where gaming is replaced by playing, here the realism of the haptics and the difficulty in interaction helps users to become convinced by the simulation.

**PLAY VS GAME - DACTYL NIGHTMARE**

*Osmose* was only the second time I had tried VR, the first was in 1991 — I tried a VR experience at the Trocadero Centre in London, where on the lower floor was an arcade game, *Dactyl Nightmare* running on a *Virtuality* system. *Dactyl Nightmare* was very much the classic arcade game, updated for VR, designed to suck money out of trouser pockets, with distinct rules and win states — attacking dinosaurs killing the player, however this was distraction, primarily I just wanted to experience VR! *Osmose*, on the other hand, was a waking dream, no pressure to behave in a particular way. Both experiences were the latest tech — immersive properties, consistent viewpoint, interfaces leading to player agency and so on. So what is the fundamental difference between these two experiences? What is the difference between playing a game and just well, *playing*? Social scientist Shiv Visvanathan in the *Times of India* in 2007 sums it up, writing that—

>a game is a bounded, specific way of problem solving. Play is more cosmic and open-ended. Gods play, but man unfortunately is a gaming individual. A game has a predictable resolution, play may not. It allows for emergence, novelty, surprise...*(Visvanathan 2007)*

**PLAYING THE GAME**

A game must have rules, that the user must act within, to win. In a game, the player travels through a dungeon, picking up treasure and killing monsters to escape, winning the game. Play, on the other hand, is not competitive and would
SIMULATIONS - WHAT'S THAT?

*Virtuality* VR arcade gaming system around 1991
let the player explore the dungeon and maybe decide they like it there and want to stay and make friends with the monsters. Game designers, of course, create puzzles which must be solved before the player can progress. There may be many routes through the dungeon, but it will always be apparent to the player that there is a desired outcome. The pleasure in gaming can arise from any number of issues including progression, increasing a score, dispatching enemies, and solving puzzles. The joy in play comes from engaging with a system where the act of exploring is the reward. In *Homo Ludens: A Study of the Play-Element in Culture* cultural theorist Johan Huizinga identifies five characteristics that play must have:

- *Play is free, is in fact freedom.*
- *Play is not ordinary or real life.*
- *Play is distinct from ordinary life both as to locality and duration.*
- *Play creates order, is order.*
- *Play demands order absolute and supreme.*
- *Play is connected with no material interest, and no profit can be gained from it.* (Huizinga 1938, 8-10)

Many modern games now come in a type or feature a mode called *sandbox* which emulates many play characteristics, ‘allowing the gamer to roam and change a virtual world at will’ *(What Is a Sandbox (in Gaming)? - Definition from Techopedia n.d.)*. Usually, the sandbox occurs in an *open-ended world* without regular game level progression. *Minecraft* is an excellent example of a *sandbox*, well known to millions of parents worldwide, it is first-person *Lego*, the player moving cubes around a procedurally generated world can build things. Sandbox games are hugely popular as they tend to be enormously rewarding, however, they still impose restrictions in the game world because of either linearity or other technical limitations, for example not allowing the user to import assets (this is not strictly true, there are often hacky methods, but in general the user is given a fixed set of toys)

**NO RULES**

In all of the game engine works that Ruth and I have exhibited, the constant
thread that runs throughout them is that there are no rules or gameplay. They are all firmly situated at the play end of the sliding scale between games and play. The lack of game mechanics is a specific choice, firstly I did not want to give anyone the sense that somehow they had missed some goal — If you play a videogame, but do not complete it, there is a residual sense that you have somehow missed the complete experience. The artworks I create do not require the audience to make a considerable time commitment for a full experience — it’s up to the user to get as much or as little out of it as they desire. Many of our environments are large, and I wanted to allow people to roam freely and explore how they wanted, rather than setting specific objectives and time constraints. The installations enable the audience to self-reward their open-ended exploration. In video gaming, the challenges and the linear progression structure are mechanics to push the player through to completion. Game challenges are what make gaming fun, but our artworks are not about that.

**RISK IN SWANQUAKE**

What other ways can users be encouraged to engage? Maybe risk and jeopardy can enhance the sense of immersion. Thanks to familiar gameplay mechanics, players quickly learn that they can save the game state and return to it, if they make a mistake, say by falling off a ledge. Careful use of saves mitigates risk, leading to careless play because risk becomes without consequence. Of course in a game, the player does not actually die, it is all happening to the character — who merely re-spawns. Without risk, there are no thrills — no danger averted — so game designers use a variety of strategies such as re-spawn points far away from the action or only allowing the player to save at a particular spot. The player risk increasing strategies can be doubled down on by making the character weak or only providing limited resources (e.g. not much ammo), by upping the challenge, suddenly player action has consequences, and the game becomes more rewarding.

Artist Brigid Costello has categorised Risk and other play design strategies in her *Pleasure Framework* - which is a number of pleasures unearthed in an interactive experience. I believe that these can be used as principles in designing, to begin with, and I will concentrate on one of them now - *Danger!* —
the pleasure in feeling scared, in danger, or risk taking, which aligns with Difficulty the pleasure participants from developing a skill or to exercise skill in order to do something. Difficulty in understanding aspect of content. (Costello 2007, 370-71)

In SwanQuake users navigate around a representation of our studio in London’s East End, traversing the Underground transport system and ending up in an underworld. When I created the piece I used one of the earliest versions of the Unreal game engine — Unreal Engine 2 Runtime (2002) which came with a minimum of content. This version did not even have a method of re-spawning the player. I grasped that our moody dystopia had no danger, even though there were obvious hazards such as a narrow ledge above a river of lava. I worked with a programmer Rachel Cordone to create death to kill the player — in practice, this meant fading the player camera to black and then re-spawning them in a new location. Because I was not attempting to make a regular game I had no features like save points. Dying players were re-spawned at disjointed spots in the game world. Counterintuitively this experience of dying for users created a better feel for the piece — because it meant actions had consequences, a sense of risk, leading to an unexpected dislocation. With the melancholic atmosphere and dystopian visuals, this perceived risk put players in a pensive mood which appropriately plays back to Benford’s uncomfortable interactions

NUDGING NOT SHOVING, RISKY INSTALLATIONS

I know little about the installation except that it involves computer game aesthetics, and I am faintly apprehensive about what awaits me. (Popat 2012)

How I present work in public can also enhance the pleasurable danger — as even the idea of installation may make some people nervous. From observing users and from reading accounts I noticed that some visitors (videogame players) came with preconceived notions of what might happen — assuming enemies would jump out to ambush the unsuspecting player. Because nothing like this happened in our game world, for some of those users, the anticipation of impending attack
racked up the tension to unbearable degrees, the longer that nothing happened, the worse it became. This encroaching panic was enhanced by Adam Nash’s soundtrack of inexplicable clanks and ominous rumbles, experienced at the installation via a surround sound system.

*The SwanQuake: House* exhibition in 2007 saw the work installed in a former sex shop, a darkened unit, housed in a rundown shopping mall. This whole area felt like the definition of the wrong side of the tracks — the shiny black exterior of the exhibition space positioned alongside dusty orange Poundshops, going inside seemed risky and furtive, transgressive. I recall a user jumping out of his skin when I walked in to check the installation. The combination of the unsettling environment both externally and simulated, appeared to have fully immersed this visitor. Risk is apparent in other works. The act of donning a headset, without being sure of the wonders inside is a kind of risktaking. Once past this threshold, in the *White Island* work the user is only partially in control. If the simulated wind changes suddenly it is possible to smash into the side of a mountain. There is no actual risk, the balloon continues to fly — the player momentarily assaulted by a loud crash and a visual flash, however, this seems to be unpleasant enough to give a frisson of fear.

*I was surprised at the intensity of the embodied experience, in which my body was disrupted, conflicted, and confused. I cowered, muscles tensed and body folded inward protectively, as I hurtled on a collision course toward a vast virtual mountainside.* (Popat 2016)

This fear enhanced because of the apparent altitude of the balloon basket which plays into acrophobia, which also occurs in *In Search of Abandoned*, here the simulation is of a glass-floored Zeppelin vertiginously soaring over mountain ranges.

Recent VR experiences like *Richies Plank Experience* (Eastes and Eastes 2017) offer scare experiences where you walk on a high plank, sticking out from the 80th floor of a building. Other offerings on sale in the Steam Store give users jump scares. These obvious tropes are quickly dismissed as they reduce the VR experience overall to a kind of rollercoaster ride which have no meaning outside
of their impulse to provoke a reaction in the audience. They do, however, neatly encapsulate Freytag’s oft-quoted *Pyramid of narrative arc* — exposition, rising action, climax, falling action, & resolution; (Freytag 1908). Many people must love these scares, as these numerous experiences form solid business propositions. This risk plays back into Costellos *Pleasure Framework*. The risk I’m trying to create, on the other hand, is a subtle one — a nudge not a shove.

### CHANCE

The cousin of risk, chance, also plays a big part in my work — Ruth and I have taken advantage of chance in many ways to create unpredictability and instability in our practice. Controlled randomness allows the work to exhibit possibilities outside of a fully regulated system, breaking down linear patterns. Chance possibilities give rise to complexity, producing exciting choreography, and I talk about this in a later section. In *White Island* chance drives the wind system which provides unpredictable and therefore challenging navigation, as users must often change tack to move in the desired direction. Randomness is common in all kinds of gaming, and this is one feature that our work shares with games, however where some games may use randomness for background effects, we tend to *foreground* chance to increase liveness and bring it back to the improvisational.

### INTERACTION

I came to make interactive work as a natural progression rather than a deliberate strategy. It is the succession from seeing others performing on stage and wanting the audience to be able in some form, to influence the performance. I talk about this in detail later, reflecting on this during the PhD, interaction is a risky strategy — not only for the viewers engaging with the work — but also to be able to present the work. Many galleries were averse to showing anything with a plug bringing with it the ever-present fear of technical problems, compounded by the fact that interactive work may not be a great commercial proposition in terms of sales. The desire to allow the audience a *way in* slowly over time has become a deliberate strategy, as galleries are beginning losing the fear of technics and why not? Just as billions of regular users log in every day to interact with software on glass rectangles, moving from an informational tool, the computer is now more
like a medium ‘providing a new set of media forms and genres, just as printing, the cinema, radio and television have done before. These digital media forms stage experiences for us.’ (Bolter & Gromala 2003, 5)

INTERACTION TECHNOLOGY AND RISK
Interaction is a risky strategy, but who is taking this risk? Risk can be loosely divided amongst the 3 parties involved: artist, viewer, venue, and pretty much we have come up against or heard all of the following at some point.

*RISK for the viewer:* They might do it wrong, or may suffer from performance anxiety in front of others, - inexperienced computer users may fear that if they perform the wrong action, there is always a chance that it will cause a catastrophic malfunction such as reformatting the hard disc. (Apparently, this is an actual phobia called Logizomechanophobia (Greek - Talk/Machine/Fear). Experienced users already know that ‘To err is human, to really foul things up requires a computer’ (Vaughan 1969, 1) — these users have just internalised risk.) Magnified in the gallery, for the visitor, there is the additional pressure of not understanding the art correctly. This fear is contextual and is a risk that any user must overcome when confronted with any piece of art.

*RISK for the venue:* It will go wrong, they will need technical support, and they can’t sell it, people are distracted from looking at regular artwork because of some technological frippery. Their visitors may be biased against this type of art. The work may not fit into the curatorial remit or artistic direction of the gallery. There is also a cost implication; the gallery might have to hire expensive beamers or computers or interns to babysit delicate work. It may take too long to switch on/off.

*RISK for the artist:* It can be hard to persuade gallery to show, its hard to get critical acclaim as work involving computers may not be seen as a proper art form — though this is slowly changing. If we think back to the community of practice, the Electronic Superhighway put a load of computer based work in the same show, seemingly chosen because of the medium. It is hard to think of the Whitechapel gallery curating other work based solely on medium, i.e. a bunch of paintings, the commonality being that they are all oil on canvas.
Working with technology isn’t an easy way out, it can be expensive, and it still might not work. Of course, the most significant risk of all is actually to try and make something, anything, anything at all. In the next section, I will talk about how I make things, in, with and around landscape and figures.
05
LANDSCAPE +
FIGURE
INTRO

In this chapter I will look at landscape artworks: either installations with generated landscapes or live-action video works. Existing in distinct dimensions, often they relate, live and generated ‘scapes originating from the same location, opposite sides of the same coin. The live action serves to remind the viewer of the simulacral nature of the immersive computer environment. I focus on a few examples to illustrate some of my thinking about camouflage as a microcosm of a terrain. I also talk about the techniques I have used for creating synthetic environments, the stylistic choices and I reflect on the role of the figure, serving as a guide, leading the viewer into the landscape. First however let us consider visual styles and how visual styles affect both the appearance of virtual landscapes and environments and the reading of them.

VISUAL STYLES – THE PHOTOREAL

In visual art, a style is ‘...any distinctive, and therefore recognisable, way in which an act is performed or an artefact made or ought to be performed and made.’ (Gombrich 1950, 150). Gombrich is referring to the visual appearance of a given artwork. In videogames and simulation generally, two opposite stylistic forces mean works tend to visually fall into one camp or the other — Photorealistic or the inverse, Non-Photo-Realistic. Photorealism is the goal of the big AAA developers, where ever more complex shaders and higher polygon counts all lead to more realistic environments — better hair, fur, skin, water,
smoke, grass — complexity. The idea is that if you are going to as someone to
going to pay $40 for a game, it should look like several million dollars has been
spent on it, and that is what it costs. The problem is that photorealism is an
ever-receding goal — once you can convincingly render all the dogs in any given
environment, you now need to concentrate on all of the fleas, no end-point is
reachable. For indie developers unable to access massive AAA budgets and
therefore, the vast workforce producing infinite assets, the best programmers
coding the best shaders and so on, a different strategy is needed. For many
indies, embracing Non-Photo-Realism is an excellent way to go. NPR is an area
of computer graphic rendering inspired by artistic and other computer graphic
styles, including drawing, painting, vector graphics, 8-bit. The terminology is
unsatisfying because it describes what it is not, but NPR includes visual styles
like cel-shading, which makes everything 3d look flat, mimicking the look of
animation or low-poly where the detail of models is reduced to give a toy-like
feel. Beginning to work with game engines initially, I was kicking the tyres
to see what it could do. Unreal Engine 2 Runtime came with minimal assets
— almost everything needed creation from scratch, and the main game made
with the engine, Unreal Tournament had a flashy, shiny-robo style which was
inappropriate for the experience I was trying to make. Because I was learning
the system my approach was to attempt to make everything with as much
verisimilitude as possible so I used photographic texturing and sympathetic
lighting.

PUSHING POLYGONS
In the early computer game press like EDGE magazine in the late ‘90s, much
of the writing concentrated somewhat negatively on the graphical qualities of
the game — because of the idea that the processing power of the PC limited it,
there were perceived flaws in certain games because of visual artefacts, such as
popping-up scenery, caused by short draw-distances. Here are the optimisations
that games makers needed to make to get the games to run on PCs that users
have rather than the high-end development machines. The EDGE writers
seemed unable to read low polygon counts and limited textures as in fact, the
essential qualities of the game as a visual medium. They didn’t see the game
as art, merely an incremental step towards some idealised ultimate polygonal
portrayal of reality, with every mote of dust faithfully reproduced, another step in the long march forward from the earliest sprite-based games, the world rendered in 2d. Games are often not read as what they are trying to portray, just how the surface is achieved. (an exception to this may be the Pixel art style, where bitmap based sprites are used to give a modern game a retro look.)

**DRAWING DISTANCE**

Game designers must also struggle with the fact that not only do they have to have some player controlled interaction or movement in the scene, unlike painters or filmmakers must also build the world beyond the edges of the immediate frame, so that if for example, the player moves, then more world comes into view. In fact, the game designer is working extra hard to trick the viewer into believing that there is even more world continuing beyond the area accessible to the player. Lush graphics in modern FPS games seduce the player, even while the apparent truth of the world accurate perspective is undermined by the map size distortions. To give an example, In the *The Elder Scrolls IV: Oblivion* (Bethesda 2006) the picturesque castles in what would seem to be the far distance, are really only a few hundred game meters away, or rather, they only take a few moments to get to, so that player patience is not unduly tested, whilst engaged on a quest. Accurate real-world perspective is subject to unrealistic (artistic) spatial distortion like the spacewarps abounding in the work of De Chirico, the connection back to medieval perspectives anticipating isometric and side-scrolling games. Another stylistic effect game developers borrow from painters is the use of aerial perspective to simulate depth, fading into blue and blurring distant objects giving the illusion of great depth (in game design terms however it’s unromantically known as *depth fog*). But what are strong stylistic ideas in fine art, are perceived in games as kind of weakness, a failure of the computer. The limitations of the computer game engine are the things that give it its essential qualities and should be embraced. Have a look at images by Robert Overweg in 2013. Here screen-captured images from videogames *Modern Warfare 2* and *Left 4 Dead 2* portray a landscape beyond the playable area, hinting at the game construction. The apparent artificiality and the way his pictures resemble something akin to film sets seen from behind which reveal something of the method of production. It’s a computer game as a medium — he

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Giorgio de Chirico

*Piazza d’Italia con uomo politico 1965*
calls himself a ‘photographer in virtual world environments’ (Overweg 2010). These ideas play well against our SwanQuake installation in the previous chapter. Replication of the real eventually becoming exposed

**GIBSONIAN CYBERSPACE**
The replication of the real in a digital environment is echoed outside gaming by several contemporary Virtual Realities which may be thought of as Engineering VR. Here much labour is expended to create carbon copies of existing or historical places or events. Egyptian temples, WWI trenches, Castles and Shakespeare Plays are faithfully reproduced, educational and worthy; new technology looks backwards to recreate what has been before —an approach to cyberspace where simulation is just that — an unimaginative facsimile of the real with History as an attraction. A prime example is Matt Collishaw’s replication in 2017 of Victorian photographer Fox Talbot’s first exhibition in 1839. The panelled wood spaces in VR redolent with vitrines holding digital facsimiles of Talbot’s photographic plates. These VR reproductions lead me to consider Marshall McLuhan’s idea that ‘the characteristic of all media, means that the “content” of any medium is always another medium’ (McLuhan 1964, 8). Consider on the other hand purist, Gibsonian cyberspace, immersion where physical laws don’t apply, space can be infinite and form not follow function like in base reality. The established order is not here, this is imaginative cyberspace, in this magically interactive virtual world, dream-like spaces are weightless, lacking in tactility, echoing both Surrealist artists and the poetic imagery found in the contemporaneous Skinner Release Technique. Artists Kay Sage & Yves Tanguy painted virtual landscapes hinting at rich sensorial immersions, not necessarily prioritising the visual; other senses coming into play. Talking with other researchers and artists in the VR field, I believe rejecting the pedantic and photorealistic is a current concern. Engineering and Gibsonian appear to be two opposite directions that contemporary VR is moving in; it may be useful to think about VR as a medium in itself.

**LOCATION LOCATION LOCATION**
Ruth and I have often chosen existing film locations as sites for our moving image works. It is a self-conscious choice to use the pre-mediated landscape
Kay Sage  
*No Passing*  
1954

Robert Overweg  
*End of the Virtual World I*  
2013
of the film location to situate our scene outside of the usual understanding of place and effectively put it into quotation marks. The landscape standing in for itself, having a fictitious side, becoming a character or accomplice in the artwork — Here is a forest, here is a mountain. In the same way, virtual landscapes stand in for their physical counterparts. We are not presenting the environment as a picture to look at, but as a terrain to be explored, experienced and inhabited. Our moving image works are an exploratory method to interpret and gain knowledge about a landscape, being silent, unmoving and still and giving time unravels vital qualities about a space, patience rewards observation.

There is an attempt to unwind Caspar David Friedrich’s idea of the sublime power of landscape. Friedrich is the well known 19th-century German romantic painter of haunting and mysterious landscapes, inspiring generations of artists. In his work the human presence is often reduced to a single figure, facing away from the viewer, observing the scene — John Lewis Gaddis writes

‘...suggesting at once mastery over a landscape and the insignificance of the individual within it.’(Gaddis 2004, 1)

The viewer provided with an opportunity to position themselves in the place of the figure, experiencing a sublime moment of nature, playing into Herzog’s idea that ‘a landscape is not just a representation of a desert or forest. It shows an inner state of mind...’ (Cronin and Herzog 2003). Ultimately Friedrich sought to change the depiction of nature, from being merely a static background to action to become the subject itself. Images of CAVE users frequently remind me of Friedrich’s Wanderer Above the Sea of Fog (1818) — and it can’t be a coincidence that this is an image that many blockbuster movie posters emulate — the landscape an active space for exploration, the mind of the viewer expands into the terrain. The image composition hinting at the player becoming the performer. In addition to depicting figures and landscape, our practice explores the relationship between form and ground — characters are sometimes concealed within the ‘scape or the relationship between the figure and background is entwined.

WAHAWAEWAO

We Are Here And We Are Everywhere At Once was created through an
Jenn E Norton *Tesseract*
2011 CAVE installation
international collaboration between Gibson / Martelli & sound designer Russell Scoones & choreographer Carol Brown, both from New Zealand and we were ably supported by our cast; Cassidy Scoones, Jenny Roche & Grant McLay. The bulk of the project took place in New Zealand beginning with a Choreographic Coding Lab residency in Auckland’s University of Technology (AUT) at CoLab, followed by a residency at the University of Auckland (UoA).

**WAHAWAEWAO** began with our team experiencing simple virtual landscapes I had created at AUT’s mocap lab, mocapping their responses to these ersatz terrains. The virtual scenes created are from basic archetypes: the middle of the ocean, up in the clouds, outer space, underneath trees and for contrast, the dazzle environment of MANA. The setup at the studio allowed for untethered movement with a wireless VR headset, the capture area around 25m2. Each virtual environment was animated to provoke a kinaesthetic response from the performers who, with one exception, were experiencing VR for the first time. Later, we decamped to Central Otago — the centre of New Zealand’s South Island, standing in, as it has in so many films, as a location — as a virtual reality. The performers are filmed wearing their mocap suits re-staging movement from the VR sessions. We experimented with optical signalling using mirrors and balancing sticks that resemble surveyors measuring poles — a square marked with tape amongst the tussocks delineating a motion-capture studio sized volume. The performers, mo-capped, measured and caught on film are the self-surveying surveyors. Potentially virtual doubles in the landscape act as a bridge to draw a loose parallel between the actual colonisation of both New Zealand — which was extensively surveyed by the early white settlers and the current settlement of the virtual reality space by commercial interests. Apart from in YouTube videos showing movie FX, mocap actors never appear as themselves; digital wizardry transposes them into whatever fantastical creatures are needed. In the same way, the film location stands in for another place: Iceland becoming a destroyed New York in Oblivion (Kosinski 2013), New Zealand becoming Middle Earth in Lord of the Rings (Jackson 2001) and so on. **We Are Here And We Are Everywhere At Once** obfuscates the relationship between actual and fantasy; performers are not represented as digital versions, the landscape is merely landscape; there are no dinosaurs or magic kingdoms. Overall this piece alludes to the idea of concealing and revealing, uncovering
the making process to reveal the illusion, the sweet spot where the simulation is laid open. The piece eludes narrative which constantly shifts out of focus. Technical clothing is repurposed as a costume — resembling nothing so much as medieval knights or sci-fi aliens. Movement that is systematic and pragmatic in the lab, the Range of Motions or ROM’s that calibrate the system, become the basis of improvised choreographic material interspersed with movement that is a remembrance from earlier improvisations in the virtual environments. The final gallery installation has a large central screen showing seven landscape format films, approximately 51 mins in total. Daily a media player randomly shuffles the playlist order to confound narrative. Off to the sides twin portrait monitors show close-ups of two faces, resembling astronauts blasting to space. These are 15 min loops recorded from a FaceWare facial capture system that clamps a tiny camera onto the head to point at the face. The machine streams video to a recorder for digital processing to extract facial animation. The performers seen in an unflattering light and a mild fisheye have every human imperfection visible, over their shoulders the lab whirls as they twist and shake their heads around. A reverse first person gaze, the mechanisms of the mocap process stripped bare. On the main screen in one of the video soundtracks, we hear the disinterested voices of technicians, standing in for the unseen creators, directing the movements. Folding back on itself, in the landscape itself, the performers sometimes improvise, imagining that they are back in lab experiencing the virtual scene.

WHERE THE BEARS ARE SLEEPING

where the bears are sleeping, for 45mins gives the audience occasional glimpses of a silent, motionless Sasquatch-like form. The presence in the scene takes the landscape from a merely pictorial depiction of geography into the arena of myth and legend. The figure is again a cypher, a mute presence, that opens up the imagined narrative that may be occurring. The performer not necessarily performing a character with a backstory and plot-line; instead, the human or inhuman opens the landscape for the viewer to enter or survey. Here the costume, a furry looking ghillie snowsuit deliberately breaks the convention —a figure dressed in a hunters coat, hat & snowshoes would be expected and therefore pedestrian. The faceless performer by decontextualising takes the
landscape beyond contemporary or historical reading while giving it an active role — more than backdrop to human activity. The footage is colour graded to blue & black and finally a high-contrast black & white. The stylisation that this lends to the scene combined with the stasis in the long locked-off takes show the landscapes portrayed almost like woodcuts. Only by careful observation can the viewer see the occasional falling flake of snow, giving the scene a mute power — real life it seems to say, can be turned into a page in a storybook and flipped through or poured over.

Converting the landscape into an illustration is an move towards putting the terrain into quotation marks, to make the viewer think about the scenery of the image, crossing over from a natural environment into a mise en scène, reflecting back to the virtual panoramas of the *Vermilion Lake* environment which was exhibited alongside *where the bears Are sleeping*. The terrain in Banff, Canada has another narrative too, used as multiple film locations it bears witness to other stories. A contemporary example is *The Revenant* (Iñárritu 2015), starring Leonardo DiCaprio as an 18th century bear-bothered trapper, as Hollywood would have it, based on the true account of mountain man Hugh Glass. We try to double down on both the actual and fictional, past & future film narratives, which echo through all depictions of a given location. As Simon Schama writes in *Landscape and Memory*—

> 'Landscapes are culture before they are nature, constructs of the imagination projected onto wood and water and rock'.
> (Schama 2004, 61)

**THE MAP IS THE TERRITORY in MAD MAX**

Not so much a background for action but a character in its own right is an idea that tends to get emphasised in the vernacular of videogames and none more so that in the 2015 *Mad Max* videogame by Avalanche. Here the hyperreal terrain is an implacable enemy — conceptually a post-apocalyptic wasteland, the landscape is littered with spectacular rock formations, rusted machinery and oil sumps. The devastated becomes picturesque. A dynamic weather system animates this barren landscape, and extreme weather events force the player,
as Mad Max, to seek shelter from the turbo storms with deadly lighting bolts and tornados that whirl him away to his death. At the edge of the playable space, there are soft boundaries between the vast desert and a region known as the Big Nothing — advancing into this landscape inevitably spells doom for Max. The terrain while seemingly limitless has limits after all. This constraint of movement is restricting — a counter to the hyperkinetic energy of Max’s speeding car and explosive road wars. Many Openworld games like Mad Max use overview mechanics to let players see in advance distant points in the terrain. Binoculars or a telescopic sniper sights enable a long-range view. In Mad Max, both binoculars and a the high vantage from a hot air balloon come into play. Both methods here have built-in limitations — a heat haze obscures the far distance. Combined with the other atmospheric effects, technicolour skyboxes, dynamic weather system and time-of-day mechanic, Mad Max often closely resembles Friedrich’s paintings — distance gorgeously represented with aerial perspective. The third-person perspective further echoes Friedrich’s figure subjects. Here are the crossovers from romantic painting to computer generated environments, hyperreal constructs pushing for meanings beyond the factual documentation of a landscape. Mad Max’s architectural features are massive here and have distinctive silhouettes — evident at a distance from any angle. These giant reference points are navigational gameplay aids, anchoring player orientation. The corner of the screen displays a mini-map of the terrain - a simulation of a simulation. Alfred Korzybski’s well know idea ‘the map is not the territory’ (Korzybski 1933) is inverted, the map is the territory, rendered in miniature. Philosopher Korzybski’s map/territory idea was referring to how we confuse models of reality with reality itself. Marshall McLuhan extends this idea in the The Medium Is the Massage, (McLuhan and Fiore 1967) to include electronic media representations on screens - abstractions, or virtual extensions of what our somatic sense does for us in reality.

The trade-off between usability and accuracy, particularly in the context of simulation and modelling, is known as Bonini’s paradox, and has been stated in various forms but most poetically by Lewis Carroll in Sylvie and Bruno Concluded. In the story, a map has a scale of ‘a mile to the mile’ (Carroll 1893) as a character decides to use the country itself as its own map. In videogame landscape territory, the terrain is the construct propelling players from
encounter to encounter, which does not need to function as a real place.

**HOW TO MAKE A LANDSCAPE**

How does a landscape get constructed in a video game? For the photorealistic world talked about above, it tends to be a somewhat technical method which I will describe a little here. I tend to use what is known as height-map data, often from the SRTM - the Space Shuttle Radar Topometry Mission, ‘The Mission to Map the World’ (Ramirez 2000) a topological data set that encompasses most of the Earth’s surface apart from the poles and specific military sites. Height-map data is a greyscale image of terrain where lighter areas represent high points, and darker regions represent lows, e.g. sea level. This data can deform a mesh forming a topography which corresponds to a real landscape. It’s also possible to paint height map data using a special digital brush tool which raises or lowers terrain or adds surface features like noise complexifying the surface to create terrain from scratch. If a technical artist paints terrain in this way, it can look artificial as it is very hard to do well. Specialist software uses procedural generation methods to create natural looking terrain which can then be eroded using filters — for example; the program simulates weather effects like say, water running down slopes, eroding gullies or wind or thermal erosion or other distortions. The best results seem to originate with real-world data, and it is possible to take low-resolution heightmap data, import and add detail using terrain software filters.

The SRTM data set doesn’t cover the entire globe, the archipelago of Svalbard is missing because it’s above the 80th parallel, the Shuttle mission orbit tilted at an angle to the equator to eventually pass above almost the entire surface but wasn’t quite steep enough to get the poles. I discovered another dataset of Svalbard which had been encoded by hand from contour data. This dataset doesn’t have a high sample frequency — ( In fact the Shuttle mission is 1 sample in 30 meters, so every 30x30m square has only one height measurement.) To add smaller detail, I used terrain software *World Machine*, to detail the surface, adding hydraulic erosion. Textures can be applied to terrain meshes to add colour and surface detail simulating the appearance of rock, dirt or grass. These large-scale bitmaps may be generated procedurally, calculating texture position based on
height, so sand appears down by the sea, grass in the middle, rock & snow at the top — or texture can be hand-painted — for example, an artist might add a dirt path along a forest floor to following natural features. Other procedural techniques including Normal mapping, faked lighting of lumps and dents and Parallax occlusion lend otherwise flat textures the appearance of depth, so that small rocks appear to push out — both techniques and others fake high-resolution details on low-resolution models giving the impression of complexity.

For White Island, I moved in the other direction and used a limited palette of four flat colours for all the ground surfaces. Mainly the light colours blend with lighting from a distance to appear as white snow & grey rock. It is the silhouette and shape of the mountains that make sense of the image — the terrain rendered as a low-resolution polygonal mesh. The colouring is achieved by randomly assigning a colour from my palette to each polygon. To give the appearance of snow-free rock faces, I used a procedural method to automatically give polygons that were steeper than a particular value a dark grey colour. Over large complex meshes, this provided a great look. It sounds like this automatic method saves a lot of time, and it can, but getting the best results over a broad landscape tileset is an exhausting process, as many attempts are needed to determine the best looking steepness value.

In Vermilion Lake the ground texture is a combination of rock, snowy rocks and snow and was created by making a supermaterial — a giant bitmap where the Red, Green, Blue and Alpha channels of the image become masks, each allowing another complex material to show through. In this way complex, high-resolution textures combine giving a convincing result. The drawback is that the masks can only really be painted in the Photoshop software using custom brushes to give a organic look. The soft edges blend between materials, so rock gradually fades into the snow. At this stage you are not editing in the engine, it’s all at a remove in Photoshop. (Nowadays game engine landscape software has been hugely improved, and the tools are evolving rapidly with each new iteration of the engine). After terrain is finalised, features like trees, rocks, grass and water can be added. There are many methods for this, from hand planting assets to painting tools or procedural generation. Rocks & trees are created using digital sculpting methods or via photogrammetry where multiple images of real-
world objects combine giving a photorealistic 3d mesh. Working on *Vermilion Lake*, Ruth and I sketched trees and other vegetation to provide stylistic non-photo realistic models which worked very well with the impressionistic feel of the piece. After placing all the decorations, lighting, atmospheric fog, and effects like snow and mist add final touches. *Vermilion Lake’s* terrain is extensive — 100km². When I saw the final results — rowing around with the boat interface, I realised that because of the distancing effect that the software gives - where you see a top-down view on a monitor, compared to seeing a giant projection, I had a powerful feeling I was *discovering* the terrain. The complexity and scale of the map meant that many parts lie unexplored, the procedural methods give rise to areas that which have not been consciously edited by hand, the simulated landscape having a life of its own.

**GLIMPSE THE MACHINE**

The demanding VR CAVE system used to display landscape *In Search of Abandoned* required that I press my feeble python scripting into service before Dustin Freeman, a real programmer, arrived to help. Unable to import textures meant that my models including an Arctic terrain rendered as stereoscopic wireframes - delicate lattices unconsciously echoing of the fragility of the arctic glaciers. Seeing wireframe is uncovering the skeletal structure essentially behind all modern 3d polygonal graphics, a glimpse into the machine. The wireframe is a synecdoche of all computer graphics, at once futuristically high-tech and ironically kitsch. A further limitation in the CAVE system became apparent - the landscape, using meshes, rather than a proper terrain system, meant that beyond the topology at the edge of the map was a gaping void. To create an illusion of the rest of the world, beyond the player accessible area, is typically taken care of by a *skybox* — a sphere or cube that features, well, sky - sometimes a special shader that may show slowly moving clouds. Often mountains are dropped in, sometimes a horizon is represented by a curved sheet with a picture, when combined with haze effects give the impression of distance. These techniques all help convince the user that they are in a *world*. The void, normally hidden by skybox, reminds us again of the construct of computer space - there is no scaffolding back there, everything needs building — even an empty theatre has a back wall, roof & floorboards. The in-between screens on contemporary VR
rigs use a blank grid indicating a Cartesian space, a rational place instead of an existential nothingness manifested. Placing dancers in mocap and ghillie suits into physical landscapes is, in a different form, another way of reminding the viewer of the simulation. Between minimal and maximal, my next VR installation White Island - which eventually became an element in our 80°N exhibition, riffs on the artificiality of the computer space.

White Island also exploits primitive geometry, a limited colour palette and no textures for an extreme polar environment. The wraparound viewpoint in the first generation low res Oculus DK1 headset enables the landscape to convince despite its stylised low-res appearance; the terrain is seemingly monochromatic as the coloured polygons representing the snow-covered ground optically combine to blindy white. The illusion is grounded in believability, partly because of a photoreal skybox and partly because the sound design forgoes dramatic music for realistic appropriate ambient sounds. A surround sound system or noise cancelling headphones plays high-definition audio — howling icy winds and creaking sounds from the player’s balloon basket. Both In Search of Abandoned and White Island continue a trend in our practice to take stuff out or put less in, stepping away from our previous maximalism. Likewise, MAN A VR and We Are Made of Starstuff use reduced colour and in MAN A VR even the lighting information is missed out — there are no shadows, the scenes appear entirely flat. Lacking dimensional knowledge the player is forced to rely on movement to convey shape. I believe that dropping visual detail levels can reorder the perceptual pecking order, deprivatizing the visual brings other senses more into play, this technique helping to position the audience in the work.
RUIN LUST

The decaying desertscapes in *Mad Max* are littered with rusty objects and ruined structures, the apocalypse that we see the distant aftermath of, has caused the oceans to drain - the desert presented here is the dry sea bed. Here and there lie the scattered bones of rusted boats and submarines. Alongside the corpses of cars are bleached shells of airliners stranded in dry ravines. *Vermillion Lake* too, presents abandoned structures, replicas of real-world buildings bought together because of their particular and peculiar function and history. Here is a crumbling nuclear-powered lighthouse, modelled from a rusty example littering the polar sea, over there is an abandoned coal mine from Svalbard, here is a drowned Italian town. What links them is their connection to power generation, and how this shapes the natural world, the environmental catastrophe implied by a raised water line which has reshaped the Rocky mountains into a series of islands. The aesthetics here play into a larger theme, familiar to many future looking games — that of *ruin lust* — beautiful decay, the landscapes and atmospheric effects reminiscent of a John Martin painting (Feaver 2011). The fascination with decay, ruin, broken and old things, bunkers and bomb-sites is an age-old one for artists. *Ruin Lust* (from an 18th-century German compound word *Ruinenlust*) is the idea that age and decay lend a patina of authenticity from the ancient world and this has been borrowed ad nauseam in popular culture and video games. 18C artists and writers sought out ruined castles and picturesque landscapes, a source of visual and emotional fascination and a representation of the fears of industrialisation, hinting at things to come. Jonathon Jones writing a review of the *Ruin Lust* exhibition at Tate Britain in the Guardian—

*So many things vanish. Yet ruins remain in the landscape, reassuring the mind that death might not be the end (Jones 2014)*

Perhaps one of the best examples of Ruin Lust is the painting of the Bank of England by Joseph Michael Gandy who was commissioned in 1830 by the architect Sir John Soames. Gandy was asked to imagine the bank as a videogame level-like future ruin which he did with a vengeance, possibly providing an *Ur-example* of future history. Soames was fascinated by the crumbling buildings of ancient Rome and had met with Piranesi, who was something of a ruin-lust
Piranesi was an artist-engraver and eventually archaeologist who worked in Rome in the 18th century as a draftsman, going on to produce various architectural views of the city and visiting various Roman ruins. Piranesi lived up to his motto—

*by messing about, one discovers* (Lowe 2011)

going on to produce images of ruins both imaginary and real. One series of note is the imaginary prisons, fantastical and romantic, the labyrinthine *Carceri* constructions depict impossible geometries at monumental scales, mixing architecture and ruin. Resembling computer game levels, Piranesi’s nightmare ruin also reminds us of Jeremy Bentham’s contemporaneous *Panopticon* - the all-seeing surveillance prison. Where Bentham saw giant prisons as a good thing — a solution to societal problems, Piranesi renders the gaol as the inhumane and spirit-crushing structure that it really is. *Piranesi’s engravings were such a potent framing device for the cultural imagination of the 18th century that the actual ruins had to compete with them’*(Saunders 2014)

From the 16th century onwards, the aestheticisation of ruins appears in architecture as simulated tumbledown structures were built on grand estates which lacked their own natural Roman ruins, as a romantic architectural folly. Moving forward to the modern era, in the 1970’s the *BEST Supermarket* chain branched out from the bland big box design of the modern retail store going on to become one of Americas most avant-garde retailers. BEST commissioned SITE Architects (Sculpture In The Environment) to develop a series of ruined looking stores, where parts of the facade appeared to have been destroyed or damaged in some way. Considered to be the *‘apex of American Architectural Postmodernism’*(McCormick 2014) these proto-ruins present almost a sanitised post-apocalyptic appearance — the litter and grime of the zombie wastelands appearing in contemporary TV shows like *The Walking Dead* is missing here. Instead, the ruins have an almost historicised appearance, like Coventry Cathedral in the UK which was extensively visited by the Luftwaffe in WWII but is now a perfectly cleaned up site for tourists, the piled rubble gone, the broken walls and missing roof surrounding a pleasant paved area. Rose Macaulay, writing in *the Pleasure of Ruins* says that *‘the ruined houses,*
shops and churches of London, Hamburg, Coventry and Dresden would need to be softened by nature and time before being elected to a canon that includes Pompeii and the Parthenon’ (Macaulay 1953). BEST’s iconic stores are taking the concept of the accidental ruin and pushing it into irony. One of the stores had a giant irregular chunk of masonry in the corner which slid outwards, forming the main entrance. Another constructed around an existing mature forest appears to be interpenetrated and overgrown with mature trees, growing from inside the store and pushing through the roof. Sadly unlike Coventry Cathedral, the deliberate ruin became the actual ruin - after BEST’s liquidation in 1997, each of James Wines masterpieces quickly fell in into disrepair, replaced now in most cases with the very thing that the practice comments on.

*It really puts perspective on things, though, doesn’t it?
Too much. There’s too much fucking perspective*
- David St. Hubbins & Nigel Tufnel in *This Is Spinal Tap* (Reiner 1984)

In art, the unexpected beauty of the abandoned building, smothered in vegetation, repeatedly appears both contemporaneously — like Alex Hartly’s installed crumbling modernist ruin at Victoria Miro and in romantic paintings like Caspar David Friedrich’s *Klosterruine Eldena* (ca.1825). This imagery is prevalent in culture, video games like 2013’s *The Last of Us* (Straley and Druckmann 2013) present the ruins of Boston as a spectacular backdrop for (yet another!) post-apocalyptic adventure — ‘an outbreak of a mutant fungus... ravages the US, transforming its human hosts into aggressive creatures’ (*The Last of Us* 2019). The cityscape details have an environmental narrative — the videogame design idea that the surroundings give clues as to what’s happened. Ruins always come with a backstory - and this potentially complex implied narrative is why computer games return to ruins again and again.

**PLANET OF THE APES**
Backstory ruins lead neatly to the well-worn Sci-Fi tope of the broken Statue of Liberty. At the end of the *Planet of the Apes* (Schaffner 1968) film, *Liberty* reveals to our hero that he is not on the alien planet, which is assumed throughout the movie — actually he’s still on Earth, a technical error has caused the astronaut
to travel forwards in time, not distance — ruins always leading to discovery. (N.b. I’m talking about the 1968 Charlton Heston original film, not the 2001 Tim Burton remake). The one thing you can always do with a ruin is ruin it. It needs to be left as it is to preserve its historicity, unlike Oradour-Sur-Glane in southwest France, a village frozen in time. For more than 70 years nobody has lived there, and it has been left to fall into disrepair and ruin. Oradour-Sur-Glane is a museum, a memorial to the calamity that befell it on 10 June 1944. For an unknown reason, 150 Waffen-SS soldiers entered the village seeking who knows what, one explanation is that villagers might have harboured the resistance. After sealing the exits, the Germans proceeded to massacre the 642 men, women and children and burn many of the buildings. Today the village, left as a ruin, is a memorial to the cruelty of the Nazi occupation. Frances Stonor Saunders writing in the Guardian: ‘To save any ruin from its own decay is essentially to deny its status as a ruin’ (Saunders 2014). The destroyed has a special aesthetic all of its own, the idea that even though time decays, by witnessing we somehow prevail, a kind of Arcadian comfort blanket. The accident of destruction lends the scenery a historical distance that enables us to think about the now.

AUTHENTIC PLACES

Game designer of Tomb Raider Toby Gard argues that in order to create an immersive spell its necessary to have nothing to break the illusion of the world, he writes:

the power to immerse the player, to absorb his attention completely, is the common attribute of the greatest and most successful games. When we are creating worlds in games, immersion is only possible for the player if we can convince the players that space is authentic (whether stylised or not.) If the critical features on screen don’t match up with the critical features of the player’s schemata, then he or she will not be fooled by it.’ (Gard 2010).

And of course a simple way to make a realistic place is to create the ruin of it, because now many complex features may be overlooked. An abandoned tube station, for example, doesn’t require the presence of difficult to render
commuters. A well crafted ruin lending both authenticity and simplicity. Playing with this sense of authenticity, our second game engine installation, *SwanQuake*, featured our studio and a ruined version of our local metro station, in London’s Bethnal Green. Counterpointing realistic space, fantasy elements, including a lava-filled rift under the earth, are conjoined, the concept — first tantalise users with convincing real-seeming areas and subsequently lead them into invented spaces — the authenticity of the early parts acting as a bridge to anchor the fantastical in the believable. Blending of real and imaginary, implied and actual is a thread that I have pursued in my work, to create synthesised ‘scapes where the transplanted sites combine to create new meanings. Implying narrative, the environment gives clues while defying specific interpretation, not to mislead the viewer; however, as users must already accept the truth of the simulation itself, instead the idea is to allow the imagination to roam. *Vermilion Lake* too, ties unrelated ruins into landscapes but goes further mixing visual styles adding sketch trees to realistic terrains. Sita Popat writes about the melancholic dream-spaces in *Vermilion Lake* in *Placing the Body In Mixed Reality in Moving Sites: Investigating Site-Specific Dance Performance* noting that ‘together they form a composite landscape that has a consistent mood and quality about it’ (Popat 2015, 165).

**CAMOUFLAGE + COSTUME: CONCEALING COLOURATION**

The natural and the simulated rub up against each other in the form of camouflage in my practice which I consider as a mechanism to understand the landscape beyond a method to disguise the person. A seminal book by artist Abbott Handerson Thayer *Concealing-Coloration in the Animal Kingdom* (Thayer 1923) looks at how animals conceal themselves in the natural world. Thayer’s book is full of his careful observations about how various camouflaging processes work. He correctly explained countershading for the first time, for example, the body of a gazelle is lighter on the underside than on top, disguising the cylindrical shape of the body, optically flattening it to appear as a single flat shape. However, Thayer was mocked at the time as he argued that camouflage is the only purpose of animal colouration and then had a difficult time explaining away Flamingos. Thayer’s theory of countershading is digitally heightened to
maximum values in MANA. Thayer’s book prefigures and most likely influenced the old army camouflage maxim of Shape, Shine, Shadow, Sound, Silhouette, Sudden Movement — the septet of giveaways troops were urged to consider when concealing themselves and their transport. Pocket field guides to camouflage like Hide And Seek & Surprise The First Principle of Attack were produced for soldiers by the War Office in WWII. Various camouflage methods explained in the publications include techniques to disguise vehicles and hiding slit trenches. Other sections describe how the troops should move through the battle space to avoid leaving tracks for enemy spotter planes. Camouflage patterned fabric for uniforms attempts to replicate wild nature in some way, from the woodland camouflage of the U.S Army to the Plane Tree patterns of the German Army, which had both summer and autumn variations. In the main, camo patterns replicate terrain to render the soldier invisible against the background. Distilling essential features of a particular situation into each piece of camouflage, artistically it can be thought of as a microcosm of a landscape, all detail shorn away, a whole environment rendered in miniature. An excellent example of this is the British Army 1960’s DPM (Disruptive Pattern Material), which has been widely imitated and comes in variants emulating different foliage types.

Concealing-colouration techniques became professionalised by the camoufleurs of WWI and II, who had to imaginatively disguise the men and matériel on the battlefield, as well as behind the frontline at home. Artists were involved in the development and design of camouflage including Norman Wilkinson, Paul Klee and Roland Penrose, picked for their observational skills of nature. Later one the artists began to develop more abstract camouflage forms, Gertrude Stein said that when Picasso first spied a camouflaged truck in Paris in WWI, he cried out ‘Yes, it is we who made it, that is cubism.’ (Stein 1938, 31)

PRINTS MADE FROM PERFORMERS

Unlike natural camouflage which strives to conceal rather than reveal, WWI Dazzle camouflage uses it’s high contrast patterns to confuse rather than disguise. Artists including Edward Wadsworth were instrumental in designing razzle-dazzle geometric patterns for warships in WWI. The idea was that any given plain grey or blue paint scheme would only serve to contrast and reveal a ship against the sea or sky. Therefore, instead of hiding, a baffling pattern would
make it harder for a U-boats optical rangefinder to get locked onto the target while obfuscating the ship’s direction, especially when seen at oblique angles. Each pattern was unique, to compound the problem of ship class recognition. Enemies couldn’t be sure if they were attacking a frigate or a minesweeper. There is only limited evidence of dazzle’s effectiveness; however, it was a huge morale boost for the crews on the ships. The dazzle camouflage is serving as a form of tribal warpaint.

CONCEALED PERFORMANCE

In the MANA series our re-imagined dazzle both reveals and conceals performances. The MANA prints are all derived from sequences of motion-captured overlaid and traced reducing the images to pure black & white. The prints pull double duty by acting as augmented reality markers that can be read and tracked by our custom made MANA app. Conversely regular Dazzle camouflage ‘has nothing to do with ‘machine vision.’ Machines are incapable of a state of mind like ‘dazzle” (Sterling 2012). Multiple variants of each print are created and tested to discover the best tracking result. In the field, AR tracking software looks for unique features, that is to say, individual areas with curves and corners from the incoming video image, that it can easily match with the internal database created from the marker. Complexity must be introduced to an image to achieve a high trackability score. I knew that often our printed markers would be viewed in suboptimal conditions (partially occluded, bad lighting, oblique angle etc.) and so I paid special attention to optimising features in each. A disadvantage of the flat style is that a lack of halftones and basic repetition of stripes reduces trackability; however, this is compensated for by the camera autofocus system on a mobile device which locks onto a hard black and white image quicker than a tonally graduated picture. This monochrome stylisation also neatly presents a figure-ground problem that together with the App, must be read by the viewer. In the App, I decided to strip away lighting information to a minimum so that the user has to work to decipher the optical illusion of the flat appearing image that is dimensional. Here stripes and movement all help the brain convert flat images into 3-dimensional forms. Movement is what gives form to our dancers, the moving body enables the monochromatic arrangements to be read as human shaped
**GHILLIE**

Regular forms of camo appeared in our work prior to *MANA*. In 2005 we undertook several artistic residencies in natural settings, deciding to begin investigations into camouflage and to combine it with concepts of movement and stillness in nature. Working with film and costume, we travelled to the New Forest National Park in England for *Ghillie* 58–59 and Banff National Park in Canada for *where the bears are sleeping* 48–51. In the video works over a series of locked-off takes, a single figure remains motionless presenting a tableau vivant against a variety of landscapes, wearing a *ghillie* suit. Made of many strips of cloth and worn over a combat suit, the ghillie suit is designed to replicate foliage, softening the outline and is named after the traditional Scottish hunter or gamekeeper. In the field with a carefully chosen ghillie, a soldier — normally a sniper, prone on the ground, is about as well hidden as you can get, it is the ultimate in optical concealment. The human looks like a bush. For our video works the concept wasn’t about hiding the performer, the suit worn as a costume intending to create cognitive dissonance by pointing out the simulacral nature of the clothing, compared with the realness of background. The performer’s character is disguised, depersonalised, one is unsure about the intention and un-naturalness of the silent, motionless figure which appears against or despite, the background. This lifelessness compared with the living picture background may create an uncanny feeling for the viewer. The figure-ground problem and the natural/un-natural pivot is a recurring theme which we have explored using costume in other works including *Winterspace*.

**WINTERSPACE**

The title for this 2001 live performance/installation is a riff on Merce Cunningham’s 1958 *SummerSpace* (Cunningham 1958). Cunningham collaborated with Robert Rauschenberg who painted a backdrop against which the dancers disappear with their matching painted leotards. Arrogantly we believed that we could go one better and designed pointillist suits, black with tiny retro-reflective dots. Picked up by infrared lighting, the vision-mixed dot person appears part of a monochromatic starfield. The final live image of the performers is mediated through the rear-projected image — three-dimensional forms rendered flat. With no silhouette, the dancers are perceived only in motion.
— presence and absence. The costume reducing a figure to a moving icon, this motif recurring most recently in our new video work *We Are Made Of Starstuff*.

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**WE ARE MADE OF STARSTUFF**

This moving image work is named from Carl Sagan’s famous quote in his 1973 book *The Cosmic Connection: An Extraterrestrial Perspective*—

> *Our Sun is a second- or third-generation star. All of the rocky and metallic material we stand on, the iron in our blood, the calcium in our teeth, the carbon in our genes were produced billions of years ago in the interior of a red giant star. We are made of star-stuff* (Sagan 1973, 190)

In this ongoing work (2018–), the starry costumes from *Winterspace* are repurposed for a moving image work shot on location in New Zealand. A series of three linked films, *Red*¹⁴, *Green*¹² and *Blue*¹⁶, is part of the ongoing landscape & figure exploration combining costume, performance and motion-capture. The movies use in-camera effects and the costumes to create an uneasy relationship between figure and ground. (Many of our projects, undertaken during residences are reaching for a particular landscape. In some cases, there is pressure to deliver a fixed outcome. Freeing ourselves from this unwelcome constraint, we often make a second secret project camouflaged by the main event. *We Are Made of Starstuff* is the secret project of *WAHAWAEWAO*).

In the *Green* film, the performers emerge from in dense jungle, appearing as if cutouts from the night sky. These scenes carry a passing resemblance to Rousseau’s *Snake Charmer* (Rousseau 1907) — the painting featuring a silhouetted figure peering out of a jungle, an effortless flat style of the landscape he never visited, entirely the product of his imagination. Our flat effect is caused in-camera as the retroreflective dots shine against the matt black outfits when illuminated with a small torch. In the *Blue* film, as an appropriate misuse, performers are mocapped at the AUT studio wearing the same dotty suits. Unable to reconstruct multiple points into a coherent skeleton; the multi-camera *Motion Analysis* system is reduced to performing the function of a camera — what should become a three-dimensional output is instead a flat 2d image.
overlaid onto a peak-value blue background, potentially ready for blue-screening onto other footage. Again the avatar creates a figure-ground problem. The depersonalising suits further dislocate the figures creating an alienating effect. The misuse of the motion capture methods follows another recent artwork...

**WE ARE HERE AND WE ARE EVERYWHERE AT ONCE**

For this moving image work we again work with costume, actually specialised technical clothing — tailormade velcro-like suits used by motion capture studios. We commissioned the 3x3 company in Canada to make them — 3x3’s regular customers are film and mocap studios. Usually supplied in black or grey, you have probably seen images of them worn by actors, with shiny balls stuck to them - the suit fabric is specially made for this. During the research, Javier Estevez, the lead technician at AUT’s Mocap lab put us onto a secret technique called *fauxcap*, developed by Lucasfilm — this somehow uses camera tracking on a special pattern to fill in when regular mocap fails, typically outdoors. We wanted our suits to use this mysteriously patterned fabric, but Norma at 3x3 told us that we couldn’t because it was trademarked however she then mentioned that we could design our own for dye-sublimated onto the fabric, and that’s what I did.

I began creating a simple pixel-grid pattern that references as a start point both the textile prints of artist Anni Albers and contemporary Canadian *CADPAT* and the related American *MARPAT* style camouflage. *CADPAT* camouflage replaces variegated leaf-type patterns with a digital pattern, breaking the body shape at different ranges — it has different levels of detail, a macro pattern apparent at long ranges and a micropattern for close up.

My result is a cargo-cult idea of the fauxcap design I originally hoped to use; the pattern is a synthesis of indigenous and foreign elements fitting for our cast who are colonising virtual space in the film. In the landscape our performers wear this false camouflage which instead of disguising them in nature, is working in opposition, a form of *sympathetic magic*, attempting to be extra visible for a computer vision system to recognise, creating a dialogue between the naturalness of environment and the fakeness of the production process. If our performers appeared in a Hollywood film shoot, they and their costumes, of
course, would be digitally spirited away camouflaged completely— replaced by CGI.

**EARLY PROCESS**

The research process has shown that costuming is and has always played an essential role in our work — in the early days we collaborated with designers including IE Uniform and Vexed Generation. We wanted to create strong silhouettes, and favoured face covering costumes — to achieve a depersonalisation so that nuanced individual movement comes to the fore, rather than the identity of their character. There was a self-conscious move that the performer needed to become **iconic**, representing **avatars**, instead of being a character with a specific personality. Vexed Generation’s clothing was technical, sartorial responses to concerns such as air pollution and CCTV surveillance, fashioned from ballistic nylon, a fabric commonly used for bullet-proof vests. These fabrics were waterproof, breathable, fire and stab resistant — **protective fashion**. Other costumes included parachute material pants and ninja style hoods. IE Uniform’s iridescent clothes sparkled under stage lighting and reflected projected video. These costume choices aided the production process for both stage and digital works, with cleaner lines helping the extraction of **sprites** from blue-screen backgrounds and, in live situations, facilitating easier recognition from the early video tracking systems we employed. (Around this time many computer vision and motion tracking systems became available to artists, software included: *Isadora, Max MSP/Jitter, Eyesweb/ Visual Mouse, Track Them Colours*, eventually leading to videogame hardware - *Nintendo Wiimote* and the *Microsoft Kinect* all of which could be hacked around for various purposes.) The costuming was not just about getting good tracking; however, the depersonalisation of the performers is in many ways a reflection of the motion-capture process. In Mocap a person is reduced to its motion only; literally, points in space - the mocap, of course, can reveal character and personality - but it gives movement a certain malleability or plasticity - there is no fixed end-goal to the motion, the figure cleanly extracted from background landscapes, becomes transposed. The dot figure is seen *We Are Made of Starstuff* and the process of switching from real world figure to abstraction is glimpsed in *We Are Here And We Are Everywhere At Once*. This
depersonalisation leads neatly, to thinking about the avatar.

**WHAT IS AN AVATAR?**

Most shared virtual worlds allow a user to ‘choose what kind of avatar she or he will inhabit, allowing a person to inhabit a completely different body in the virtual world.’ writes Edward Castronova in *Theory of the Avatar* (Castronova 2003). Controlled by the player, the onscreen character is the agent of the player. ‘Human consciousness can be likened to be an avatar controlled by the brain and acting on behalf of the brain and the body’ writes William Klemm in *The Avatar Theory of Consciousness* (Klemm 2015). Unlike a human, the avatar is not self-aware and has no feeling. So why use avatars? Researcher Jamie Madigan writes—

> explaining why we adopt the avatars we do is sometimes easy: we decide to look like an elf because elves get +5 Intelligence and we want to max out our mage build. ...research says that when the choice is ours, it’s often about building a better version of ourselves. (Madigan 2013)

People tend to compensate for their own physical and psychological inadequacies with idealised avatars - taller, better looking, more outgoing. ‘The more a player avatar resembles an ideal self, the greater the sense of immersion felt in the game’, according to research by Seung-A ‘Annie’ Jin (Jin 2012). Many games and virtual worlds allow the player to spend an inordinate amount of time tweaking their onscreen character and in some cases, this may be the best part of the whole game. *Second Life* and latterly the VR world it has grown into, *Sansar*, have extensive avatar customisation options, to allow the most perfect characters. Avatars get to come out of the machine too, in 2006 artists Eva and Franco Mattes presented *13 Most Beautiful Avatars* — a portrait series of amazing looking *Second Life* avatars at both the Italian Academy and in an online exhibition co-presented by the New Museum of Contemporary Art.
THE FPS VIEW
Onscreen the 3rd person viewpoint permits players to see their character from behind or over the shoulder, possibly disconnecting the avatar and user — this effect lessened to a considerable degree in the first person viewpoint, where the player sees the game world through the eyes of the character. (The player character is distinct from avatars controlled by the computer, logically known as non-player characters.) If control of the character becomes unconscious, the player can forget they controlling the actions of an avatar on a screen; instead, it is them that is onscreen, actions happen to them. This transfer of consciousness is vital to immersion and occurs much more quickly in VR where the player gives ‘primary mental attention to signals from virtual reality, with only secondary input from Earth’, the player no longer seems to be ‘here’ but rather is ‘there’ (Castronova 2003, 5). What happens in the virtual becomes primarily important, other considerations fade away. Sita Popat writes—

The participant/player’s bodily experience becomes linked to the avatar through the realisation of her physical movement in the actions of the avatar in the virtual world. This loop of intention to act, physicalization of that action, followed by feedback that the avatar has realised the action, creates a connecting membrane between the participant’s body and the on-screen avatar. The participant/player may claim the actions of the avatar as her own even though those actions may not map directly to her own physical movements. (Popat 2016, 141)

This focussed avatar activity can lead to the flow state described earlier. Everyone who has played a computer game for a while will recognise the connection that can exist between you and your onscreen avatar, if misfortune occurs, you suffer, even though it’s only happening to the onscreen character. The avatar and by extension, you, exist in the computer game space.

PERFORMER AVATARS
In many of our video and stage works the persona of the performer is disguised or concealed by her costume. The idea is to get the audience to not focus on the *part* the performer is playing but thinking of them as icons or in another way
as avatars so that the audience can project onto their kinaesthetic forms and connect to the landscape. The performers are not personalities with backstories and plot-lines; instead, their human or inhuman presence opens the landscape for the viewer to enter or survey. Our early work featured dancers and their onscreen digital doubles — life-sized interactive projections controlled either by an offstage technician or by the computer playing out a set of choreographic rules. The performer-avatars began to create an intersection between the physical and digital, depicting a mixed-reality. These avatars prefigure our enquiry into the player/performer idea but are all attempts to question how physical bodies encounter mixed-reality environments. In installations like Vermilion Lake, the performer is absent, the player physically becoming an avatar, controlling their progress across the simulated terrain by rowing the boat controller. Rather than an abstracted layer of control where a human pushes a button causing an onscreen character to move, here the abstraction disappears — the landscape is simulated, but the effort to move across it is real. The installations White Island, In Search of Abandoned and Vermilion Lake all attempt to make the player the avatar, transferring their consciousness into the ‘scapes of virtual. As we have seen, boundaries between real and synthetic become blurred in authentic seeming computer environments and stylised live action videos. Ambiguous figures melding with the terrain, as the implied narrative and lack of detail allows room for the imagination. Performers in our ‘scapes guide the audience in, converting them from passive viewers into active participants by providing an avatar viewpoint. Immersive scenes situate the viewer inside the landscape, allowing the player to begin to become the performer.
07
NEW
PERFORMANCE
SPACES
POST STAGE

My research enquiry is about bringing the audience into an artwork. Previously I exposed ideas around immersive environments and simulation. In this section are rapidly detailed some of the primary methods I employed reaching towards the goal of creating performance spaces, including various dissemination methods to democratise the artwork. For early post-stage works, I realised that performance could be something handed or gifted to the audience — breaking away from the theatre, carried away for encounters in a different space. This concept simultaneously allowed viewers a measure of control over where the performance is accessed and for how long, plus giving interactive control over sequencing and multiple viewpoints of the work itself. These ideas feed into later experiments with immersion.

LIVE STAGE TO THE INTERNET

An exemplar of the performance gift is WindowsNinetyEight 60-61(1996) — an early CD Rom. The now defunct format was a pivotal moment in collaboration with Ruth because the project developed many techniques used in later works, and it marked a shift in our studio practice — here we began to devise sequences composed to allow for re-ordering and interactive manipulation. Inspired by Hitchcock’s, Rear Window, WindowsNinetyEight is an interactive portrait of three women living in a high-rise block in London. Each character stylistically...
NEW PERFORMANCE SPACES
varies, ranging from a gritty photocopied look to an animated super-flat style. These aesthetic decisions were approaches to dealing with the hard 650Mb file size limit of the format — vector-based Flash animations, for example, were significantly smaller in size than the corresponding video. The project also introduced a passage of time mechanic - as the user chooses their journey; a 24min day/night cycle unlocked further scenes, progression and non linearity.

**SCRATCH DANCERS + RANDOM CODE**

The interactive approach fed back into live theatre productions, *Viking Shoppers* (1999) featured life-sized, video-projected animated dancers enacting a computer-mediated duet with their living doppelgängers — which we called scratch dancers. The scratch dancers comprise 5-8 min choreographed sequences pseudo-randomly programmed to switch direction with a tendency to play forward. It is difficult to discern dance movement direction, reversing extended the sequences without being obvious to the audience. The scratch dancers could also be mouse-controlled from offstage, to change playback speed and direction, by revealing a custom cursor to the audience, the machine became a partner to the on-stage dancer, drawing back the curtain on the illusion. This three-way interaction is challenging for both performers and crew, who through anticipation and observation take on some of the movement qualities of the scratch dancer. Onstage what starts to emerge is an improvisational movement grammar — influenced by the language of the system. Experimenting with user or machine control, it emerged that the pseudo-random code got the thumbs-up from dancer Joanne Fong — unaware it was the laptop doing the work. This live experiment implanted the benefit of using random behaviour to control choreography - hardly an original idea, Merce Cunningham had developed ‘choreography by chance’ (Encyclopaedia Britannica 2018) in 1952, interested as he was, alongside John Cage, with the potential of chance phenomena. However unoriginal, random and pseudo-randomness produces excellent results. In the final act of *Viking Shoppers*, custom software converted the dancers into ASCII text, projected onto a gossamer scrim. In combination with the scratch dancers these projections were the beginning of the performer-avatar concept.

Experimenting with multiple staging arrangements allowed us to envelop
NEW PERFORMANCE SPACES

audiences and gallery visitors within a live performance or installation, surrounding and immersing them with dancers, sound & imagery. Combining gifting and computer control led to using the internet as a distribution platform. Because of Ruth’s previous experience with motion capture, we began to understand mocap was an excellent means of delivering performance.

Mocap can free the viewer from fixed positions as the viewpoint has multiple angles. Unlike video, mocap can be slow-motioned seamlessly interpolating between recorded frames, preserving fidelity. Multiple viewpoints, zooming and variable direction of motion chimed with our desire to escape from the linearity of video. Compared to video mocap also has great compression vs resolution, back in the days of 512k modems, streaming video was not a good option, whereas a 5-minute clip of mocap can weigh in at under 600K. Moreover, the problem of the monitor remained, the frame of the screen creating its own fixed viewpoint proscenium arch — something that we longed to avoid. Our first web-based mocap project to use these ideas was dotdotdot in 2002 — a web browser allowing control over zany avatars while simultaneously streaming banging drum n’ bass or other internet radio stations using our built-in tuner (another fix to speed up downloads, by not forcing users to load large sound files). The motion-captures animating the avatars were all improvised - capturing an improvisation, retains the ephemeral live, our digital versions designed not to replace a real dancer, but to preserve something of their unrepeatable quality. Sadly, file formats for this project are now obsolete, effectively the project is defunct, existing only as documentation video.

THE SWAP TO INSTALLATION & GAME ENGINE SPACES

Web-based 3D worked well; mocap animation had smooth playback, the drawback was that limited bandwidth meant forgoing detailed models, textures & backgrounds. The answer became clear — working with a computer game engines would fix the bandwidth issue — the viewer would need a big PC, but in the computer game worlds, high-resolution textures, spatial sound and animation all became possible. Furthermore, the user could navigate around a series of virtual spaces. The player avatar and by extension the player would
be inside the artwork. Thinking this through I realised that not all potential users would have a high spec computer and not having the skills or resources of a game studio to draw on, my method for dealing with playback issues was to install better hardware - but this would not help a home user. The answer was to only show the work in a gallery; here I could specify the equipment ensuring there would be no performance issues. Inside a gallery a more immersive approach would be possible by projecting at scale and adding other features — sound systems, interfaces, even reaching out from the computer and becoming physicalised in some way.

These early artworks enabled the user to simply improvise with the work itself, choosing avatars, viewpoints, controlling playback and sequencing. The concepts in these examples are delivered into the present within our long-running umbrella series MAN A. During the PhD MAN A provides a framework to examine my research question — How to bring together the artwork and the audience, creating a new experience for them in immersive performance space?

**MAN A**

Once again escaping from the theatre, our experiment takes place in the new performance arena of *mediated reality*, the audience achieving alternate viewpoints and dynamic variations by moving their own body in and around augmented reality prints. (*Mediated reality* is a term which refers to the ability to add information to the perception of reality through the use of a hand-held device, mediated reality encompasses virtual, augmented, and mixed reality. Nowadays its occasionally short-handed as *XR* and includes Virtual and Augmented Reality. Julian Oliver thinks of Augmented Reality, as an *Improved Reality* (Oliver 2010), contrasted with Jean-Jacques Grimaud's *Diminished Reality* (Grimaud 2016, 216) this artist uses AR to remove objects from the world.)

The first MAN A work was conceived as part of a series of artist commissions for the Selfridges department store in London. We took over one of the large window displays, customarily used for showing merchandise on Oxford Street. For this first iteration, I carefully matched the size of the augmented avatars to
the actual dancers animating their movements. Extensive testing with a 1/10th scale physical maquette facilitated the optical illusion in the mediated mode, the figures appearing correctly aligned and situated in the real world. The window is approximately 5m x 3m and raised from floor level about 60cm. The window depth provides a shallow stage-like area, where I wanted the monochromatic avatars to appear, echoing the augmented Dazzle prints that would fill the window. I watched the crowds in Oxford Street, pulsing in waves — controlled by the street crossing timing. I observed how if one person got out their phone, to scan the QR code on the window in order to download the app, then a whole group of other people would congregate quickly and also whip out their devices, either to use the app or merely to film others. In this way, a knot of people flow and ebb in front of the window, Benford’s spectators and second-order spectators, again.

3D FORMS & MAN A
Later works in what eventually became a series, experiment further with staging, abandoning the prosenium format to create performances in the round, Solid (2014) for example is a 2m form, a truncated triangular trapezohedron commonly known as Dürers Solid after the form in his 1514 engraving Melancholia (Dürer 1514). The freestanding shape is designed to encourage viewer circulation, the augmented avatars life-sized again, appearing in front of and behind each facet of the shape, moving around and through the object. To view the work completely, which is usually placed centrally in a given gallery, rather than against a wall, viewers must move around. Traversing a wide area the motion sequences occasionally pass through the viewer encouraging repositioning. Simultaneously tracking multiple AR markers, it becomes possible to flip between avatars when two or more markers are seen by the App. Other three-dimensional forms include Huff & Puff 28-29 (2016) a modular sculpture comprising a set of interlocking panels that can be re-combined by visitors forming multiple stage-like platforms. Huff & Puff riffs on and appropriates mid-century modernists, Charles & Ray Eames’s House of Cards (1952). Like the illustrated original, our gradient tints and black & white panels ‘give any structure you make the look of a multi-screen media event’ (Lange n.d.) and indeed interaction happens both by viewers recombining pieces and via our
app. The Eames’s take play very seriously - ‘embrace of play as an end in itself’ (Sisson 2015), likewise MAN A seeks to encourage playful interactions where discovery leads to movement and vice versa.

EPHEMERAL MEDIA & MAN A
The MAN A prints and objects have all used various transient media including the large format digital printing, often used for temporary outdoor advertising, newsprint for an unlimited edition work on paper and various types of cardboard. Solid is editioned in cardboard and Kappa, intending both impermanence and functionality — the large form can be flat packed and shipped, yet expands to a large size. Huff & Puff extends this pragmatic approach, appearing both as a gallery-sized edition with 24 different 54 x 84cm panels which can built a 2m high structure and as a practical edition of 100 pocket-size cards. Taking considerations of ephemerality and practicality to their ultimate, we arrived at Big Bob (2015), a giant reclining harlequin-esque figure which is a maximal re-materialisation in cardboard, of the avatar of Robert Davidson, one of our MAN A cast. The 15m scale of Big Bob attempts to immerse the viewer in the MAN A world, inverting the scale relationship between avatar and observer. Now the viewer is a moving avatar for Big Bob. Dazzle patches once again conceal avatars, who in this work break with our normalised MAN A conventions of scale and orientation, swarming the recumbent giant with lilliputian figures. Many of these avatars eschew traditional representation, abstracted entirely away from human forms — the nonhuman shapes speak back to ideas of costuming, concealing identity to prioritise focus on movement qualities, which I have examined earlier.

PERFORMERS IN MAN A
Part of the investigation of MAN A has been a concern with the essential liveness of performance which arguably disappears with prerecorded files. Counteracting this, motion captured performances of the dancers used in MAN A are all single-take improvisations. With a live performance, the sense it must be witnessed firsthand makes it a slippery ephemeral form. Our team are experts in Skinner Releasing Dance Technique (SRT) a specialised dance teaching
Instructions:
01. Cut along grey solid lines (there is some bleed)
02. Score, then fold grey dotted lines
03. Glue flaps, A joins to A, B joins to B etc.
which recognises that every human has her own natural *animal* grace, seeking spontaneous movement, frequently evoked by imagery, integrating technique and creative process. Ruth gathered seventeen SRT dancer colleagues for an in-depth study to examine the poetic image with mocap visualisation techniques. The improvisational performances provided the raw material for the *MANA* animations, creating an archive of SRT performance and a memorial for our dancer, Joan Skinner’s prodigy, Robert Davidson, who passed away in 2016. Ruth has practised SRT since 1989 for her AHRC research into dance & visualisation techniques, we developed an experimental mobile app *MocApp* in 2013 — a viewer tool for mocap, intending to allow mocap subjects some control over their own data, neatly sidestepping the need for a PC with specialist software. *MocApp* uses an AR function to display the mocap back into the world; users printing our unique marker could place it on the floor. Normally AR scaling is fixed to marker size; for *MocApp*, a zoom function meant that the augment could be scaled to any extent. The concept here is that if the phone display is mirrored, via the correct lead, on a TV monitor, a user can stand alongside her life sized dancing mocap using the monitor as a virtual mirror. I realised that changing scale to reflect real-world dimensions was important for immersion, as it moved the AR function of the tool from being about looking down at toy-like models to becoming a *window* into a computer world. This reminds me of Bolter and Gromala’s *Windows and Mirrors* theory, the idea that computer can be a window — showing the user content only, with a *transparent* interface or be a *mirror* where the user is aware of the computer as a medium where they can have some influence. Many users seeing AR for the first time have a magical reaction to it. *MocApp* which was designed as a tool, appears to be a ‘*digital artefact oscillat(ing) between being transparent and reflective*’ (Bolter and Gromala 2003). The AR function in *MocApp* contributed to the development of the *MANA* App, here the *reflectivity* of the software is reduced to the didactic, presenting background information about the work. The AR feature is fully *window*-like as the choice of avatar is a function of where the device is pointed rather than via menu selection.

**RAGTIME & MANA**

*Ragtime* (2015) from the *MANA* series shifts away from both motion capture
and augmented reality. We were invited to show work in the Politics of Amnesia II exhibition at the Cafe Gallery Project in London, the exhibition examining ‘past trauma throughout the conduit of technology, itself now presented as implicated in that very trauma it is representing.’ (Ducker 2015). Nervous about this opportunity, I knew the other exhibiting artists would show serious work dealing directly with warfare and its effects on participants. The curator, Richard Ducker, wanted something from the MAN A series because of the obvious connections to camouflage, WWI and the engagement with technology. Ducker writes—

-as our hi-tech future promises us infinite possibilities, it leaves a gap filled with impending disappointment. It is a disappointment through our sense of separation that is loaded with atomised pathos. And it is to this gap that these artists look, where memories appear flattened and shorter, and where we are distracted by the heat of the present. This sense of amnesia, induced by the seduction of the spectacle of technology, becomes the consequent politics of memory and distraction. (Ducker 2015)

Influenced by reflections over my PhD, I wondered if I might be able to reference my software toolkit and speculate on the exhibition themes. Consequently, I decided to experiment with computer simulation and randomisation, creating an endless improvisational work, taking as its title, Ragtime. (referring to the precursor to Jazz, Ragtime music was largely distributed as code, via sheets or piano roll, the intended syncopated effect inducing the listener to move with the music, eventually falling by the wayside as Jazz grew popular during WWI.) Ragtime uses a procedural variety of animation known as rag doll. In standard, First Person Shooter games such as Call of Duty ragdoll animations replace otherwise canned static dying animations to give endless variety. The motion of the figure driven by a physics simulation reacting when subjected to force. The human is now fully replaced by simulation, in this piece, the avatar subjected to endless, unpredictable explosive forces shooting the helpless figure into the air, which crashes to earth aiming to generate a kinaesthetic response in the viewer. As with the other MAN A works, lighting and shading are removed so that it is only the movement of the monochrome figure in the inky void which reveals its form, abstract triangles resolve into a figure, challenging ideas of choreography and display.
NEW AUDIENCES & MAN A

There is no point making a work if there is no-one to see it. Looking at statistics, we could tell that in London for example, the audience for a contemporary dance performance was a thin slice of the overall arts attendance pie, especially compared with the fat visual arts wedge. (see Christophersen 2018). Using an App has helped the work reach many more people than we could ever reach with performances in a fixed venue. Mobile, AR, VR and Simulation are all moves to create a new audience amongst young people and those who readily engage with new media, — not necessarily the same audience for performance or dance. Together with public and private exhibitions at galleries, arts centres, site-specific, architectural places, fashion shows, game festivals and a hospital, MAN A has been viewed by over 600,000 people. Work in the series is currently (2019) part of a five-year world tour with the Barbican’s Digital Revolution survey show. In terms of reaching an audience, overall the technologically mediated performance is more effective and cheaper than touring a live show.

MAN A VR

The logical next step for MAN A was VR, presenting several scenes, each an inversion of the performance in-the-round, the viewer surrounded by dancing avatars. MANA VR leads the viewer into the immersive monochrome world of the avatars while encouraging them to perform. For the VR Makers Symposia in Sweden (2016) we set a condition where the visitors protect each other by holding the headset wires out of the way. If the user moves a lot, the person holding the wires has to move around them, creating a chain-like duet where the avatar ultimately leads the wire holder, we refer to this helper as a chaperone — the chaperone can only see the user, who in turn is unaware of the chaperone. This interaction can free up the chaperone to move around when it’s their turn. Ruth and I are very interested in how there is a transference of movement impulse from the digital avatar, to the viewer, then the helper. This movement transfer feeds into the idea of kinaesthetic empathy which I touch on now. Dee Reynolds and Matthew Reason extensively examine this concept citing John Martin, ‘sensory experience could have the effect of “reviving memories of previous experiences over the same neuromuscular paths” (Reynolds and Reason 2012) and Theodor Lipps, ‘when observing a body in motion, such
as an acrobat, spectators could experience ‘inner mimesis’, where they felt as if they were enacting the actions they were observing’ (Reynolds and Reason 2012). In Ragtime it can certainly be painful to watch the character awkwardly faceplanting onto the ground after the suspension in the air, any sympathy is in any case, sympathy for the computer as no actual person is involved in the process.

> Linking kinaesthetic empathy with affect rather than emotion means it can be viewed as embodied intensity that impacts the spectator kinaesthetically. The punctual impact of affect can be described as a sudden shock, localised in an event

Reynolds and Reason’s Kinaesthetic Empathy book brings in viewer responses to seeing multiple mediums too, film, music and mocap:

> Kineesthetic empathy and related concepts took on particular relevance in the context of modernism, which emphasized the idea that receivers should respond directly to the medium of a work of art (eg. movement rhythms) rather than to a storyline or a subject (Reynolds and Reason 2012, 132)

**THE BRONZE KEY: PERFORMING ENCRYPTION**

**The Bronze Key** is a collaboration with Susan, forming part of her Performing Encryption a project which itself is part of the five year-long collaborative and multidisciplinary scheme Living Archives: Enhancing the role of the public archive by performing memory, open data access, and participatory design led by Susan at Malmö University.

Thinking back to the earlier concepts of VR as a surveillance machine and combining it with our interest in both rematerialisation and new modes of performance led to a collaboration with Susan, a colleague from the early dance-tech days. Our discussions about encryption led to thoughts around data trails and confidentiality. Susan and Ruth had been less concerned with their mocap data and privacy in the past — we collectively imagined if there were some unique way to encrypt it. Susan writes
It points to one of the most urgent issues around archiving in the contemporary climate: we archive but we are archived. If we realise that our data – in particular, our bodily data – are archived often without our awareness or consent, then encryption becomes a necessity that filters down to everyday usage. (Kozel, et al. 2018, 2)

Jacob Applebaum too, has written about data archiving and surveillance issues:

*Over the last forty years, a revolution has swept the planet. It happened quietly and those who noticed were ridiculed at best. It is a revolution where nearly all of our data is devoured in an automated fashion – machine to machine, person to person, voice, text. Communications, movements, all of life is consumed, quantified, searched, and catalogued.*  
(Applebaum 2016, 155)

**VR DRAWING, MAKING THE BRONZE KEY**

In VR the head and hand positions are tracked with a high degree of accuracy – imperative to maintain the illusion. Latency is a big problem for VR, so the system tracks fast. In effect Virtual Reality forms a simple motion capture system -the difference being that VR doesn’t naturally record the motion, for that you need to run a software package. I hit on the idea of recording a short *gesture* with VR drawing tool *Quill* and using the 30 frames of data captured from a single hand marker to use as a bidirectional encryption key. A gesture is idiosyncratic and has the advantage of being time-based to give a range a range of complexity. The system is neat as the subject creates her own unique key. This key would encrypt a 30-second dance phrase using a simple encryption algorithm; performance encrypts performance. Bidirectionally refers to how the key can both encrypt and decrypt if both sender and recipient know the algorithm. The mocap .htr file format seemed to be the best way to store the mocap *message* - a simple spreadsheet with the encryption algorithm enabling the encryption. I had previously experimented with the open access .htr file format - it can be opened in any text editor and read by humans. These regular plaintext files show X, Y and Z translation & rotation co-ordinates for each
NEW PERFORMANCE SPACES
marker in every frame. Copy-pasting inside the text file, then saving and opening with a mocap viewer, demonstrates how much distortion comes from a simple change. Inserting both take and gesture into the spreadsheet and performing a mathematical function encrypts the data, the reverse operation decrypts it — a symmetrical encryption key. The data quickly becomes large — 30-sec mocap takes, recorded at 30 frames per second, yield spreadsheets with around 54,000 rows. Movement recorded by mocap is a series of points moving spatially over time, linked by a skeleton. 3d drawing package Quill does the opposite in VR, converting the motion of a brush tool into a 3d shape, a mark or a line dividing space. These marks if exported as files, are useable by other 3d packages, leading to the idea of rematerialising the gestures, taking the performative encryption key out of the digital - ephemeral becoming tangible. The Bronze Key20–21 (2018–) moved from being about privacy to being concerned with archiving. Digital forms have built-in obsolescence due to the ever-changing nature of computer hard drives, file formats and operating systems. To save data onto a computer is effectively to turn it into smoke. Each storage technology has a life span of around ten years. In practice, this is even less, because of the relentless churn of ever better technological forms. Storage in the Cloud is also futile, just like a real cloud it will eventually dissipate - and of course, essentially you are giving away your data while paying for the privilege - there is no insurance policy to get it back.

Technology creates the problems that technology solves, and vice versa (Hill 2019)

The result of the Bronze Key experiment is three artefacts. The first a dense 700 page book, Susans encrypted 30-second movement in .htr format - with luck and dry storage it will still be readable in 50 years. For the second artefact, a bash script converts Ruth’s motion capture into Speech with the 46-odd Apple voices reading out 250-line sections. This archive of around 460 hours of audio material has sections of varying length as the different languages are spoken at various speeds. Converting the audio into a useful analogue format, we pressed into service a vintage reel to reel tape machine to record 6-hour sections on 10" magnetic tape reel. The vintage reels I used had previously been filled with 80’s pop, recorded from vinyl and still sounding amazing
after 40 years. I am reasonably confident that this analogue format will be accessible in another 50 years. For the third artefact, I created maquettes — 1/10th scale models 3D printed in bronze of the encryption keys, solid forms that can (theoretically) be re-performed by others. Bronze is one of the most durable human-made substances and should last for at least 4000 years. The artefacts create the possibility of the new performance space, solidified, the rematerialisation moving beyond a recording easily viewed, instead, objects must be dematerialised from physical form into pure data in order to be seen. (These experiments are not practical methodologies, merely thought exercises. However in a later test, carried out in VR, a neural network plugin is trained to recognise the gestures. It became possible for another user, accurately repeating the gesture, to be successfully identified by the system. The network can be set to be very discerning about how much deviation it will accept. This method may be used to unlock or decrypt the extended movement sequences, and once again, expert movers can reasonably be expected to be able to learn the gesture keys.)

CAPTURE THE FLAG
The original concept for Capture the Flag\textsuperscript{10-11} was to create a flag for VR – a metaphor for the uncontested territory of cyberspace. A white flag of truce, parley or surrender, the flag would be interactive so a VR user could wave it around. To make the flag behave in a flag-like way, I employed a cloth simulation. During development when it became time to attach the flag to the flagpole. The flagpole also needed to be simulating physics so that it would be grabbable by the user. An unexpected simulation error connecting the cloth to pole caused the flag to exhibit an unplanned behaviour, it appeared to run away I decided that this chance mistake was a much more poetic solution and I kept it, adding a following 3rd person camera viewpoint framing the flag in an ever-changing, never-ending shot. The endlessly regressing and approaching wraith-like draped form is reminiscent of the works of science-fictional surrealist painter Kay Sage - her work featuring empty horizons and occasional ‘figures that might not be human, hidden by flowing drapery’ (Wikipedia 2018). The minimal ‘scape is simply an almost blank default environment that I use to begin creating in the game engine - it is a proto-level that eventually becomes a fully fleshed landscape — the simplicity of this ‘scape reveals something about the game level
design process. The title too, loops back to computer gaming, *capture the flag* is a standard First Person Shooter gametype where rival online players compete for the enemy flag, rushing it to the home team base generates a win condition. In *Capture the Flag*, while it does not incorporate or represent dance in a formal sense, movement is essential to the visitors engagement with it, *kinaesthetic empathy* again - the implied body observed creating an affective experience for the observer. Over the PhD, this affective experience is something I have slowly begun to recognise and attempt to reproduce in my work - abstraction articulated with movement helping to engage with audiences. I’m reminded of Kay Sage again, talking about her non-human but human-like forms in Time Magazine 1953 as *‘a sort of showing of what’s inside—things half mechanical, half alive.’* (Suther 1977, 134)

**VECTOR LINES**

I experimented with creating a drawing tool, something that would be transient and that would encourage a user to interact and move. *Vector Lines* 2018 is a sketch of this, resembling nothing so much as a 3d version of 1970’s string art - ultimately simple, the user conjuring straight lines, upwards from the origin to each palm, another between the hands if both triggers are activated simultaneously. The lines are temporal, moving the thumbsticks gives the lines persistence, lasting up to 20 seconds before fading. A secondary trigger squeeze transforms line origins to the hand location. Using the controllers permits users to create three-dimensional vector lines, which decay over time. The resulting temporal drawing is a complex spatial cats cradle form. The experiment was twofold, firstly to make a toy for *movers* to play with and secondly to see what the most straightforward possible virtual reality could be. The programming here misuses the built-in debug line drawing feature for programmers, in a simple code, showing something of the inner workings, Line colour follows the schemata used as X, Y, Z axis in 3D design software packages; red green and blue. Ultimately I was figuring out how the user can make their own environment.

**DRAWING SPACES**

Another drawing experiment carried out during the research, the body has been sketched in Virtual Reality using a commercial drawing tool that scribes
NEW PERFORMANCE SPACES

The Uncanny Valley

Uncanny Valley

human likeness

familiarity

humanoid robot

bunraku robot

healthy person

industrial robot

stuffed animal

corpse

prosthetic hand

moving

still

Movement

+ reaction

similarity to human

1 Industrial robot
2 Android
3 Moving corpse
4 Prosthetic hand
5 Handicapped person
6 Bunraku puppet
7 Unhealthy person
8 Healthy person

Appearance

+ appearance

1 Stuffed toy
2 Noh mask of thin man
3 Corpse/uncanny valley
4 Decorative robot
5 Doll
a virtual line. Tracing the simulated brush tool around a person leaves a sketch form, human-sized and shaped. This toothpaste-like figure is exported and animated using regular 3d character rigging tools - adding mocap it can be made to move. This technique is similar to the OpenEndedGroup’s animated sketched characters in Hand-drawn Spaces (1998) and BIPED (1999). In Hand-drawn Spaces, Merce Cunningham’s choreographed dancers are seen in a mental landscape video projected at scale. For BIPED the ‘projections being cast onto a front scrim, allowing the live dancers to appear to interrelate with the virtual dancers in various abstractions and spatial configurations’. Spectacular and seminal at the time now ‘images from BIPED have since become archetypal of digital performance’ (Dixon 2007, 190), and indeed we have seen the latest iteration of this longrunning form of digital performance theatrics in Tesseract (2019), Charles Atlas’ 3D film with Rashaun Mitchell/Silas Riener’s ‘contemporary choreography exploring human form and technology.’ (Barbican Press Office 2019)

Writing about the 1999 Ghostcatching piece with choreographer Bill T. Jones, Steve Dixon writes about the unearthly properties of mocap—

this conception of the computers ability to extract essences from the human body and like the older belief (which still holds in some parts of the world) that a photograph captures part of the subjects soul, reconceived a notion of some form of capturing the human spirit (Dixon 2007, 193)

Sampling the flavour of a movement and catching something of the human spirit, is the best feature of mocap and this really is putting the graphics into choreographics. Nowadays when everybody Instagrams selfies like crazy, it’s laughable to think a photograph can steal your soul, but compared to the clunkier early systems, mocap now does possess almost supernatural qualities of resolution and fidelity where even motion imperceptible to the eye is captured faithfully. Hito Steyerl, writing about affective digital writing reports sensorial qualities I think apply to viewing mocap when you consider human movement as a form of communication, because a “meaningless gesture is a contradiction in terms” (Langer 1953, 174 quoting Mary Wigman).
The combination of (almost) real-time communication and physical absence creates something one could call absense, so to speak: the sensual aspect of an absence, which presences itself in (almost) real time. A live and lively absence, to which the lack of a physical body is not an unfortunate coincidence, but necessary. (Steyerl 2017, 58)

Our hand-drawn figures are experienced *life-sized* in VR, maximising the sense of presence of the otherwise absent performer. One of my recurring issues is how to represent the dancer. I had been thinking about how difficult it is to create convincing humans in VR because I wanted my avatars to avoid *uncanny valley* issues. No essay writing about computer graphics is complete without mentioning the valley, and so I describe it briefly now. *In 1970 Masahiro Mori coined the term ‘Uncanny Valley’ concerning his work on robotics to mean the point at which the humanlike qualities of robots become disturbing and sinister* (Brenton, Gillies, and Surman 2007). Uncanny valley effects resonate in fields outside of robotics too — the quest for realism in character design in games is a case in point, playing into photorealism mentioned earlier. It’s tough to make hyperrealistic characters that run on domestic gaming technology that don’t creep people out, and in VR they become more unsettling as they are suddenly right there with you, and as Mori pointed out, uncanny effects become magnified by movement. Our wonky sketch characters with lumpy lines and proportions seem to avoid these issues, even when imbued with motion. The lack of a proper face helps viewers concentrate on the movement too. My lowpoly simple characters in *MANA* likewise prevent uncanny issues too, however, but they can still be unsettling when they come right up in your face, but then I don’t necessarily want viewers to be completely comfortable either.

Building on from the sketch character experiments, Ruth began creating VR drawings with Quill by holding the controller with her feet — this part of the body is obviously crucial for dancers but is frequently overlooked for an input — which tends to prioritise the upper body, concentrating on interactions stemming from the hands. The Quill software renders a gesture as a solid shape, a moving point becomes a line, the foot drawing a performance in *stasis* essentially. The VR system here can be thought of as a type of motion capture system. In *Drawing Levels* 04–09 the foot sketches resemble brain-shaped tumbleweed,
skeletal forms which in VR became environmental superstructures, colourised using translucent shaders programmed to animate individual vertices, creating undulating movement giving the normally rigid models a softer organic feel. The drawings may be experienced at different scales, small, jellyfish-like and handheld or at gigantic scale — with the human action creating a horizonless landscape, discarding conventional landmarks creates a scaling effect for the viewer who may feel miniaturised down to microbe size in a petri dish of seaweed forms — the set of four linked environments are stylistically non-photorealistic to give a layer of abstraction. The pilot version, as yet unexhibited has had several rounds of testing with users, leading to a simple control scheme where the user pilots a submarine craft glides through a viscous medium. Further development includes implementing a breathing interface I have developed which alongside a leaning interface revisits the Char Davies Osmose controller. I thought it would be timely to revisit this method of VR locomotion and put together a breath controller, simple electronics where a conductive cord measures expansion and contraction of the wearers’ lungs. The system is profoundly analogue giving nicely smoothed output. Slow, steady breathing maintains the user in a balance point, deep in — or exhalations cause the immersant to ascend or descend. The breathing controller is somewhat akin to scuba diving and has been described as such by a diver. The second controller finely measures head position, leaning out of a central inaction zone causes acceleration in the lean direction — more significant bends give faster action, in effect the user is a human joystick. Motion is a continuously variable physical quantity, both controllers together providing an excellent body based interface, a world away from the regular game-type controllers — bringing somatic control back into the habitat which is also made by the body.

FUTURE DEVELOPMENTS

My ultimate endpoint goal for Drawing Levels is a multi-player system for a prime mover to draw the environment at the same time a second performer manipulates it, while several users are inside it — this would be a good example of a new method for performance and brings together several experiments I have carried out over the course of the research.
I have been working on a prototype using wireless VR backpack PC’s together with extending room scale tracking in the shape of an OptiTrack mocap system to track both the audience & cast - bringing them together in the same space, virtually and physically. Planned experiments with pre-recorded motion, live capture and remote setups will determine if the presence of dancers and audience creates and enhanced live immersive experience, extending my research to connect real and virtual spaces.

The baseline scenario in MANA VR is that a single viewer sees multiple pre-recorded absent dancers through sequential scenes. The avatars give a great sense of presence to the user, but there is no avatar/player interaction. By extended the tracking area means that for example the MANA scenes can be spatially rather than chronologically separated - the audience physically walking to another room, rather than pressing a button and experiencing a jump-cut - increasing immersion. Assuming multiple audiences can be occupying the same physical area, they need to be represented to one another to avoid bumps. The physical venue must be represented somehow too, there must be some visualisation; otherwise, untethered users will crash into walls. In this scenario the properties of XR give it an advantage, transparent HMDs helping with collision avoidance.

The novelty of the experience of course may be distracting from the original intention — to create artworks. It is feasible to link virtual realities allowing remote viewers and protagonists to beam in. Now we may have to deal with griefers — the term from videogames where a person is annoyingly disruptive, maybe by aggressively getting up in your face or using aspects of the simulation in unintended ways. Griefers in VR chat rooms are regular sweary kids, anonymous and unmoderated. I don't imagine these users will want to attend some kind of strange art event, but regular visitors too need to be wrangled to prevent them become unwitting griefers through unintended behaviour, such as poor appreciation of personal space. In fact, one of the preventative features introduced to VR chat world vTime is a the personal shield which neatly ‘prevents other users from touching your avatar, or invading your space with their hands.’ (Roberts 2017) (if only we could have that in real life too). Our participants may need some way to communicate with each other. VoIP is an
obvious choice, but what is the protocol for shushing talkers? The format is not formed yet, there’s no consensus of user behaviour. I think to go back to multi-player FPS. Players can chat with a limited text interface, and during the pauses before online games start there is a moment when the only communication is silent button mashing to make your avatar do a strange dance while rooted on the spot.

Finally, with our current system an actor can be live mocapped, simultaneously present in the same physical and virtual reality as the user. In this scenario the real performer may directly interact (via touch, for example) with a viewer - in a digitally mediated performance. However, because of the strong sense of presence for the viewer in the simulation, this final mode of performance may be deeply uncomfortable. This current work tests the assumptions that multi-player experiences are preferable. The future developments are about cultivating & integrating kinaesthetic intelligence into immersive environments.
08
CONCLUSION
A WHISPER NOT A SHOUT

What I uncover throughout the PhD, is that the practice I share with Ruth creates innovative experiences for audiences and opportunities to present movement-based work: These are novel artistic works that employ chance, figure, landscape, audio, costume, interactivity, scale, form, pattern and moving image to reposition the viewer, immersing and involving them in the artwork.

I resist narrative while obliquely and subtly referencing political and social themes, including surveillance, the environment, territorialisation, alienation and loss. Sometimes the methodology re-purposes disappearance and disguise, concealment and camouflage, stillness and quietude — both outwardly to hide or reveal performers and inwardly to guard the motivations for making the work. This open-ended approach is designed to allow space for the imagination, leaving room for the viewer to come to their conclusions rather than forcing confrontations with unchallengeable convictions. I agree with artist Theaster Gates when he says—

*The role of art and artists never needs to change. It should take the temperature, but it cannot be the doctor..... We cannot depend upon artists to do the work of presidents, ministers, social workers or private wealth. We can ask artists to be present and to speak truthfully from their core. This is the beginning of change.* (Art Newspaper 2015)
Our practice situates itself within a field which believes it is creating the next generation of immersive experiences. Yet much of what is produced is re-staging old ideas in these domains. What we are interested in, is working within and with these systems to create original forms, not superimposing on what has gone before. To uncover something of a performance, or to uncover something new, it is crucial that things can fail. We are living in a society which does not accept failure. We need to take risks as artists and develop places and spaces where audiences can do the same, escaping the bubble, to learn something about our place in the world.

Revealing elements of our multi-layered making process I allow the audience an opening, uncovering some of the issues surrounding our toolset, not to deny or reject technology, instead, to raise awareness of some of the multifaceted simulated constructs and trickery that technology can enable. The artificiality seen, for example, in *We Are Here And We Are EveryWhere At Once* where our cast glimpsed inside a mocap studio, explore ‘being digital’ by reminding us of the making processes of computer effects. The dancers in the landscape placed into avatar roles, incongruously clad in monochromatic suits re-staging the ritual technical motions for calibrating the system, hint at a fabricated reality where the landscape exists outside nature, to present the site as a synthetic vista. In *We Are All Made of Starstuff* the human disappears into and comes out of, the landscape, other figures move between the virtual and physical viewpoints, a de & re materialisation. In my practice, clothing and costuming are vital, either as digital skins or suits to create a performer avatar. The depersonalised avatars guide the viewers in, situateing the audience inside the landscape.

In the wireframe terrain of *In Search of Abandoned*, the underlying structure of modern computer graphics inherent in the virtual environment is laid bare. Here the pixellated expanse of the digital domain becomes apparent in a move towards the sweet spot where the result of the illusion and the means of producing that illusion are both visible at the same moment. In Search of Abandoned is experienced as virtual reality, with dynamic sound, a massive terrain appears as a net over a void where users glide over glaciers and mountains in a zeppelin, wonder and terror — the simulated sublime, leading to a deeper immersion. From the onset of the PhD I have to create artworks that
resonate with viewers, this is evident reading Sita Popat’s responses in Missing in Action, as we see in chapter 5

Minimal ‘scapes seen in *Capture the Flag* are the almost blank, simple, default environments that I use to begin creating in the game engine — this is the *ur-site* that eventually becomes a fully fleshed landscape. The simplicity of this barebones scene both revealing something of the game level design process while becoming like the barren psychological spaces of surrealist Kay Sage.

Processes exposed in *The Bronze Key* are efforts to understand movement as data, complexity as a physical act, recorded and expressed in different artefacts; an ephemeral gesture made permanent. The project is an exercise about data privacy and thinking of how it may apply to one of the essential idiosyncratic aspects of humans. The work also links and reverses the ephemerality of both performance and data storage, the eventually evaporating *digital cloud* replaced with hardier *analogue* materials. The focus throughout the PhD has transitioned from producing with the digital, to exploring the idea of being digital and this artwork encapsulates this idea, recurring again in *We Are All Made Of StarStuff* where analogue techniques imply a digital body.

Materiality plays well with *MANA*. The impermanent A+VR making an instant connection with a new audience, bringing them into the magic circle (Huizinga 1938, 20) & (Zimmerman 2012) of the expanded performance. The *MANA* series has acted as a lab, where I have conducted experiments with camouflage, scale, abstraction, figuration and modularity. The *MANA* objects: wall prints, sculptures, art in public, while physical and designed to increase accessibility, create opportunities for users to have an experience at home, helping the project reach more people than performances in a fixed venue. In the large scale sculpture Big Bob, our performer Robert Davidson is first digitally transformed into an avatar and then rematerialised in cardboard. The project using ephemeral materials in both production and realisation is mindful that the performance may be viewable multiple times. Therefore the aim is to achieve unique movements, unrehearsed, from expert dancers, never to be repeated — retaining something of the liveness in the recording, each avatar containing a set of motion files, randomly sequenced for playback, chance variations give
multiple juxtapositions.

**HUMAN IS KEY**

The human is always central to our work, either as a subject or as a viewer, who is transformed into an *actor-interactor* as David Surman succinctly describes in *Performance In Disguise: Notes on Gibson /Martelli* (Surman 2015, 18).

I have seen that from live performance to web-based motion capture, gallery installations and then game engines and virtual reality, each development of our practice is a step that has sought to increase immersion for the viewer and their understanding of the process that creates it. In many installations representing real places with synthetic landscapes:

> *The presence of the visitor’s sensing, moving body in the artwork is the critical factor in its specificity as a site*  
(Popat 2015, 168, writing about *Vermilion Lake)*

During my research, I have discovered that interaction gives a sense both of control and authorship to a user, individually determining their path of engagement - game techniques and tropes converted into open-ended discovery. Reciprocal action means that players become a partner in the artwork, at the same time becoming a performer of the work, when controlling the viewing experience for others.

I uncovered how vital it is in my practice to cultivate and transfer a kinaesthetic sense to the viewer, not only to give a sense of presence but actively to increase immersion in environments like *White Island* by using techniques including haptic interfaces which further engage the bodily senses. Here touch is extended into and out of the virtual world connected via a rope controller, anchoring and otherwise out-of-control experience, linking the real and virtual. Fans replicate the Arctic winds that downed the polar balloonist that the experience reenacts. Somatic senses create the actual from the virtual... *the body is the experiential interface through which virtual and physical become real* (Popat 2015, 176).

Encountering human-like movement in *Capture the Flag* and *Ragtime*, both
simulations of movement where controlled chance brings them to life, somatic sensing engages kinaesthetic empathy — the process where a body is observed (or in some cases implied), creating an affective experience for the observer. Drawing Levels and related experiments look to bodies as control systems, sensing systems for virtual environments. These minimal environments are in turn created from the body, here a performative gesture represented as an abstract tangle, this landscape is created from movement, the figure entirely morphed, is absent from the scene, the figure of landscape.

**REPRESENTING SITE**
Representing and re-presenting site is another critical element in my practice; sites are selected to re-colonise their existing cultural values as film locations — trading on the fictional plays into a myth-making process where imagined narratives bubble up.

The realness of the sites in moving image works is counterpointed in virtual recreations interplaying physical and digital, placing dancers into an avatar role. Giving a sense of place by increasing immersion, dynamic interfaces in this and other artworks connect the physical with the virtual, increasing the sense of presence and placeness. Interaction encourages the audience to be inside the artwork itself, being in several ways, an author of their own experience. Several installations embrace interactivity to increase engagement, navigation around artificial constructs, on some levels based on real environments, gives a way to present sites not just backdrops for human action, but as characters in their own right. Wayfinding and navigating through these virtual worlds create ‘the strong illusion of being in a place in spite of the sure knowledge that you are not there’. (Slater 2009, 3551) moreover, they are made from experiences, a re-presentation of the affective experience of being in that place (Popat 2015, 166).

Dislocation and immersion here enhance viewer experience. Popat goes further with her description of mixed-reality environments building on Bolter and Gromalas 2003 Windows and Mirrors theory that digital artefacts should move between transparency - the mastery of technique, and reflection — helping us to understand the system. Popat proposes additionally—
that digital artefacts designed as mixed reality environments offer a third mode of engagement – as a door. The door is accessed by the experience of the moving body within the artwork, offering an active counterpart to the otherwise inherently visual/cognitive orientation of the reflective/transparent binary. Through this door, I propose, potentials embedded in the virtual become real, and thus the conceptual site is concretised in the visitors experience of moving within it. (Popat 2015, 169)

The work still exists in three strands:

*Immersive simulations* like *Drawing Levels* are presenting a total artwork that envelops and engages the viewer in electric landscapes to suggest a sense of place, works like *White Island* impart a sense of the body in a simulated reality. The *expanded performances* such as the *Bronze key, Capture the Flag, Ragtime*, which cultivate & integrate a kinaesthetic intelligence whilst revealing something of their making process.

Finally *moving image works* including *We Are All Made of Starstuff, We Are Here And We Are EveryWhere At Once*, cast performers into avatar roles, a foil to nature, hinting at a idea of being digital.

Taken together, these strands are the *new performance spaces* that I propose, not higher-tech makeovers of existing theatrical experiences — seeing dancers on stage with better visuals. Instead entwined virtual and real environments offer new embodied affecting environments, an exploration of the growing lexicon of new realities as they relate to immersion. Exploring how we can move in and around new spaces that emergent technologies afford uncovers the mysteries of these new encounters, focussing on human behaviour, modes of moving and visceral responses. The new performance spaces are actually moving toward creating unique categories of experience, which are kinaesthetic, embodied and immersive.
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04-09 Drawing Levels 2018 – Virtual Reality. Audio: David Jensenius
10-11 Capture the Flag 2018 – infinite simulation.
12-17 WE ARE MADE OF STARSTUFF 2018 ongoing – Video 26’21” Performers: Bianca Hyslop, Ruth Gibson.
18 Golem 2016 – giclée print onto hahnemühle photo rag.
19 Tower Bridge 2018 – C-Type Prints from the Ruined series 2018.
The Bronze Key is a part of Susan Kozel’s Performing Encryption project which is in turn part of the five year long Living Archives Project at Malmo University.
22-27 WeAreHereAndWeAreEverywhereAtOnce 2017 – 3 channel video installation colour with sound. Performers: Cassidy Scoones, Jenny Roche, Grant McLay, Ruth Gibson, Carol Brown. Drone Nic Fy. WeAreHereAndWeAreEverywhereAtOnce was created through an international collaboration between Gibson / Martelli and sound designer Russell Scoones (NZ) & choreographer Carol Brown (NZ).
31 Solid 2014 – from the MAN A series – giclée print direct to Kappa, dimensions variable and App.
37 Jazz 2014 – from the MAN A series – Site-specific wall prints & objects.
42-43 Perfect Circle 2013 – Single channel looping HD colour projection, 4’04”, meteorological balloon, rope, iris
44-45 Capturing Stillness 2013 Falling Upwards – Realtime Virtual Environment for Oculus Rift.
48-51 where the bears are sleeping 2011 – single channel HD video 42’ looping, colour. Performer: Ruth Gibson. Editor: John McMullin.

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