3-D Computer Generated Animation and the Material Plane – An Investigation of The Material Qualities of 3-D Computer Generated Animation and Relations to Space and Form.

Abstract

This research considers the production and presentation of 3-D CGI animation where the intention is to explore the potential of this mode of practice as material. Through a practical and theoretical study, this research project outlines the proposal that within the context of 3-D CGI animation there exists a property that can be regarded as unique, or deemed as an essential quality, which in turn can be defined as material.

The research refers directly to work developed by Structural/Materialist filmmakers and artists working in the 1960s and 1970s whose investigation into process and materiality acts as a method and potential framework for exploring approaches and processes within 3-D CGI animation.

The project asks the following questions:

1. Is it possible through a practical exploration to establish distinctiveness for 3-D CGI animation?
2. Can theoretical research in relation to media studies, film studies, specifically Structural/Materialist film assist to support and shape project development?
3. Can the practical work associated with the project and theoretical undertaking converge to support a basis for determining an individual characteristic for 3-D CGI animation?

Hypothesis

My hypothesis in relation to the expected findings and outcomes for the project can be distilled to form two strands:

1. That 3-D CGI is definable as a unique mode of production and can be classified as distinct from other digital modes of image production.

That the result of the research will point towards a conceptualisation for 3-D CGI where as a process it has the capacity and the influence to be considered as a unique, discreet mode of production. That the qualities and the self-styled artefacts that emerge from the digital mass can be determined as definable products linked to a specific process.

3-D Computer Generated Animation and the Material Plane – An Investigation of the Material Qualities of 3-D Computer Generated Animation in Relation to Space and Form

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A thesis submitted in partial fulfilment of the requirements of the Royal College of Art for the degree of Doctor of Philosophy

May 2017

Royal College of Art

Acknowledgements

The writing of this thesis represents a major academic and personal challenge. It has provided an opportunity for me to focus my research and to develop a clear path for further investigation. The research undertaken to inform this thesis has steered my practical work and delivered theoretical clarity. From this personal perspective the essay presented here has been a successful endeavour.

I would like to take this opportunity to thank my Supervisor Joe King for his support and encouragement over the past few years.

I would also like to express my thanks to Al Rees for his limitless knowledge and advice relating to this subject area.

Thank you to Joan Ashworth and the rest of the Animation Team at RCA for their assistance and genuine support.

Thank you to Nicky Hamlyn for his inspiration and patience in assisting me and steering me through this written work.

And Finally thank you to my wife, Peggy, for her endurance and her graphical skills without which this document and supporting work would never have been completed.

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Author's Declaration:

During the period of registered study in which this thesis was prepared the author has not been registered for any other academic award or qualification. The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

Signature:

Date:

Preface

My background is in fine art. I was trained as a painter and my education and my interests remain in the Fine Arts. For a number of years I worked within the computer games, film/TV and animation industries where I gained skills as a 3-D CGI computer artist. A knowledge that enabled me to apply my creative interests to this medium across those vocational routes. Yet within the mode of 3-D CGI there was a disjunction between creative aspiration and technical process. As a painter and filmmaker I have understood medium and material relationships. I have broadly come to terms with the material parameters of paint and film, explored the idiosyncrasies, peculiarities and specificities relating to those materials and used this knowledge to manipulate or subvert a related material to advance personal style and reinforce meaning. These have been largely formal and material properties that distinguish oil paint from acrylic, watercolour from ink, and charcoal from pastel. Understandable, tangible qualities that possess a physicality as well as a relationship with the real-world. Material properties that assist to categorise process of creation as well as present the artist with practical choices which ultimately and influence final product. Film has its own distinctions. Perhaps, in a general sense and in relation to paint, more prescribed and technologically determined but still analogue, organic, definable.

Yet with 3-D CGI I have been troubled by its potential, its status as a medium and its position as a material. I have developed a desire and curiosity to understand the medium that I am working with, to define its parameters, to recognise its properties and to learn its language. Ultimately, perhaps through an investigation of its composition, I can step beyond or distort its predetermined, pre-programmed limitations, to explore its language. But first, I need to understand it, analyse its nature and develop a dialogue between material, medium and language of 3-D CGI animation. This research is concerned with this journey.

Introduction

3-D computer generated animation, more commonly referred to as 3-D computer generated imagery and its abbreviated form 3-D CGI is perhaps a misnomer. It has in essence, no more of a three-dimensional aspect than a painting by Bellini or Crivelli (see fig.1) or a photograph by Ansel Adams. 3-D CGI's (screen-based) representations are rendered as flat, two-dimensional images which describe and are formed by an understanding of perspectival space. Like a painting by Bellini or Crivelli, the representation of 3-D CGI space is illusionary, fundamentally abstract[1]. This is a space that is a theoretical and perceptual construction, linked to and created from a mathematical and computational dependency, which in turn is based on a spatial system of perspective developed (largely) during the Renaissance.

The notion of '3-D' can perhaps more accurately be understood as the *interactive* possibilities afforded to the user within 3-D CGI, the supposed notions of dimensional control. An illusionary third-dimension providing the ability to access interactively, a representation of an imagined three-dimensional world, where at will digital objects can seem to recede and advance within Cartesian laws of perspective - an illusion within an illusion. It is this conceptualisation of object, image and the spaces that they inhabit that lies at the core of this project. What do these spaces represent? How does a 3-D CGI space differ from the envisioned spatial fantasies generated and offered by other media formats? And when we stare into the void of the 3-D CGI universe, what space are we imagining?

[1] Abstract as in only existing in the imagination

Fig:1 Carlo Crivelli's, *The Annunciation, with Saint Emidius* (1486), provides an example of early Renaissance painting where an understandable representation of 3-D space was achieved via the illusion of perspective

(Image Source: National Gallery website - https://www.nationalgallery.org.uk/paintings/carlo-crivelli-the-annunciation-with-saint-emidius)

i. Overview of Aims

This research therefore sets out to investigate such questions. By bringing into focus 3-D computer generated digital animation, the project seeks to verify its mediation, its material, its qualities and its distinctiveness. This research is also a project about connections. Connecting the immaterial to the material, the virtual to the real, the internal to the external and about the spaces that exist between these thresholds.

The purpose of this research is thus, to establish how we might define a (material) characteristic associated with three-dimensional computer generated animation, to determine a quality that distinguishes 3-D CGI from other ways of image production. In working towards these aims the ultimate aim, the overarching goal, is then to apply this knowledge, to create images that speak of an understanding of the material of three-dimensional computer generated digital animation as well comment on its cultural position as a visual form.

ii. Project Overview

Within contemporary visual culture the computer image is employed to represent many things; a reflection of specific cultures[2], a comment on current technologies or a window into a digital world[3]. As an artefact, the computer-generated, digitally constructed image, or specifically in this case, the 3-D CGI image, might be seen as representing the un-representable, or as Boris Groys suggests in his discussion on digitalisation and the immaterial, 'the digitalized image actually visualizes something that is itself invisible' (Elkins, 2009, p.119). An image of itself, about itself, manifest through code. A trick. To understand the trick is to reveal the illusion and it is the idea of the illusion that forms a central theme running through this work, both in its construction, its realisation, its presentation and also in its deconstruction.

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[2] For example, digital image technology, states and reinforces visual cultural identities within Japanese, Chinese and Western cultures.

[3] Here I refer to phenomena such as the VR (Virtual Reality) and the proliferation of goggle headset technologies that claim to transport you to virtual domains.

For the realisation of the digital illusion, a computer-generated image is dependent on any number of converging electronic and technical systems not only in its manufacture and realisation but also for its presentation (Grau, 2010)[4]. For this reason, and to satisfy the ambitions of its research, this study embraces a broad horizon of connected contextual arenas, ideas, technologies, philosophies and relevant practical examples across varying formats (3-D CGI, animation, film, as well as painting and sculpture). In the leading chapters of this thesis I will be discussing the subject of 3-D CGI in relation to experimental film, animation, as well as the digital, and in doing so make connections between avant-garde approaches to understanding the material of film and my own work within the digital domain. I will also speak to the theoretical and philosophical models that support these works articulating how they have influenced and driven my investigation, and ultimately informed its conclusions.

Through the thesis I have endeavoured to report and reflect on the process and progress of this research project, to explain how the practical aspects have informed results, and how approaches to the subject have led to new avenues of investigation. I have also striven to document a logical, stepped progression for the research, to maintain a clear linear narrative in order that the reader can successfully navigate the evolution of ideas and conclusions presented. In reality the advancement of ideas and practice is not linear. Many dead-ends, closed avenues and unsuccessful tangents have emanated from, and conclusively shaped, the direction of the project, some of which due to word restrictions, have not been included in the main body of the thesis[5].

In the final chapter of this thesis I offer a conclusion to the research, that 'space' or the idea of space, presents a distinct quality for 3-D CGI. For the reader this section might seem to take a directional swerve, suddenly entering new territory, or to seemingly arrive in unfamiliar terrain. If this is the case it is

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[4] Oliver Grau provides an excellent overview of this subject in his introduction to this subject, see Grau, O. (2010) *MediaArtHistories*, pp.7-10

[5] Some of these appear in the appendices.

because Chapter 6 intends to frame the idea of ‘space’ in relation to 3-D CGI, to present a plausible, contained, solution to the unbounded topic of space. Here the aim is to draw connections and workable conclusions to relations between space and 3-D CGI; noting that ‘Space’ as a conclusion without interpretation, is not sufficient as a conclusion - space needs explaining. Chapter 6 therefore seeks to address this and as such represents a body of research around the topic of space where the result is a practicable suggestion for dealing with space within 3-D CGI.

Chapter 1: Aims, Objectives and Context

> Each new medium modifies and extends the linguistic possibilities of the moving image, subsuming the syntaxes of previous media without negating them. (Youngblood, 1998, p.27)

1.1 Outlining Project Aims

This section outlines the main aims and objectives for the project and establishes the hypothesis and distinctiveness for the research. The chapter also functions to introduce an academic structure and philosophical foundation to assist and support the inquiry.

The central questions that inform this project relate to whether the processes and production of 3-D CGI can be determined as distinct within its associated domain, a field commonly regarded as a digital medium. If so, what are the parameters of 3-D CGI as a discrete process, what of its communication and language?

1.1.1 Possibilities of a New Medium: The Material Nature of 3-D CGI

From an ontological perspective the question for this study might be 'what are the possibilities of 3-D CGI animation as a medium?' Under a broader thematic umbrella where the categorisation is 'moving image media' (within which I include video and film) such an enquiry might draw comparative reference from discourse presented in Stanley Cavell's *The World Viewed* (1971) in which the discussion on the nature of film, the responsibilities and qualities of the 'medium' of film, are reflected upon and contextualised against traditional narratives of painting, sculpture, as well as more contemporaneous modes of visual expression including photography[1].

[1] Cavell dedicates a chapter to 'Medium and Media of Film' (1979) in which he debates the characteristics and status of film as well as our place within film. Film as a human activity, film with the possibilities to embody human histories, and the phenomenological human experience of projection and viewing. (Cavell, 1979, pp.72-73).

We might further such a discussion by reimagining Cavell's reference to film's photographic basis, the essential relationship between objects and the projected nature of filmed objects on screen as "inherently reflexive, they occur as self-referential, reflecting upon their physical origins." (Cavell, 1979, p.xvi). Returning to our question, how then, might we imagine objects within 3-D CGI? What point of reference exists from which we can debate such images and their origins? What are the 'linguistic possibilities' of the medium of 3-D CGI? It is these questions that form the basis for the project presented here, the beginning of an enquiry into the nature of this mode of production, the start of an investigation that concerns the application and material aspects of 3-D CGI animation. What therefore is this process of 3-D CGI, what might it represent and how can the potential of 3-D CGI animation be interrogated?

1.1.2 Medium as Immaterial

Opening up questions around the possibilities of 3-D CGI necessarily brings into the research frame subjects of media, medium and material. Therefore, initial questions attached to this project deal with issues surrounding the concept of the digital, where in an aspiration to establish the location and position of 3-D CGI as a creative and expressive mode of communication, we might review relationships between the notion of medium, digital and 3-D CGI.

In this respect the quest to delineate properties for the digital has been the basis for many discussions where the topic is computer-based practice. In such debates it is often the problematic notion of how to address a medium habitually referred to as immaterial[2] that has remained an unyielding challenge. The perceived immaterial nature of 3-D CGI and its apparent lack of tangible physical reference is a 'digital' issue that similarly faces this project. How can 3-D CGI be framed as a mode of production, defined within its own set of

[2] As an example Alan Warburton explores within his research issues concerning immateriality within 3-D CGI. Commenting on the Ed Atkins exhibition, (Serpentine, 2014) he notes the tension that is created by introducing *a "corporeal quality in the everlasting, ever-present, immaterial medium of CGI."* (http://www.cgwtf.com/blog/ed-atkins-at-the-serpentine - accessed January 2016)

parameters, when the associated nature (seemingly) lacks material embodiment?

One answer might be that in an era that has witnessed an ever-increasing separation within our cultural experiences from tangible existential relationships, that the question of digital immateriality becomes relegated as an irrelevant pursuit. That through a plausible deference or naturalisation of the intangible, it is possible to allow for associated research to focus on abstract and philosophical solutions to address 3-D CGI's medium or material status. Here rather than relying on dominant, traditional definitions of what a material, or a medium's possibilities might be in physical terms, we could instead echo Panofsky's approach to a similar problem where it is the 'dynamization of space and spatialization of time'[3] that act as a means to explain the unique and 'specific possibilities' of the medium of film[4].

1.1.3 Position of 3-D CGI as a Hybrid Medium

Perhaps a more immediate problematic is how we determine a medium often conceived to operate not only as immaterial but as also hybridised[5]. Many theorists[6] allude to a 'hybrid, visual language for the digital moving image' (often with specific reference to 3-D CGI), a manner in which layered digital graphics conspire in the composition of a final image or sequence. A claim which Manovich suggests results in more than merely a digital collage,

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[3] In his essay (1947) *Style and Medium in the Motion Pictures*, Panofsky examines the relationship between spectator and projected film, noting that the overwhelming difference between a viewer's experience in a theatre production compared to one within the cinema is the notion, delivery and reception of space and time. (Panofsky, 1947, - referenced version published, Talbot, 1975, pp.15-21)

[4] Artists such as Turrell take this idea further in forming space and light.

[5] Manovich's idea of a hybrid digital media stems from integrated still and moving image formats that took place in 1990s and is referred to by Manovich as a way to explain the manner in which digital media has subsumed traditional formats and allied them with digital ones. See *Image Future* (2006)

[6] For example, Chadwick, A. (2013) *The Hybrid Media System*, Manovich, L. (2014) *Understanding Hybrid Media*, Spielmann, Y. (2006) *Video: The Image Future Reflexive Medium*, Wood, A. (2015) *Software, Animation and the Moving Image: What's in the Box*.

submitting instead that,

> […] the result of the hybridization process is not simply a mechanical sum of the previously existing parts but a new "species"—a new kind of visual aesthetics that did not exist previously. (Manovich, 2007, p.4)

In this regard 3-D CGI can be deemed as frequently integral to a hybridised digital process, a homogenised form of production destined (and in some ways designed) to service and support film's photographic-based illusionistic fantasies. Equally, 3-D CGI is associated to and employed within, video game industries as a sculptural tool to construct and populate increasingly photorealistic and visually convincing video game environments, processes often positioned within an underlying hybrid structure[7].

Hybridization within this context points towards a merging of digital formats, a constructed digital image, set against or fused with live-action footage where 3-D CGI acts to enhance or extend the vocabulary and possibilities of film, or in other instances functions as a hybrid object-oriented foundation in areas such as for gaming worlds[8].

Therefore as a basis for a discussion on medium properties it might be claimed that the production of 3-D CGI animation borrows from and includes, syntactical metaphors and production analogies from both these traditions (from the world of film we introduce metaphors such as depth of field, film gate, and

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[7] Typically the trend is for film-like video game experiences with titles such as Konami's, *Metal Gear Solid V: The Phantom Pain* (2015) offering film-like experiences and narratives. Such games are developed using combinations of film (as reference), 3-D CGI, photography and motion capture to achieve believable results. Also see Degan, Melhuish and Rose as an example of culture hybridity within video games, Melhuish & Rose (2015) *Producing place atmospheres digitally: Architecture, digital visualisation practices and the experience economy*. First published 2015, available in Journal of Consumer Culture, Vol. 17, March 2017, 3-24.

[8] Malcolm LeGrice sees the computer and a supposed medium specificity of the computer as unachievable, that tendrils of digital media are spread and infused in multiple disciplines and practices. In his chapter Le Grice (2008) *Never the Same Again* articulates the diversity of digital media claiming that *"[…] digital systems represent the basis of a new cross-media, cross-cultural discourse"* (Le Grice, 2008, p.227), which includes 3-D CGI.

motion blur, whereas from a game heritage we adopt sculptural metaphors notions of 'modelling' and construction[9]). Yet 3-D CGI is not a photographic medium, nor is it considered primarily a sculptural mode (in a traditional understanding of the physical or existential relationship with sculpture as a medium). If 3-D CGI is to be thought of as a hybrid format can an alternative definition be proposed for its classification as a medium, one not necessarily constrained to an association with film or video games? For example, might it also be possible to discuss a hybridity between (digital) sculpture and film? By asking such questions and by examining the shifting horizon of this process[10], the aim of this project to re-emphasise the scope and potential of 3-D CGI, to redefine 3-D CGI as a medium (in terms of its making, the ability to produce images and possibilities for the presentation of its product).

1.1.4 Finding a Position for 3-D CGI

To many it is issues around hybridity and immateriality, the indistinct and metamorphic boundaries associated with 3-D CGI, that act to complicate or halter any attempt to claim medium-specificity for this subject. As such 3-D CGI is often declared as too integrated within the gamut of neighbouring digital technologies, or too diverse as an individual process to operate as unique. Alternative views exist. Lev Manovich and others, have for example, speculated on the significance (and semantics) of 3-D CGI asserting 3-D CGI not only as a "medium unique to a computer" (Manovich, 2013, p.290), but also highlighting the position of 3-D computer graphics as the catalyst in the emergence of completely new visual languages emanating from the spatial processes associated with 3-D CGI[11]. Manovich comprehends 3-D CGI as unique within a digital hierarchy, albeit a

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[9] For example in video game environments we talk of 'building' game worlds.

[10] See Manovich (2001) and also (2013) for discussions on the ever-changing technological landscape of 3-D and its application.

[11] Manovich claims that a shift in working practices took place within the 1990s where architects, traditionally working with analogue drafting techniques adopted the practice of working directly with 3-D CGI processes. In turn this led to new ways of thinking about space and form. (Manovich, 2013, p.290). For example Michele Pasca di Magliano: *3D Prototyping and Digital Manufacturing in architecture* (https://www.youtube.com/watch?v=byNVZ4v9D5E - accessed January, 2016)

hierarchy of medium systems where 'programming/code' resides at the top of the digital order, a pervasive binary structure that drives the rest.

Fig:2 Zaha Hadid and Patrik Schumacher *Dune* (2007) provide examples of how 3D CGI software and 3D printing have been employed in a way to challenge traditional Cartesian geometries and support the development alternative visual languages to discuss three-dimensional surfaces.
(Image Source: http://www.zaha-hadid.com)

Fig:3 Zaha Hadid Architects, *Elastika, Miami, USA*
(Image Source: http://www.zaha-hadid.com)

1.1.5 Hypothesis

While Manovich's supposition for a systematic and algorithmic structure to act as a core within a definition for 3-D CGI is useful in discussing this topic, my approach to the subject is one that creates a theoretical distance from a position that has a purely binary-related base, one that tackles the issue from an increasingly subjective perspective. Instead, I suggest that medium specificity for 3-D CGI, lies within the idiosyncrasies that emerge as a result of complex combinations of production, image generation and presentation processes (associated with 3-D CGI) that can pronounce 3-D CGI as distinct from other forms of digital media. Properties that include a concern for the intangible rather than one of pure logic.

As an example, Manovich talks of hybridization, "a new "species"—a new kind of visual aesthetics" (Manovich, 2007, p.4) one based on the 'high level'[12] qualities of 3-D CGI; direct access to the controls of the software afforded by the user interface systems, its graphical architecture, the surface qualities of the software.

1.1.6 Comparing 3-D CGI and the Dilemma of Film

One aspect of this research therefore necessarily concerns the ambivalent boundaries of 3-D CGI as a medium, the points at which related media overlap, convergence and technologic synergies. Conditions that some theoretical approaches suggest act to dissipate notions of difference, while others see as a location where opportunities exist for material traits to emerge and flourish[13].

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[12] High level is used here with reference to the concept of 'high level programming' which is used as a way to distinguish progression away from binary and machine code to offer increased accessibility to the user.

[13] As a sculptor, Keith Brown crosses and re-crosses the boundaries that separate physical materials such as wood with the virtual material of 3-D CGI. Distinctiveness is often in these cases, in the process and the exchange that takes place within these acts.

Fig:4 Keith Brown *Dive_01* (2014)
An example of practice work that dissolves the borders between actual and virtual in terms of production and concept.

(Image Source: Keith Brown, http://www.art.mmu.ac.uk)

Moreover, in addressing this issue the work here recognises the historical lineage offered by subsequent investigations around medium and material, noting that debates regarding media distinctiveness are not limited to digital formats but are instead configured and contextualised by comparisons with other media, including film, which faced, and some would argue still face, a similar dilemma of medium identity[14]. Such examples can be seen in the work of Cavell (referring to Panofsky), who talks of the "exploitation of the unique and specific possibilities" of film (Panofsky, cited in Cavell, 1979, p.30), stating

[14] An example of a discussion on the open-ended nature of the ontology of film can be found in Giovanna Fossati's *Grain to Pixel* (2011, p.109) claiming that such a quandary is considered by some to have never been successfully resolved.

that each new medium has legitimate claims for the evolution of its own language arguing that "[…] narrative movies emerged because someone "saw the possibilities" of the medium" (Cavell, 1979, p.31).

1.1.7 New or Mature Mediums

In this regard I suggest that 3-D CGI can be justified as both a relatively 'new' medium but also and simultaneously positioned as a culturally 'mature' medium. My argument for this stance is twofold, firstly, in comparison to other forms of creative agencies, most notably film, television and photography, 3-D computer graphics occurs along a relatively short historical timeline (with recognisable 3-D computer graphics emerging via pioneers such as William Fetter, and his ilk, during the mid-1960s and early 1970s[15]). On the other hand if we consider the evolution of 3-D CGI during that half-century, it can be noted that 3-D CGI as a process has become wholly integrated into our contemporary visual culture. 3-D CGI as a format has arisen to fundamentally shape the way in which we interact and consume a broad spectrum of visual culture and one that has now established, I would argue, a position as an accepted and mature medium[16].

Such a marked developmental shift from inception to maturity within what is a comparatively short period of time[17], has itself generated debate and discussion around the 'phenomenon' of 3-D CGI; the spectacle, the potential of a new visual technology, the shifting horizon of our illusionistic

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[15] Brown, P et al provide a good account of British Computer art in *White Heat, Cold Logic British Computer Art 1960 – 1980* (2008), also see Oliver Grau's *Media Art Histories* (2010)

[16] 3-D CGI is integral to much video Game production which as an industry/ format has reached significant maturity.

[17] From a software orientated perspective Lev Manovich provides an insightful discussion concerning the rapid transition from conception to a fully-fledged *"[…] platform for moving image design"* (Manovich, 2013, p.290)

experiences[18]. Yet conversely it might be said that it is the very speed in which this change has taken place, a compressed and energetic evolution, that has denied appropriate time for reflection or contemplation of 3-D CGI as a medium in its own right. For scholars, critics and practitioners to review a medium it is often the advantage offered by the passage of time, a distance-enabled context, that affords the opportunity to draw measured and qualified views. Counter to this approach, reviews on the subject of 3-D CGI frequently provide forward thinking, anticipatory commentaries, favouring narratives on current or future algorithmic advancements over reflexive investigation[19]. The aspiration of this research is to avoid such a reformist tenet, to construct an intellectual space in which to step away from enthusiastic technological gratification or an exploitation of the latest algorithms and effects, to instead offer a reflective and affecting pause where we are able to consider the implications or linguistic idiosyncrasies of 3-D CGI as a medium. The work thus seeks a review of a digital medium that has played such a critical and resounding role in the redesign of our visual media terrain. To review what we have before pressing ahead.

1.2 Introduction of a Foundational Theory

1.2.1 Surrounding Debates

Within this project 3-D CGI is placed within a broader digital media discussion which includes philosophical, phenomenological and existential relationships with the digital. The aim is that through referencing an expansive visual-historical landscape while simultaneously keeping an eye on the extensive,

[18] Vivian Sobchack offers a body of work that addresses and connects the impact of digital technologies on phenomenological experiences of film and the role of SFX, including 3-D CGI. *Meta Morphing: Visual Transformation and the Culture of Quick-change* (2000) provides a useful foundation text in this respect.

[19] Advancements in 3-D CGI are typically directed towards advanced rendering, lighting, texturing, shader-algorithms to support either extreme photorealism for a burgeoning VFX demand, (i.e. invisible rendering and effects that can be seen as crucial in narrative and storytelling such as recreating the poppy fields in *Birth of a Nation* (2016)), to refine, develop and define commercial animation projects (realistic rendering) such as Disney's *Alice Through the Looking Glass* (2016) or the evolution of Video game products (using real-time algorithms for design and play scenarios).

current technological vista, that the dialogue is able to form a grounded, measured and informed evolution.

Some would suggest that as a consequence of our migration into an ever-expanding digital landscape we are experiencing a disparity of self, space and being. Such ideas submit that in establishing a position within the digital terrain we bring forth a cultural dilemma, a rising issue around identity and one that has led to concerns over the implications and effects on our digital-oriented worldview. Today, themes such as *Post-digital*[20] and *After Digital*[21] provide central arguments within current media theory interest. Debates associated within these spheres revolve around mathematical, algorithmic vocabularies, ruminate on analogue/digital futures and histories and attempt to make sense of an accelerating and pervasive digital existence. One prevailing trend that exists within this field places us in a position of control where an ideological acclimatisation of digital technologies is leading us to notions of a post-digital condition. Others argue that a longer-time is required before we can fully digest the effects and impacts resulting from our relationship with digital, advocating that caution as well as a deeper interrogation is needed[22].

This work is positioned at the fringes of such discussions. It represents a timely adjunct to a much larger and growing discourse, one that serves to interrogate and measure the cultural impact of digital technologies as well as review the

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[20] Post-digital as a rethinking about our relationship with digital, to reassert humanity into the process more directly. Examples such as Berry and Dieter (2015) *Re-Thinking Postdigital Aesthetics: Art, Computation and Design* and also, Paul and Levy's Genealogies of a *New Aesthetic* (2015) provide a commentary on this subject.

[21] See Megan Fulwiler's *After Digital Storytelling: Video Composing in the New Media Age* (2012)

[22] Wolfgang Ernst *"let* us rather re-think the "*digital*" *(rather) than dismiss it too early. It takes time to confront the challenge of the digital epistemologically. The fact that in ubiquitous computing the digital seems to have become part of everyday culture - just like listening to music from an MP3-Player introduced complex compression algorithms into popular culture - does not mean that contemporary culture has already digested the shock of digital electronics invading the analogue world."* (2015) Lecture transcript from *Digital Presence: A Micro-Temporal Regime*, presented at BFX Bournemouth Visual Effects and Animation academic conference *Analogue to Post-Digital* Bournemouth University, September 25th -26th, 2015).

position of 'humanity' within what is a progressively mechanistic world. As such this research relates to, references and draws inspiration from ideas about new digital aesthetics, material and immateriality debates, acknowledges concerns over material specificity[23] and explores points of theoretical intersection in relation to virtual (and actual) spatiality issues.

1.2.2 The Medium and Material of 3-D CGI Animation

Spatial themes also connect this research to earlier eras of investigation where the function of space has been highlighted as a means to inform discussions around medium and materiality. For example, film as we have already alluded to via Panofsky and Cavell, embodies a spatial component, a position that transcends the celluloid nature of film as substance. Cavell through Panofsky asks of film "What are 'the unique and specific possibilities of the new medium'?" (Cavell, 1979, p.30). The discourse offered by Cavell (and also Panofsky) are historically distanced from debates around computer-generated images, where the medium of film in 1979 is aligned to and references a contemporary cultural landscape and set against the narrative opportunities afforded by theatre, painting and photography. Yet the debate introduced via those essays traces a trajectory of investigation that echoes the concerns and ambitions of this project, namely that "[…] legitimate paths of evolution were opened […] by developing (film) within the limits of its own possibilities." (Panofsky, 1975, p.18). A sentiment repeated and expanded by Cavell who questions:

> What are "the unique and specific possibilities of the new medium"? Panofsky defines them as dynamization of space and spatialization of time – that is, in a movie things move, and you can be moved instantaneously from anywhere to anywhere, and you can witness successively events happening at the same time. He speaks of these properties as "self-evident to the point of triviality" and, because of that, "easily forgotten or neglected." (Cavell, 1979, p.30)

[23] For example the research acknowledges the varying views in relation to medium specificity including discussions concerning the post-medium condition as offered by Rosalind Kraus (1999).

Following a similar course of enquiry and by asking related questions, can such an investigation establish a unique understanding of the processes and function of 3-D CGI? Is it possible, through the 'self-evident'[24] qualities of 3-D CGI, to gain access to the vocabulary of its remit and determine a materiality for this particular 'digital' process? If so what might these be?

To answer such questions the project seeks to review and include other historical discourses to support the investigation where a dialogue between space and the moving image is explored. The experimental film work carried out in the 1960s and 1970s by Structural/Materialist, and/or Materialist and Structuralist filmmakers Peter Gidal, Malcolm Le Grice, Kurt Kren and Paul Sharits, (to name but a few), provides one dialogic example. The work in this field aimed to unmask the medium of film, to reveal an alternative priority for film as process over illusionistic narrative as well as to determine the nature of film's substance beyond a mainstream cinematic application, concerns that resonate with the intention of this study. Such ideas evoke questions about purpose, application and the expectation of a moving image medium, again, interests that correlate directly with questions and objectives of this project.

1.3 Representation and Reception of Space

It is these ideas, and also connections between the technical representation of narrative, illusion and the subjective and objective ways in which we, as viewers (or participants) interact with the idea of space as a visually artificially constructed concept that develops as a dominant theme within this research.

In relation to 3-D CGI which within its acronym acknowledges it as a dimensionally oriented software, the connection between space and 3-D CGI seems an obvious one. Perhaps 'self-evident'. Other modes of creative communication claim space as the fundamental building block, a core ingredient, the material of expression. Can 3-D CGI assert a similar stance? Can

[24] i.e. Panofsky's self-evident properties when discussing the specific possibilities of film, (referenced by Cavell, 1979).

space be anticipated as integral to the process of 3-D CGI? Can a clear unequivocal relationship between process, space and medium be assumed?

Correspondingly, with regards to the subject of space, the work here recognises that a pursuit to establish a dialogue between process and medium is not a new one and that a foundation of ideas and research precedes it in the fields of video and film, as well as sculpture and fine art, where a concern for material, language and the scope and identity of a specific format or mode is built into subject discourse. For example, Basque artists Eduardo Chillida and Jorge Oteiza provide grounded, physical interpretations and methodologies that deal with the remit of space as material, a realisation of space as imbuing substance and meaning as well as the basis for a new language.

> […] I attempt this type of liberation of energy in the statue, through the fusion of elements that are formally unimposing, that is, dynamic or open, not through some arrangement that fills space by breaking up its mass, but rather the shattering of the neutrality of the empty space for the sake of the statue, or for the sake of space under conditions that the statue needs to liberate, but always by means of a logical and ascending system of elemental forms[25], of intrinsically spatial matrices, capable of being conjugated. (Oteiza, cited in Zulaika, 2003, p.221)

The subject of sculpture and associated spheres of understanding (space, form, material) also plays a significant role in this project.

Furthermore, it is the realisation of form, the engagement with modelling and managing form within a spatial context that manoeuvres the world of traditional sculpture and the world of digital 3-D CGI to a point of intellectual convergence. Also, if we revise the superficial disparity between digital and traditional media and instead map the histories of sculpture along the trajectory of change we can determine a common ancestry. For example, by extending Jack Burnham's text *Beyond Modern sculpture* (1968) which deliberates that the trends, ideas and language of sculpture mutate away from ideas of mass, we can contemplate a contemporary manifestation of sculpture, a transmogrification of

[25] In relation to 3-D CGI a hierarchy can be seen to exist between vertices (points in space), Edges that connect vertices and faces (planes that exist as a result of the formation of the previous).

thought where 3-D CGI suggests a postscript to Burnham's academic narrative and an addendum to his opening quotation where Herbert Read, poses:

> One must ask a devastating question: to what extent does art remain in any traditional (or semantic) sense sculpture? From its inception in prehistoric times down through the ages and until comparatively recently sculpture was conceived as an art of solid form, of *mass,* and its virtues were related to spatial occupancy. (Read 1964, cited in Burnham, 1968, p.1)

Both Burnham and Read contemplate a dematerialisation of modern (ultimately anticipating post-modern) sculpture by opening a course of questioning that concerns the transience of the sculptured form. A review of (their) contemporary sculptural landscape, its function, value, identity and material, predicts a mechanisation of sculpture, an enmeshed relationship with technology. Their foretelling is of a scientific art, one that evolves beyond the traditional and ideological boundaries of form to neatly embrace the opportunities and challenges of the digital, an idea that contributes to discussions about science and art[26].

[26] This is an area that Burnham attempts to unfold in his text Burnham, J. (1968) *Beyond Modern Sculpture* where the intention to disentangle relationships between science and art, the development of aesthetic discourse of sculpture.

Fig:5 Robert Breer's *Self-propelled Styrofoam Floats* (1965-66)

(Image Source: MacDonald, 1992, p.45)

It is unlikely that either Burnham or Read could have imagined the heights to which such dematerialisation would reach, the ultimate conclusion for dematerialised sculpture manifest in 3-D CGI digital form. Burnham's vision, where sculpture would turn to cybernetics and electro-mechanics to satisfy a human desire for art, at the time evident in Robert Breer's *Self-propelled Styrofoam Floats* (1965-66), Nam June Paik's *Robot* series (circa 1965) or Alex Hay's electronic theatre events from 1966, have been left far behind in favour of a predilection of science to support an algorithmic aesthetic. At the time of Burnham's modernist stance, the linear evolution of sculpture to forge new solutions to the age-old problems, via embodied humanistic expression, can only be hinted at. Ideas and questions of material, space and sculpture have instead

found new grounds for cultivation, inventive dematerialised worlds which have flourished in a new digital landscape.

1.4 Space and Material

1.4.1 The Virtual Object – Early CGI Art

In the 1990s and early 2000s experiments in computer animation by artists such as Michel Bret, Karl Sims, Nicole Stenger, Manfred Mohr, David Larcher and William Latham produced work that questioned the apparatus, the material and the processes of modern sculpture. The work that these artists created was about objects, virtual sculptural entities, but it was also about space, the space and the void within which their digital objects inhabited (Popper, 1993). Their animations became symbols of technology, surreal environments with imagined computer generated landscapes and fantastic CGI creatures, invented worlds[27], existing within the internal mechanisms of the computer, where the mode of production is grounded in and about space.

If we can consider much of the work produced during this period as concerned with the notion of setting and environment, then it is the discrete stage within which objects, creatures and Phong-shaded characters exist that is pertinent. These are surreal, highly imaginative terrains where strange and evocative narratives often play out against a backdrop of alien or strangely dramatic landscapes, or a simple void.

[27] Wood discusses the capacity of the computer to offer new creative vistas for artists working in the field of 3-D CGI where their *"[…] interest was fueled by other capabilities, for instance its ability to allow the artist to be to be the omnipotent creator of a new universe with its own physical laws."* (Dietrich, 1986, cited in Wood, 2015, p.35)

Fig:6 Karl Sims, *Galápagos* (1997)

(Image Source: Karl Sims, http://www.karlsims.com*)*

Fig:7 William Latham, *Coiled Form* (1987)

(Image Source: William Latham, http://www.doc.gold.ac.uk)

Emerging from these early works is a sense of a spatial language. A syntactical difference materialising from a separation between the 3-D models, their stylistic manifestations, and the environments within which the action takes place, the stage, the background or the surroundings. From this disjunction

questions arise about relationships with space: what is the nature of this digital background? What are the constraints or possibilities of a virtual backspace?

1.4.2 Presentation of Digital

Twenty or so years later, as cinema refines its pictorial illusion, such rudimentary questions seem to have been largely neglected. Today onscreen environments and digital panoramas employ 3-D CGI as a choice technology as to readily describe unfeasible landscapes and believable impossibilities. As a cinema-goer we can be transported to alien worlds, visit fantasy locations or become a participant in catastrophic events. The visual treatment is convincing and for a moment believable, yet we recognise the deception, understand the artifice. Perhaps the visually impossible has now become naturalised and the collective of spectacle and 3-D CGI effects films of the 1990's, such as *Twister* (1996), *Independence Day* (1996), *Titanic* (1997) has acted to desensitise our awe of incredible 3-D CGI cinema screen experiences, delegating the technical process of CGI to be absorbed into a universal cinematic language, an illusionistic device parallel to others.

In addition, current trends seek to replace a fascination for superficial 3-D CGI flat screen spectacle experiences with events that celebrate the capacity of the moving image to operate beyond the confines of the two-dimensional screen. For example, 3D Cinema, projection-mapping and VR promote an intellectual interaction and a physical/perceptual management of image space that functions within a very different dimensional domain. A growing discourse in these areas signals the emergence of new visual dictionaries, introduces alternative vocabularies where the viewer plays an increasingly active role in his or her experience. Authors such as Elsaesser, who provide a commentary on these trends, claim that there is a transition of the screen from a passive viewing environment to one where the boundaries and the screen's 'frame' are becoming culturally refigured, suggest that,

> When inflected phenomenologically, the window and the frame no longer stand in opposition as classical film theory argued for Bazin and Eisenstein and their respective conception of the parameters of depth and flatness, representation and figuration: now it is the lived body

> encountering the window/frame as a 'container' in which the dimensions of time and space are held that allows one to distinguish 'here' and an 'I' from 'there' and 'you'. Thus, the cinema in the new digital environment both modifies the scope and re-energises with new meaning one of our key metaphors, window, frame and paradoxically the one most commonly associated with the photographic image 'realism'. (Elsaesser, 2015, p.200)

Ideas around realism will be discussed later in the thesis, however a key insight surfacing from a supposed departure from two-dimensional viewing to multi-dimensional viewing is the revisiting of an interest in process. Elsaesser develops the concept by separating process and presentation inferring that it is the attributes instigated by both the 'process of digital spaces' and the 'presentation of digital spaces' that can be determined as the traits of digital (visual) evolution.

Similarly, video projection mapping explores illusions of space as process and also presentation, the physicality of environments, the employing and redeploying of projected vistas where urban landscapes act as canvases of communication and visual expression. These are activities that largely rely on, and fundamentally link, the process of 3-D CGI to physical spaces which in turn act as a phenomenological driver in the departure from the canon of traditional two-dimensional screen-based media[28]. Such ideas invite questions about the status of 3-D CGI and its role within a common digital language. Can we reason that 3-D CGI plays a 'key' role in the transition and the modification, as well as the physical, intellectual and psychological advancement in our relationship between screen and image?

1.4.3 Space and Cultural Psyche

Finally, running alongside the practical application of 3-D CGI, are ideas of a 'common' digital language, or the emergence of a 'central' vocabulary, where infused within contemporary discourse is the notion of objects in space, or 3-D space. Concepts that point to or are symptomatic of an emerging digital

[28] See Barbara Klinger's *Three-Dimensional Cinema: The New Normal* (2013)

ontology, a total environment, a common vocabulary[29] within which all digital media fit and radiate from.

Some scholars, including Lev Manovich, maintain that such a paradigm shift has already taken place, that this is evident in the way in which we operate and conceive of visual media, a position inspired via the introduction of 3-D CGI and the process of digital compositing, stating that, "[…] the way 3D computer animation organizes visual data – as objects positioned in a Cartesian space – became the way to work with all moving image media." (Manovich, 2013, p.294).

If an 'objectivity' of media has infiltrated and influenced our appreciation and consumption of the moving image it has similarly dominated the way in which we construct high-level composited worlds (such as video games or 3D stereoscopic cinema), as well as our management, interactions and engagement with these formats as mainstream media. Ideas that signal a dependence on spatial environments (and 3-D CGI). Moreover, a new horizon is potentially dawning with the re-emergence of virtual-reality cinema, thus acting to further broaden and reinforce our visual (spatial) expectation, influence the way in which we converse with the concept of space, and redefine how we fit into an expanding multimedia, multi-dimensional world.

Such concepts are touched upon by Patrick Power in his essay *Animated Expressions: Expressive Style in 3D Computer Graphic Narrative Animation* (2009). Within the essay Power explores an inconsistency in the generation and effective expressive capabilities of digital graphic animation, specifically in relation to 3D CGI, where he brings into the discussion attempts that have been made to garner or develop a language which could be used to support expressive capacity for the user/artist. It is Power's concern for a vocabulary that links this discussion to these and similar ideas where the aim is to open up a dialogue that will add to the range of techniques available within 3-D CGI practice. To enrich

[29] Manovich talks of a common computer-based vocabulary from which all digital techniques pertain to – see *Image Future* (2006)

3-D CGI practices and to establish what, if any, language exists for 3-D CGI, if not engrained in the digital mass.

Topics that are introduced by Power in his essay point towards the notion of perspective the intrinsic nature of perspective and photorealism that act as the cornerstones of 3-D CGI. These are factors that he claims are critical pillars within the software, properties that dictate the style and representational values of the image that also operate to inhibit and similarly liberate visual results; issues that are discussed but not fully resolved within his debate. If we consider 3-D CGI as conceptually concerned with space, it is about space and within space where its construction and manipulation all point to spatial relationships that drive and develop its function (Manovich, 2001). Then my view in the assumption presented by Power is generally one of agreement, conferring that the prominent features of 3-D CGI; space, perspective, potential for photo-realism, are some of the very things that mark 3-D CGI as distinctive as a medium, pronouncing it different from other digital formats. However the claim here is that these traits (i.e. perspective, photorealism) are not the only significant ones, that other spatial mechanisms for describing and working with space exist within 3-D CGI production.

1.5 Hypothesis for Space

In laying the groundwork for this research and following Power's lead, my supposition is that the project will raise questions around accepted representations of space within 3-D CGI animation. Questions which will ultimately focus on how we might discuss the function of space within this mode of production. Furthermore, I anticipate that space, or the mechanisms for discussing and representing space within 3-D CGI will be acknowledged as a primary trait, fundamental, inherent or the essential remit in its operation. The fiction of space within 3-D CGI, I predict, will be the dominant fiction within the process of 3-D CGI. Such speculations are intended to lay the groundwork for the central focus for the project, one that deliberates over a concern for medium distinctiveness for 3-D CGI.

Thus at the heart of this investigation is an interrogation of the media-specific parameters of 3-D CGI and relations to space. A quest that acts to challenge the concepts of how (in terms of production, image generation and image presentation) we understand 3-D CGI within the limits of its inherent possibilities and one that suggests a relationship between 3-D CGI and its operation or function to represent space as a key component in this context. Here space is not wholly a narrative space as suggested by Panofsky or as a primarily process driven space as discussed by Thomas Elsaesser[30], but space within 3-D CGI has a material function aligned to an objective/subjective spatial dependency as mooted by Burnham and his prophetic realisation of changing material/spatial relationships.

> The characteristics of sculpture can be summarized in the fixed attributes of the classical world; place, position, immobility, parts, proportion, and static homage to the human condition – in a word, the creation of immutable ideals through *objects*. Sculpture increasingly has forsaken its anthropomorphic ideal to become a continuum of steadily changing ideas about the world. Sculpture's status as object continues to be deceptive because it leads us to believe that its substantial attributes – in spite of so many losses – are inert materiality: weight, mass, and form. This too has vanished and *the dialectical tension within twentieth-century sculpture remains its steady gravitation toward seeming immateriality (through forms of attenuated and unstable materiality), while at the same time resisting this trend*. (Burnham, 1987, p.167)

It is the idea of space, as linked to material, that develops to become intrinsic in this study and which forms the basis for an investigation, a foundation for a possible framework and a method for addressing this subject. As a starting point the work here follows a route of enquiry that represents a considerable departure from mainstream historical and contemporary practice and scholarly thought concerning 3-D CGI. Typically ideas referring to 3-D CGI radiate from an emphasis on mathematical structures and systems; Manovich stresses an importance on software, Aylish Wood advocates code as the basis for understanding 3-D CGI. Although cross-overs do exist,

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[30] Elsaesser's phenomenological account of space is not dismissed here but is set to one side at this point as the discussion explores alternative ideas.

> Mohr sees himself as an artist who uses mathematics only as a vehicle to realise a vital philosophy. He leaves it to the observer to find an approach to his work, whether as pure aesthetic experience or as a cognitive experiment in discovering and deciphering certain processes and structures. (Popper, F, 1993, p.103)

In this study I move away from the notion of structures and systems of code or any precondition of mathematics for the realisation of an image[31]. Instead it is through an interrogation of space and the relationship between space and 3-D CGI that the research aims to establish a critical dialogue.

Within the thesis and specifically in relation to the 3-D CGI image I refer to two strands of spatial understanding, (1) an objective space, where objects and environments are discussed in terms of Cartesian geometry, and (2) a subjective pictorial space, where an individual interpretation of space within the image is conceived through the viewer's perceptual sense of vision.

Later during the concluding chapter of this thesis, ideas concerning space and 3-D CGI evolve resulting in a redefinition of objective and subjective spaces. During the concluding section of this project, with reference to Heidegger, the research explores an objective space that refers more directly to the notion of "…entities "in" world –space" (Arisaka, Y, 1995, p.4), an idea perhaps more aligned to Leibniz's relational space than it does to Newton's absolute space, where one concern is the distances between things. Similarly at this point in the discussion subjective space, with reference to Heidegger, attempts to assume a position that is less about "psychological feeling" (Arisaka, Y, 1995, p.5) than it is about Being-in-the-world.

Via practice-based research, the aim is to establish space as the basis for 3-D CGI where the ambition is to extend the possible vocabulary of 3-D CGI as a media format, to review the way we consume, interpret 3-D CGI and to offer a new methodology for understanding 3-D CGI.

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[31] While code underlies the process of digital image-making, code is ubiquitous within digital media and does not allow opportunities for discussion relating to media specificity concerning discrete software applications.

1.6 Conclusion

So far the project suggests a largely modernist, Cavell-like intention to define 3-D CGI as particular mode of media production, to establish media specificities and to assert 3-D CGI as a discrete process. Yet this study falls within an era that can be referred to as post-cinema, an epoch where the influence of video, television and the impulses of the digital offer radically new techniques for film production and the presentation of the moving image. Such advancements prompt a revision or even a semantic reversal of the language available to the visual practitioner where it is possible to present ideas, manifest personal expressions and institute formal narratives. At the centre of such a shift is the notion of the digital as the catalyst for discussion and change. Elsaesser, for example talks of reversing the traditional hierarchy between cinema and digital – that cinema can be reviewed as a property of digital, an "adjective or attribute of the digital, rather than the other way round…" (Elsaesser, 2015, p.198). From this perspective, cinema becomes part of an orchestrated binary language of media, an overarching digital hierarchy within which all other media fit and from which all code-based media emerge[32]. From such a standpoint, where digital media is viewed as a system that can incorporate film, photography, 2-D animation, 3-D animation, compositing in its various forms and other methods and techniques of image making, how might it be possible to disentangle the notion of discreet modes of practice?

In relation to such thoughts my view is that alongside an intellectual belief where the shift in power relations (Elaesser, 2015) demands reassessment of 'film' and the notion of 'cinema' as a media format, that in practical terms the idea of 'film' is largely still considered the dominant noun. That notwithstanding debates around the hierarchical position of film in relation to digital, or the acknowledgement of the impact that digital processes have had on film, the 'idea' of film and film's associations with cinema remain stubbornly and traditionally embedded within a general psyche. 'Film Schools' are still very

[32] Similarly, code can be recognised as foundational for digital image construction and manipulation but this study does not consider code as a basis for media specificity within 3-D CGI.

much entrenched in traditional academic distinctions of film, where students, working with digital technologies and techniques, are instilled with a dominant classical film (and cinema) ethos.

The point that I am trying to make here is that previous matured specialisms such as photography and film, that already operate within an established, long-standing and strong visual linguistic heritage, are seemingly afforded dispensation from the supremacy of digital. Digital is regarded as inherent in the image-making process but not as a controlling distinction of the activity, i.e. that codes and conventions of filmmaking practice (largely) supersede any distinction offered by digital, rather than the other way around.

If therefore we can conceive of film as elevated as distinct from digital, can it not also be possible to establish a similar position for 3-D CGI where the activity and process of three-dimensional animation is unique? Can we claim its independence[33]?

[33] Hamlyn notes the importance of this question suggesting that, "*This is the crucial question. In some senses digital is not a medium like film, since it's not visible in itself like paint or grain, and besides which it is common to any number of analogue outputs; images, sounds text etc. On the other hand, it is a medium in the sense that it can be formed into artefacts that are distinctive and impossible to create in other media, such as clay or paint or film"*. (Discussion, 2015)

Chapter 2: Specificity of Medium: 3-D CGI and Other Media

2.1 Introduction

The intention of this chapter is to lay down a foundation for an investigation into the medium of 3-D CGI animation. The primary concern for this section of the thesis is to locate 3-D CGI as a medium within the context of a moving image media tradition, where the aim is to define and contextualize the position of 3-D CGI against other media including film, video and sculpture. To assist this aspect of the research the chapter introduces and seeks to advance largely modernist methodologies to determine the position of 3-D CGI as a medium.

The chapter can be thought as comprising broadly three sections. A first section outlines, as well as reviews, existing debates and related practice (that comment on media specificity) in relation to 3-D CGI. A second section outlines a proposed methodology for the project and draws comparison from other related media in the attempt to map the characteristics of 3-D CGI. A third section provides a narrative for the project's practical research activity relating to material and surface as a means to apply and test, via practice, the propositions acquired in the second.

2.2 Definition of the Digital

For Cavell, in his articulation of the medium of film it is the 'definition' of the medium that is required for an understanding of that medium[1] (Cavell, 1979). Following a similar logic, to study or understand the medium of 3-D CGI is to recognise a definition for 3-D CGI; to construct a methodology to establish its traits, its virtues, its potential and its parameters as a medium. Approaches to such a question, the subject of media specificity in relation to the computer, are scattered across media theory and examples during the past decade include landmark texts by writers such as, Marshall McLuhan, Lev Manovich and

[1] Cavell, characterizes a medium's potential where "A "possibility" of a medium can be made known only by successful works that define its media; in modernism, a medium is explored by discovering possibilities that declare its necessary condition, its limits." (Cavell, 1979, p.146)

Rosalind Krauss, to name a few. Alexander Galloway adds to these debates and in his dialogic text on the computer interface, he tussles with notion of specificity in relation digital media noting that,

> [t]he possibility of a medium stands in intimate relation to what a medium is, that is to say, the definition of whatever medium is in question. Thus when one asks "what is the possibility of video?" one is in the same breath asking "what is the definition of video?" Yet the computer occupies an uneasy position in relation to both definition and possibility. (Galloway, 2012, p.19)

Galloway's lead chapter, informed by a tradition of writing on ideological relationships between society and the digital, follows a route of enquiry concerning computer mediation where outlined methods attempt to lead us to one possible definition; the computer as process, as an interface. In his text Galloway probes the legitimacy, function and process of the computer as a medium, interrogates the digital as a format for mediation and frames these questions to form a structure within which to underpin his pursuit of a workable language for discussing the nature of the computer.

In Galloway's work the notion of the computer is developed as a mechanism for media exchange, a conceptual juncture between one material state and another. Here the computer interface acts as a 'boundary' "the moment where one significant material is understood as distinct from another significant material" (Galloway, 2012, p.33) where the process of translation between materials generates possibilities for the emergence of new semantics, realities and worlds. It is this thought that he maintains is the crucial concept in our understanding of digital formats; the forming of worlds through practice and process, generating worlds that have hitherto not been experienced and as such, demand new approaches in our study of them.

For Galloway the computer, as a medium, occupies new territories and as such cannot be aligned to previous interpretations or theories that place the computer as a re-mediator of already existing media systems. In fact he forcefully argues against recognized theories, such as remediation, as a way to understand the

computer as a medium suggesting that, "[t]he remediation argument […] is so full of holes that it is best to toss it wholesale" (Galloway, 2012, p.20).

Instead Galloway's position is one that institutes the computer as a process for mediation (rather than remediation) with the effect that the computer acts as a *processor* of stuff rather than a *producer* of things, concluding that,

> […] the computer is the interface effect, … the computer is not an object, or a creator of objects, it is a process or active threshold mediating between two states. (Galloway, 2012, p.23)

Supporting his narrative he acknowledges, while at the same time questions, preceding theoretical work by Cavell and Manovich (regarded by Galloway as too formalist and essentialist in their approaches), who through their writing problematize ontologically the notion of the computer. Such methods do not sit well with Galloway who instead argues that any ontological devise to

> […] define the medium with reference to specific "language" or set of essential formal qualities, which then, following the metaphysical logic, manifest in the world a number of instances or effects, (Galloway, 2012, p.19)

is a precarious methodology when applied to the computer. Essentialism is therefore a direction for study which Galloway rejects, claiming that issues around 'metaphysics' prevent a review of the computer in an essentialist or ontological way, suggesting that such approaches are out-dated or misplaced. Through his commentary he opposes what he refers to as Manovich's formalist and essentialist methods (in this instance) stating that essentialist approaches in the context of understanding medium specificity of the computer are inappropriate, with Galloway preferring instead to follow the route of the computer as an ethic;

> The machine is an ethic because it is premised on the notion that objects are subject to definition and manipulation according to a set of principles for action. The matter in hand is not of coming to know the world, but rather that of how specific, abstract definitions are executed to form a world. (Galloway, 2012, p.23)

While such a statement might hold true for the computer as an entity (as a collection of software applications, algorithms, functions including hardware/software protocols), I offer that the study of an *individual* software application should not be critiqued in the same manner. I argue that a computer application can be categorized as unique, seen to embody a definite remit or possess a discrete nature as a medium. The Adobe Creative Suite, for example offers a set of software applications designed to operate or function to support a specific task. Within the suite, applications such as Adobe Photoshop represent a purpose to manipulate digital still imagery, whereas Adobe Premiere the task is focused to edit moving image footage, each intended to provide explicit utilities, tools, creative platforms to manage and organise visual content[2] in a specific way. Perceived in this way computer programs can be viewed as distinctive productive media, assert opportunities to explore and study the specifics, idiosyncrasies and potential of individual software applications to break away from any generality to speak of new languages or alternative dialects that are frequently left uncharted.

Supporting such a view, Aylish Wood in her recent text *Software, Animation and The Moving Image: What's in the Box?* (2015), bestows a delineated review of the medium of the computer where her investigation acts to scrutinise the specifics of 3-D CGI software to reveal the possibilities of dealing with and producing 3-D CG imagery. Wood considers the implications of 3-D CG imagery in relation to contemporary visual culture, deliberates the role that processes such as 3-D CGI have in constructing and shaping our visual landscapes and measures how such processes have affected the way in which we consume and interact with visual media. 3-D CGI in this instance is introduced as a defined subject rather than as a subset of the digital per se, in effect reversing Galloway's generalist track.

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[2] Other devices both analogue and digital act as interface devices, for example it is possible to argue that a Steenbeck could be compared to a computer interface in this context, i.e. a Steenbeck can be deemed as a "device that is an interface, not a producer" (Hamlyn, discussion, 2015) of things but aligned to a specific task.

In her commentary, Wood connects leading dialogues and discussions within related theoretical discourse (where themes associated with the computer convey ideas specifically around symbolic, ideological and practical expressions formed via 3-D CGI) to compose a series of arguments designed to untangle complex relationships between computer code, space, image and a broader digital culture.

Through her work Wood records potential traits and trends to suggest a unique language (as a shared expression) or a materiality for 3-D CGI as a software application and in this respect Wood's line of enquiry can be regarded (in essence) as a departure from Galloway's anti-essentialist views; supporting and helping to validate the notion of (specific) software as unique as argued in this chapter.

Seeking to enter a similar tract, this research engages with the subject via a largely modernist standpoint (as a part of the project's overall strategy) that references theoretical work by writers such as Yvonne Spielmann as well as alluding to visual practitioners including Peter Gidal. Following this theoretical trajectory, I propose to garner awareness of related media, assess properties, perform comparisons and outline differences to determine the specifics of 3-D CGI.

Returning to Galloway, I submit that despite his predilection for an anti-essentialist stance, many of his observations can be viewed as exciting starting points for an investigation into 3-D CGI; the generation or forming of new worlds; the interpretation of the relations between digital space and digital image (as resistant to categorisation when compared to previous modes of spatial representation such as painting or photography[3]); and a necessary connection to logic and structure as a means to discuss computer-generated

[3] See Galloway (p.11) where he opens up a discussion concerning relationships between the viewer and the image, a human "desire for nearness" with regards to the images and space encapsulated within 2-D representations.

images - all speak to the possibilities of 3-D CGI as a medium and relate to a structure of logic.

In addition to logic and structure, central to Galloway's debate is the notion of process. He engenders the computer as process, refers to the computer as a possibility machine, and inaugurates its status as an effect where he claims "the image as a process, rather than as a set of discrete, immutable items." (Galloway, 2012, p.37). To support a broader research field, such ideas might be seen to echo, connect and contemporise the intent and ideologies of earlier systems of investigation where the aim is to interrogate relationships between material and technology. For example Structural/Materialist and Materialist film from 1960s and 1970s advances an ambition, through ideas of logic, structure, process and material, to puncture the surface of a dominant mimetic, illusionistic cinema culture, an approach which I attribute to this project as a second methodological strand.

Where Galloway's commentary might be considered as falling short is in his recognition of the breadth of possibilities for the computer or for the computer's predisposition for creation. By maintaining his assertion that "the computer is not an object, or a creator of objects" Galloway does not fully acknowledge the conceivable capacity for applications such as Maya 3-D CGI to create (if not initially in the physical sense) objects, worlds and realities embodying their own specific qualities. For instance, the 'products' of 3-D CGI are not (necessarily) remediated from previous media, nor are they the results from translations between media. Instead I would argue that the stuff of 3-D CGI occupies new territory, delivers an independent mode of expression, one that is inextricably linked to, but distinct from the generalisation of the computer as pure process as articulated by Galloway, which as an idea is convincingly communicated by Wood in her observation on 3-D CGI (Wood, 2015).

My primary contention with Galloway's text however is the idea that the possibilities and the material qualities of the computer are ultimately concerned

with code, that within this digital hegemony code is heralded as the basis for medium/material specificity.

Although Galloway engages with a relationship between code and software interface in a way that can be described as non-linear[4], he later proceeds to intellectually collapse user access to a software application by bringing together what he views as an,

> […] entirely artificial (distinction) between legible ASCII text, on a Web page, for example, and ASCII text used in HTML mark-up on that same page. It is a matter of syntactical techniques of encoding. One imposes a certain linguistic and stylistic construct in order to create the artificial differentiations. Technically speaking the artificial distinction is the case all the way down: there is no *essential* difference between data and algorithm, the differentiation is purely artificial. (Galloway, 2012, p.33)

Such as statement could be construed as poorly representing the broader possibilities of the computer (and its associated software applications) or considered as failing to recognise the opportunities afforded to the user (where the user has varying levels of access to the software) to manipulate or influence the software and its output[5]. What therefore is lacking in Galloway's argument is the acknowledgement of human interaction and interpretation and while, in an example comparison, a punched roll of paper might cause the player-piano to press certain keys in a certain way, the output is purely mechanised with no significant human interaction affecting the result. Such an analogy does not correlate with a design-specific computer software programme in which human

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[4] Examples and the levels of interaction that can take place within a single application might be varied and provide multiple methods for user engagement, such as visual metaphors to click or numeric input boxes to populate. Wood (2015) explores these ideas in relation to a common language for Maya and user interface design providing smooth access to deeper levels of control (Wood, 2015, pp.89-92).

[5] Wood refers to a humanness and non-humanness in relation to material and the computer. See Wood (2015, p.93) who discusses Matthew Kirschenbaum's computational materiality outlining a distinction between forensic and formal materiality.

interaction is predominantly critical to operation and output and where process is open to variation and individual expression[6].

In contrast to Galloway, Wood (2015) determines a connection between code and interface which traces a metamorphosis of code from one state, where programming is abstract, through to another state where code provides a visual interpretation or 'formal' route from which the user can interact with the software. Here, Wood's research via discussions with industry practitioners elucidates the depths in which the code can be accessed. Her text describes how the non-linear approach to interacting with code (within Maya) via the interface presents the user with a unique flexible toolset.

> This perspective situates the formal properties of code and operations as being 'in-use', concentrating on the routes through which a seemingly abstract entity based on code becomes part of a meshwork of meaningful structures. To do this, Maya's user-interface is viewed not as an array of toolsets, but also as a visual organization attaching specific frames and patterns to the abstract space and time of the algorithmic processes. (Wood, 2015, p.8)

For Wood[7], the software application, the code as well as the incorporated 'linguistic and stylistic' constructs within Maya are neither linear nor fixed. Wood concedes that it is this flexible approach to the concept of code in which to form a 'meshwork of meaningful structures' (Wood) and not the 'artificial differentiations' intimated by Galloway that is important here. Moreover, Wood suggests that it is precisely the malleability of the interface, (i.e. the varying points of interaction that can take place within Maya's user interface; the access to deep algorithmic structures and layers of code[8] or the intuitive, surface levels

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[6] Process and technical aspects of production work together in this context to inform and drive the nature of the resulting output

[7] Wood's text makes specific reference to, and seeks to continue, Galloway's concern for the interface, here however her emphasis is on the interface as a means to interpret and address space rather than on the computational structures of the user interface directly.

[8] To reinforce this point Wood introduces Wardrip-Fruin's account referenced from *Expressive Processing* (2009). In which *"He describes how a player's encounter with a game involves the interplay of: 'data, process, surface, interaction, author and audience'"* (Wardrip-Fruin cited in Wood, 2015, p.8)

where the user can manipulate objects) that offers an attractive feature for Maya as a software application.[9]

2.2.1 Media Studies

Nevertheless, Galloway's sentiment remains important within this thesis and I introduce his work as a way to outline discursive trends around the study of the computer where his approach typifies a tendency to view the digital terrain from an elevated vantage point, one that encompasses the vastness of its landscape. A view, commonplace within 'Media studies', that melds together a ubiquitous array of software applications, a homogenised oneness of digital-ness, a pervasive *digital media*. The subject of *3-D CGI* is accordingly often embedded within such discourse, studied as part of or included as a subset of digital media. For example, Lev Manovich's *The Language of New Media* (2001), implies just that, a review of new media, a vision of an all-encompassing digital communication. Yet despite the broadness of Manovich's title (and a tendency to effect programming code as a medium), he does offer an insight into (visual) strands of digital communication, and at times, refers to individual software applications such as Photoshop and After Effects as being instrumental in altering our relationship with the image or as a catalyst to systemic changes in the way we conceive of the world and operate within in it.

> What was a set of social and economic practices and conventions is now encoded in the software itself. The result is new form of control, soft but powerful. Although software does not directly prevent its users from creating from scratch, its design on every level makes it "natural" to follow a different logic – that of selection. (Manovich, 2001, p.129)

Here, trends that comment on the universal nature of the digital, probe the cultural, social or economic impact of the computer, and elucidate the fears, insecurities and ambitions of a digital humanity, can act as a useful backdrop to

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[9] Within her study and as a means to reinforce this dialogue Wood refers to 'platform studies' where connections between hardware and software systems are examined as a branch of media and video game studies, perhaps further distancing the debate from Galloway's rather contracted argument with regards to this notion.

this project, but as an entirety must be treated with caution and not be seen to distract from rather than support the research focus.

In comparison to Galloway and Manovich, Wood provides a specific study of an explicit software application within the gamut of a digital media terrain. Her depiction of a 3-D CGI software application identifies key features relating to the software (such as the notion of the interface and the concept of space), a position that suggests a starting point for material specificity. For Wood 3-D CGI (Maya's) interface is spatial, a mechanism which provides opportunities to reconfigure our relationship with space in terms of (a) how we construct (ostensibly 3-D) images, i.e. the manipulation of represented form, the interaction with virtual objects and the introduction of 'cameras' within a synthetic space, and (b) the way in which we perceive the moving image; including the integration of 3-D CGI into game and film formats, that in turn foster new ways of understanding space visually either as cinematic form or as video game playing experiences.

> […] drawing on ideas in cinema and animation studies, I aim to bring greater definition to something that remains implicit in many discussions of computer-generated image: a more-than-representational space with digital origins and whose appearance on the screen adds another affective dimension to our experience of moving images. (Wood, 2015, p.10)

It is the analysis of the relationships between space and interface that forms the foundation of Wood's evaluation of 3-D CGI software. To support her work she undertakes interviews with 3-D CGI software users, which she suggests acts as a way to gain a more precise insight into how software mediates, hypothesizing that communities using software such as Maya 3D develop a syntax and/or set of terminologies that form distinct and valid interpretations for a specific software application or modes of working that enables clear communication within communities and its members.

> Claiming that […] cultural practices of media production as an important site of analysis, John Caldwell describes the media industry as having workaday forms of critical and cultural analysis that provide insights for media scholars (Caldwell, 2008). Through their production culture, production communities generate cultural expressions, 'involving all of

> the symbolic processes and collective practices that other cultures use: to gain and reinforce identity, to forge consensus and order, to perpetuate their interests, and to interpret the media as audience members' (Caldwell cited in Wood, 2015, p.6)

It is the analysis of a material for 3-D CGI that drives Wood's text and through her research she uncovers a number of pertinent avenues for the investigation and deliberation of 3-D CGI. One overarching conclusion by Wood is that space and the manner in which Maya (or a 3-D CGI software application) deals with space, is central to its remit, marking a core of possibilities for this mode of production. What we do not uncover from Wood is a definition of what she means by space and what function space has for 3-D CGI or indeed how we might understand a terminology for space within the context in which she presents it. These are questions that I will be addressing throughout this project where the idea of space (in a similar way to Wood), is central to the research.

2.3 Methodology

The project identifies four methodological strands to support this research where ultimately a triangulation of results from the four areas will be performed in an attempt to distil results and to draw conclusions:

(1) A concern for media-specificity to provide a starting point for determining the nature of 3-D CGI as a medium/material and as a means to establish distinctiveness for 3-D CGI.

(2) Structural/Materialist filmmaking principles to drive the practical elements and initial practice-based investigations.

(3) Theoretical and philosophical discussions relating to space: Ideas introduced via Heidegger where concepts of space and material are articulated through practical examples. To tackle these ideas I reference Heidegger's understanding of sculptural space and his notion of voids, edges and delimitation.

(4) A Practical investigation where ideas and hypotheses are tested via animation products.

The focus for this project is on the visual aspects of 3-D CGI production, the process and production of the generating 3-D CGI, including presentational possibilities of the image. Often with time-based work it is audio that plays a critical role in the communication process, a point of sensory convergence where image and audio combine to deliver an idea, message or narrative. The focus for this project is primarily on addressing visual challenges, advancing the particulars of a visual media format, as such, audio within this research as a whole is not a key concern. Where audio has been included within a presentation of a piece of work it has been added as a mechanism to underline a particular aspect of investigation. For example, where the work in question is exploring repetition or looping systems within the image sequence, audio might be applied to assist the delivery or concept of looping, through either enhancing (perhaps through looped audio) or contrasting visual and auditory effects.

2.3.1 (1) – Medium Specificity

This study builds on a belief that to secure an understanding of a material it is necessary to elucidate its qualities and its traits. As such the project can be regarded as implementing a largely modernist view to determine individual attributes and material qualities of 3-D CGI via a comparison with other related phenomena and media. I propose that it is through establishing irreducible properties of a medium, as discussed through examples such as Clement Greenberg (his collected essays, 1957-69), Stanley Cavell (*The World Viewed: Reflections on the Ontology of Film*, 1979) and Wassily Kandinsky (*Point and Line to Plane*, 1926), that one can determine the specificity of medium to define a distinctive characteristic of 3-D CGI.

For Greenberg it was the qualities of flatness, frame and facture that constituted the formal properties of (abstract expressionist) painting, for Kandinsky it was the irreducible properties and potential of point, line and plane as language of abstraction and for Cavell it is the photographic qualities of film that act to

instigate meaning. In this section of the investigation I consider methods for exploring 3-D CGI within a similar realm.

Within a related technological, moving image context Spielmann, in her analysis of video, *Video The Reflexive Medium*, (2008) submits that,

> A medium also does not appear as pure technology, but always in culturally semiotic forms of expression that not only communicates the particular, specifically technological characteristics but also generates those features which a particular medium has in common with other media. It follows that the difference between the technological manipulation of signal processes in video (its technical self-reflexion) and its media-specific modes of appearance (in the format of video image) must be drawn more precisely. (Spielmann, 2008, p.11)

For Power (2009) it is the intrinsic nature of perspective and photorealism that might be regarded as the fundamental characteristic of 3-D CGI. A quality that allows the user to construct, manipulate and render objects and environments photo-realistically within a virtual Cartesian space. However, it is my supposition that this attribute, the illusion of photo-realistic Cartesian space, although unique to the process of 3-D CGI, does not alone constitute medium specificity for this mode of creative production.

My belief is that medium specificity for 3-D CGI lies within and is dependent upon three areas; production (the tools used within the process of manufacturing 3-D CGI products, i.e. the software and associated interface), recording (the means in which the products of 3-D CGI are captured or rendered) and presentation (the mode in which products produced via the process of 3-D CGI are presented, for example projection or computer screen, which includes the experience of the viewer)[10].

[10] For example media specific techniques emerging from 3-D CGI practice, such as the digital 3-D morph and the impossible camera have become embedded within film language as well as accompanying theoretical discourse.

This aggregate[11] position for medium specificity within 3-D CGI wholly connects production to output. An entwined relationship where idiosyncrasies of production or recording of process affect and are inseparable from the nature and quality of the final product[12]. My conjecture is that a combination of contributing factors act to inform and anticipate a distinguishable quality for 3-D CGI, a process of integrated parts. Such an idea incorporates and can include photo-realistic renditions forged in 3-D CGI, without necessarily being obliged to offer medium exclusivity to photorealism as a style or method of practice.

In the ambition to understand the nature of 3-D CGI my research approach draws from modernist concerns for media specificity where individual traits and inherent qualities relating to medium exist within a particular practice or process. It might be argued that such a view has limitations when positioned within a contemporary globalised, internet-based world of digital media. Or that the notion of medium specificity is unreachable for digital media products, representing an outdated view of media/medium when considered in relation to debates surrounding a post-medium age or conditions of post-medium as voiced by critics such as Rosalind Krauss in the 1990's and further explored by Jihoon Kim is his recent text *Between Film, Video and the Digital: Hybrid Moving Images in the Post-Media Age* (2016).

My view is that such ideas, developed through evolving postmodernist and cultural studies dialogues and that champion the dissolution of medium specificity, are useful insofar as they offer opportunities to engage with the notion of medium as non-physical, non-material. By effect allowing for expanded notions of medium specificity that propose 'concept' as medium (for example conceptual artworks such as those produced by Robert Barry) and provide philosophical models in which to consider new media processes in

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[11] As an example Rosalind Kraus introduces medium as apparatus interdependent "the compound idea of the 'apparatus'" in relation to Structuralist film.

[12] For example, David' OReilly's chooses to include draft renders within his films as a way to establish a contrasting aesthetic. Alternatively, John Gerrard employs multiple projectors to generate large scale animations as a method to engage and involve the audience in a way that is very different from work viewed on a small TV/monitor screen.

ways that are "radically different from traditional art" (Goldie, P and Schellekens, E, 2010, p.60) and by doing so lay the ground for new avenues for exploring medium and/or digital practice to evolve.

However my fear in abandoning discussions around media specificity, as posited by Krauss and by those taking a similar theoretical stance, is that such debates can act to a close down opportunities to explore particulars of a process, inhibit investigations that examine a creative terrain or overlook (and stifle attempts to push against) boundaries relating to a certain medium or practice. Furthermore, through the act of broadening the concept of 'medium' to incorporate social, political and commercial arenas, the danger is in effect a distancing of the craft of production from the practitioner and his/her position within that framework.

My opinion, is that mapping the boundaries of production for 3-D CGI and establishing medium specific traits for 3-D CGI, will allow for the opening up of opportunities to explore the edges of this particular medium. That by focusing in on specific software application traits and acknowledging the requirements of this medium[13] rather than positioning the process as consumed within a "postmodern sensation"[14] it is possible to establish an expressive capacity of this particular way of working[15].

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[13] My alliance here is to thought processes that align to Hildebrande who notes that "in no case, however, is artistic ability manifest in wilfully ignoring the requirements of the material worked in." (Hildebrand, A, 1907, p.13)

[14] See Krauss p.56 who outlines Jameson's ideas relating to consumption of the image within contemporary society.

[15] I should add, that my view is not as prescribed as Greenbergian media-specificity and the research focus here is on an understanding of the basic properties of 3-D CGI, to seek the inherent qualities within 3-D CGI, where the traits and qualities of the software application are of its own, but not to the exclusion of other media formats. For example, that 3-D CGI does not reside exclusively within 3-D CGI applications (such as Maya, 3Ds Max, Cinema 4D) and that in current releases of many graphical software applications such as Adobe Photoshop (which has developed largely as a 2-D digital paint and design software application) 3-D is offered as a design option (albeit in a limited way). It would therefore be fruitless to entertain a media specificity that aligned to Gotthold E. Lessing's view where the individual contributions that can be made by artistic renditions of traditional narratives and the differences between translations in paint and poetry. Where for example modes of painting offer unique methods of expression in relation to their medium – based on their anticipated reception and delivery i.e.

This is a mode of thought that I intend to unfold within this chapter as a foundation for positioning 3-D CGI (as a medium) within contemporary digital culture and practice.

2.3.2 (2) - A Structural/Materialist filmmaking Principles

A foundational methodological framework that supports this research emerges from a set of principles developed from Structural/Materialist filmmaking whose ambition was to establish a connection between process and material by demystifying the processes of making. Structural/Materialist filmmaking can be discussed in terms of an ideological quest towards "pure film,"[16] or regarded as a reworking of dialectical materialism[17] as a method to understand the cultural positioning and a cultural dependency on technology and its histories. Based on Structural/Materialist filmmaking methods this research implements three principles for analysing the medium of 3-D CGI animation where the central concern is to determine materiality (in relation to unique and distinctive traits for 3-D CGI) and space for this mode of production:

(1) *Production and Process:* The disruption of the image and the problematisation of illusion to foreground process and medium; A privileging of process over photo-realistic reproduction; An analysis of the relationship between camera, viewer, animator, object and overt techniques of production; To question the primacy of the material and not its photo-representational value.[18]

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seen through the eye or heard through the ear "colors are not tones, and ears not eyes" (p.89) . (pp.88-89). Lessing, G.E. (1873). Laocoön: An Essay Upon the Limits of Painting and Poetry. (1766). Frothingham, E. (trans.) Boston: John Wilson & Sons.

[16] This idea in relation to Structural/Materialist film has also been expressed as an extension of a *"Greenbergian impulse that artworks should explore the constitutive elements of their given medium"* (Hatler, 2010, p71).

[17] A useful connection between remediation and dialectical structures of media, new media and society is provided by Kember & Zylinska (2012, p.19) Also, Grau, O. (2010) *Media Art Histories*, MIT Press. provides a number of interesting essays relating to this subject.

[18] One of the key arguments of Structural/Materialist film talks about *"[…] processes without product"* Gidal, 1989, p.154.

(2) *Recording Process:* Seeking to define medium and space through process; 'recording' (the means in which the products of 3-D CGI are captured or rendered) and 'process is instituted as process' as advocates of material when the goal is to consider production and its individual constituent parts; to consider process through pro-filmic devices as ambiguous in its nature. i.e. the role of the camera, the notion of the camera and the relationship between camera and what might be conceived as pro-filmic in the computer-generated world; The camera as mediator between image (what might be considered as filmic) and the pro-filmic is indistinct.

(3) *Presentation of Process:* The act, or the process, of presenting an image might itself be deemed as a constituent of the medium. For example the altering of screen space, or a "collapsing of on-screen/off-screen space" to suppress meaning as seen within films like Gidal's *Clouds* (1969) or Kurt Kren's *Trees in Autumn* (1960); to build a visual tension through the presentation of process so as to create 'a process of constant redefinition' (Gidal, 1989).

2.3.3 (3) - Theoretical and philosophical Methods for Discussing Space

Ideas of space developed by Schiller, Bergson and Heidegger will inform an enquiry into space as a potential method to underpin a practical analysis of 3-D CGI. A practical and theoretical investigation into philosophical approaches, where the aim is to understanding space, our relationship with space and ideas around space (how such thoughts might influence an exploration of 3-D CGI) is conducted.

2.3.4 (4) - Practical Investigation and Enquiry

I propose that 3-D CGI can be construed primarily as a construction medium, in that the process and function of 3-D CGI is essentially linked to the construction of objective spaces, i.e. that it is possible to conceive of 3-D CGI's essential traits as dealing with perspectival space and the reconstruction of the

representation of an objective space within the digital landscape of the computer. I also submit that 3-D CGI is built on construction principles associated with digital media where a layering of image-based material is orchestrated to construct a final visual result[19].

Practical work was produced to reflect these ideas and developed in conjunction with the theoretical and philosophical explorations outlined above. 3-D CGI animation work sought to test and interrogate such ideas where products were presented publically via exhibition, conferences and talks in such a way as to foster and evolve central project concerns.

2.4 Method 1 – Media Comparison

Digital media (as outlined in chapter 1) can be viewed as a hybridized form[20] representing not one platform but many. Its strength, versatility and creative possibilities lie within its ability to be and to do many things within the same frame, often simultaneously. These are qualities that can make it a difficult subject to unravel, analyse or define as a medium. As such it has become an area that has attracted various, and often contrasting, theoretical discourses. Manovich for example refers to 'new media' (which includes 3-D CGI) as materially about systems, mathematical algorithmic manipulations, loops, and incorporated programming languages that support, underpin and necessarily generate a software application (Manovich, 2001). Others, including Malcolm Le Grice, conceive that a modernist ambition to define media specificity within digital systems might not survive, and that "it is difficult to sustain a concept of a general discourse based on media specificity in the face of the 'inclusive'

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[19] For example, Lev Manovich discusses the role of 3-D CGI in the construction and reconstruction of 3-D space within the context of film, specifically compositing. (Manovich, 2001, p.137). Also see Manovich's essay "*The Mapping of Space: Perspective, Radar and 3-D Computer Graphics* (1993).

[20] Le Grice suggests stability within digital media might not be reached because of the hybrid links between associated technologies (Le Grice, 2001, p.311 and also Le Grice, 2008, pp.219-228)

characteristics of digital technology." (Le Grice, 2001, p.283). Le Grice goes further in his denunciation of material specificity within the digital suggesting that "Digital technology is too incorporative through the abstraction of symbols, images or sounds into a common digital form and through the flexibility of its output devices to support the idea of media specificity based on any one state of the technology" (Le Grice, 2001, p.282).

Spielmann (2008), offers an alternative view and speculates that the challenge of trying to understand the problematic nature of digital media in terms of medium specificity can be approached through a comparative investigation. She theorises that media specific characteristics (in the case of video) are most prominent when confronted with related media (such as film and television) at which point, the limitations and differences between media/medium enables the properties of a medium to become more apparent.

> It is, therefore, a question of contextually framing the structural relations and differences in the media so that, from these peripheries, we are able to define the main aspects of video's specific identity as a medium so that the technical changes in the medium are also noted. (Spielmann, 2008, p.7)

This method she claims provides a higher ground from which to survey the related cultural and technological landscape thus establishing a better position to understand and observe potential medium related differences (Spielmann, 2008).

2.4.1 Conditions and Preconditions of the Medium

One way to conceive of 3-D CGI is as a medium, located within the digital, that incorporates traditional animation histories and borrows from the conditions and preconditions of film, video and animation (Le Grice, 2001). One primary subset for 3-D CGI therefore relates to moving image production and in particular optical image generating processes, where a contradiction exists in that 3-D CGI has very little or no direct physical relationship with either lens or capture processes (being predominantly a *construction-based* medium rather than a *capture-based* medium). Despite this 3-D CGI's closest affiliations are

with film and video formats, both of which have strongly influenced 3-D CGI's evolution as a moving-image output and a driver behind the development of its technical and aesthetic language.

In terms of 3-D CGI, a comparison of mediums presents a complicated starting point for establishing specificity. From a technical, mechanical perspective, an assessment of the physical attributes of film[21] set against those of video, establishes the two modes (film and video) as materially divided, thus offering a clear demarcation between formats, film being dominated by its 'film materiality'(celluloid) and video by its 'electronic signal mechanisms' (Spielmann, 2008). In a similar comparison with digital media, or more specifically 3-D CGI, the 'physical' relationship and comparison with other media forms is more complex, and further distanced in terms of somatic production.

If we directly contrast 3-D CGI against the medium formats of film (celluloid) and/or video 'electronic signal mechanisms' the physical differences between the systems appear acute. However, the ability and ease with which the film apparatus (for example a physical camera) can be integrated into 3-D CGI processes problematizes the situation and it can become unclear, in relation to 3-D CGI, where the demarcation between mediums and materials is drawn.

Using an analysis of production process as a method for establishing material-technical attributes of a medium, we might describe the relationship in traditional film process as being the association between, film (celluloid) and the apparatus required for film production (camera), as being (primarily) *linear*[22].

[21] The term film in this discussion and throughout the thesis refers to a traditional conception of film as celluloid.

[22] i.e. celluloid responds to conditions of light determined by the settings of the camera. Exposed celluloid is then (generally) processed, edited and then projected, forming the basis of a linear process.

However in both video and 3-D CGI the necessary dependency and relationship between physical material and apparatus for production (technologically-biased, hardware-based[23], software-driven) is less obvious and as a result presents a more difficult task in establishing a clear associative connection[24].

2.4.2 A Material Basis in Comparison to Video

By comparison video production can be thought of as an electronically recorded image (Manovich, 2001) where the process of image capture refers to video's electronic and magnetic properties for transmission and mediation. Here video is concerned not with the capturing of images as units and the sequential presentation of these units, as in film, but in a consistent regeneration of an image.

> Video is the first truly audio-visual medium that, in contrast to film, does not generate images as a unit and does not display the materiality of a film-strip, which makes use of one track for image and one for sound. (Spielmann, 2008, p.12)

Because of this specificity of process, video is sometimes considered as a transformation medium[25] in which the signal and 'pictoriality' (Spielmann, Y, 2008) provides an unstable and introspective medium, "whose forms of display derive directly from these electronic signal processes." (Spielmann, Y, 2008, p.11).

2.4.3 A Material Basis in Comparison to Film

If video can be thought of (in terms of process) as a transformation image, film might be described as pictorially fixed, static, non-transformational, and stable (Galloway, 2012). Also, film's historic-photographic grounding and material

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[23] This position is further complicated by the proliferation of technological accessories and external hardware components that are available to assist moving image production, including direct access to the internet from digital recording devices.

[24] Le Grice problematizes the physical nature of video and film in his essay '*Digital Cinema and Experimental Film Continuities and discontinuities*' 1999.

[25] Spielmann suggests that synthetic simulation in the form of transformation is unique to the format of video (Spielmann, 2008, p.52)

heritage support an establishing link between a supposed and recorded reality and as a medium can be seen to offer a distinct corporeal relationship between method, medium and process, presenting an additional dimension to its physicality[26]. In this way the mechanical nature of film can be discussed as having a strong indexical relationship with the pro-filmic. In video and certainly 3-D CGI when compared to film, there is a less discernible indexical relationship.

If it can be suggested that film, as a process, can be considered fixed and stable[27] and that video can be thought of in terms of a transformation image, then in comparison the digital image might be discussed as located between these poles, as both fixed (temporarily) and, at the same time a transformation medium (without the requirement for individual, sequential frame sequences[28]), it can occupy both states. Conceptually, the ethos of digital imagery might be thought of as (potentially) a transformation, or modification state: even when an image is captured through pixel recording it embodies a constant potential for change in a far greater way than either video or film (although perhaps ideologically and procedurally closer to video as a format), an image that can be endlessly modified[29] (Hamlyn, 2016, discussion). In this way,

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[26] Generally, film as a medium has established closer cultural affinity with its process and material than video or digital image making. Most people, certainly within Western cultures, would appreciate the basic physical requirements for filmmaking as opposed to mechanisms required for the production of video or digital.

[27] I refer to fixed as image fixed at the point of capture. The image generated as a result of photochemical reaction on celluloid. It is recognised that a photographic image can be manipulated through processing, printing and editing.

[28] An idea that refers to Galloway's *"image as a process rather than a set of discrete, immutable items"* (Galloway, 2012, p.37)

[29] In his book *Memory and the* Archive (2013) Wolfgang Ernst observes that "What looks like an image on the computer monitor is nothing but a specific actualization of data (imaging). The computer thus renders data visible in a time-based way; the static notion of the image is being replaced by a dynamic one. (p.132) Also in this respect Manovich discusses 3-D CGI as possessing a modular structure that in comparison to a *"2-D still image or 2-D moving image stream…makes it easier for a designer to modify the scene at any time."* (Manovich, 2001, p.140)

> (the) reflexive characteristic of the medium of video comes close to digital technology, because whereas video distinguishes itself through the direct presence and new possibilities of multiple image formation, the contribution of computers consists in challenging the physical characteristics of the medium and overcoming the optical laws governing the image. (Spielmann, 2008, p.5)

As a medium therefore, 3-D CGI might be thought of as representing (without physical optical properties) both *transformation* (for example through animation) and *capture* (through rendering[30]) but to also occupy a third state of *generation* or *construction*. As a medium 3-D CGI has an intrinsic ability and function to build digital worlds a quality that can be considered as specifying a moment of constructed generation as well as transition.

2.4.4 Digital Medium

Earlier in the chapter the consideration of image as *process* was introduced via the work of Galloway and also through the Structural/Materialist principles relating to film (film as process), where a potential exists to discuss material, and the possibility of the image to represent process. Here I put forward the idea that process can manifest through the image, which in turn is dependent on its medium. The concern of the image (for example what it depicts), the construction of the image (i.e. the process of its manufacture) and how an image is expressed as an image (in terms of how it is presented to the viewer), is informed and determined by the nature of that image and by the language of its medium.

I suggest, in the case of digital imagery, that process can be revealed as dominantly imitative in its production, in that digital media (to some extent) emulate the qualities and the language of other media types[31], incorporates or

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[30] Here I propose that rendering in 3-D CGI can be considered as a process for capturing and recording digitally generated pro-filmic events and animation. Rendering in 3-D CGI provides the means to realise the image, to capture that which is presented in front of what can be considered the virtual camera.

[31] Although this research is not arguing for or against remediation it is useful to draw in views on new media and remediation See Bolter, J. (1999) *Remediation: Understanding New Media*, MIT Press in order to assess a broader context.

mimics various established (analogue) media formats and integrates these systems through computing process. It is perhaps a multimedia hybridisation[32] that takes place within digital processes, and the homogenisation of existing media, that is also the basis for its difference.

If digital media can be characterised as transformative and imitative, 3-D CGI as a subset of digital media, should also therefore be transformative and imitative. In this analysis therefore, 3-D CGI can be said to display the ability to; imitate other media models; transform or reconstruct an image; construct and adapt an image's spatial, pictorial relationships; reconfigure relationships between images and to present or disrupt connections between synthetic (space of the computer) and actual (real-world) spaces[33].

The aim, of the above comparisons has been to establish emerging common features of the digital image through determining media specific differences between film, video and digital. A discussion concerning the disparities between the electronic, digital and analogue media image reveals individual possibilities for the capture, generation, manipulation and presentation of moving image material as well as suggesting specific vocabularies, aesthetic constructs and practices for each. Through this comparative assessment it is possible to consider the medium qualities of 3-D CGI animation as incorporating three traits for further examination:

(1) Of *Construction*: 3-D CGI animation production is predicated upon its ability to construct environments and objects. That there is no dependency on real-world reference for the realisation of a 3-D CGI image[34] and that an image in 3-D CGI is constructed within its own

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[32] Hybrid in terms of digital media representing and incorporating a number of media modes processes. For example 'mixed media' or 'multi-media'. See W.Mitchell, in Grau, 2010.

[33] See Manovich 1993

[34] The construction of objects within 3-D CGI is based on an objective space mathematical paradigm that conceptually links 3-D computer generated images to our understanding of our actual physical space. Construction of objects is based on this system, however it does not

environment. That rendering a 3-D CGI image (through the imagined lens of the virtual camera) can be considered as image capture.

(2) *Imitative*: The basic "environmental" function of 3-D CGI is to imitate real-world systems (space, light, camera); That it provides a system for codification, modification and construction that largely mimics film's material and cinematic techniques. As a software program 3-D CGI imitates and has at its foundation, principles and processes relating to traditional film and animation techniques.

(3) Embodying inherent *transformation* potential: The intention and potential of 3-D CGI animation is change[35]. It embodies the ability to transform position or direction with reference to an internal coordinate system, without alteration in comparative angle[36]; 3-D CGI has the capacity to perform transformation through transmogrification of constructed internal objects. That the digital image, and by association 3-D CGI, is always provisional, malleable, "a process of constant redefinition" (Gidal, 1989).

The remainder of this chapter is concerned with applying this hypothesis. To test through practical application the idea that 3-D CGI incorporates, the qualities of a medium that is *constructive*, *imitative* and one that embodies *transformation*. The overarching method for this section relates to Structural/Materialist approaches as a means to reveal material through process (namely production, recording and presentation)[37] where the focus for the

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require a real-world referent for objects to be constructed. Information from processes such as motion-capture can inform object construction and movement, but the process and the construction is not dependent upon it.

[35] Transformation in Structural/Materialist film was, in a way concerned with the transformation of the profilmic, the transformation of codes, the transformation from representational image to the dissolution of form. (Gidal, 1989, p.16)

[36] In other words movement and transformation can take place as a part of a computer-generated environment without (physically) affecting actual world space.

research is to understand the material qualities of 3-D CGI. The following work represents a foray into this quest.

2.5 Process Through Transformation

Within this section I introduce two examples of experimental animation works, that when combined, can be conceived as an opening investigation to test a set of proposed material qualities relating to 3-D CGI; *construction*, *imitation* and *transformation*. The outlined research endeavours to maintain a Structural/Materialist philosophy where the work is not presented as a documentation of process or a visual description of that process, but as an exploration of the artefacts of that process.

> A crucial distinction follows: the film as "record" of its own making and the modernist/post-modernist contingencies of such, must not be misunderstood as some kind of *record-of*, but rather as the abstract of that. In the concrete empirical sense this does *not* mean a film that *documents* the filmmaking techniques via what we are given to see by the illusionist capacities of the photochemical recording device (film). Rather, it means film's abstract, a filmic real in which a process is instituted as a process, not the documentation of a *process*." (Gidal, 1989, p.73)

Therefore, Structural/Materialist film can be seen to posit *process*[38] through effect[39] to question film's illusionistic qualities[40] as a method to understanding the material properties of film. It is my proposition, at this stage of the research, that a similar methodological approach can be employed to address the material qualities of 3-D computer animation; which I submit as *construction*, *imitation* and *transformation*.

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[37] In his polemical summary of Materialist and Structural/Materialist film *Materialist Film*, (1989) Gidal locates the imperative of the image as being instigated by process[37]. It is in the act of establishing process and the revealing of the material (of its construction) through its making, that informs the first phase of this practice research.

[38] To further underscore a relationship between process and material, it could be considered that objects/artefacts in 3-D CGI are predominantly manifest as process, as opposed to camera-based filmmaking. (Hamlyn, notes from discussion, November 2015)

[39] Effect as a consequence of production, of the film event, (Gidal, 1976, p.2)

[40] This is in conjunction with and alongside a central ambition to denounce film's illusionism as a method to investigate film as material.

Following this line of enquiry a series of questions then arise; if we are to understand and discuss material through the act of process then how might process suggest material in 3-D CGI? What systems can be employed that will assist in forming a dialogue between process and material in this digital mode? And how might it be possible to examine 3-D CGI through its own making?

2.6 Experiment 1*: Portraits 1 – April 2010*

Portraits 1 directly aspired to explore the hypothesised 3-D CGI traits of: (1) transformation, and, (2) its imitative qualities (to mimic real-world systems, space, light, camera)[41].

To interrogate these two themes, a set of questions was formulated that sought to examine the main focus of the research through practical application and enquiry. The questions derived from the two themes highlighted above, one that looked at the potential of 3-D CGI animation to express transformation through the transmogrification of constructed objective form, and another that considered 3-D CGI's system for codification, modification and construction in relation to film's material and cinematic techniques. In turn the questions concerned:

2.6.1 Transformation

(1) By emphasizing the effect of form-based distortion (achieved through and as a result of animation and movement in 3-D CGI) is it possible to capture, evidence and foreground process?

(2) By exaggerating the possibilities of distortion to the point of abstraction (via features available through the software interface), whilst at the same time maintaining a semblance of the figurative, is it feasible to explore relationships between the abstract and the figurative in ways that align

[41] For a discussion concerned with replicating actual world environments see Manovich, (2001, p.200).

to Structural/Materialist methods (for example, to reveal process through creating a 'dialectic tension'[42])?

(3) Can the application of motion-blur within 3-D CGI provide evidence of, or imply transformation?

2.6.2 Imitation

(1) By extending or breaking illusionistic codes and device parameters of 3-D CGI software is it possible to achieve confirmation of process[43] (for example through motion-blur)?

(2) In what ways can the introduction of structural loops and repetition act as part of the method, or help to ascertain material?

2.6.3 Method

To examine the above questions a series of short semi-abstract animations was proposed. The central element for each work was to consist of a 3-D CGI polygon-based mesh model, with the construction of the model built in such a way as to infer human form (specifically a human head). The model would be designed as a non-photorealistic representation, instead the intention for the model would be to suggest the attributes of a human head in an abstracted way, the basis for an abstract animation. Here the emphasis would be on generating a tension between abstract and figurative forms as means to determine process.

Through the process of animation and the application of (3-D CGI-based) motion-blur, the form was designed to become increasingly visually distorted and abstract, with the overall aim being an attempt to foreground materiality

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[42] Drawing on the writings of Stephen Heath, '*Repetition time: notes around Structural/Materialist film*,' Gidal provides a discussion based on the tension between the abstract and the representational. (Gidal, 1989, p25)

[43] For example motion-blur is used within 3-D CGI as a mechanism for emulating the photographic artefacts associated with capturing movement on film see Apodaca, A (1999) *Advanced RenderMan* Academic Press, London

through abstraction[44]. The application of motion-blur was initiated to support the transmogrification of the image.

The intention for the project was to include motion-blur within the process of production in a way that would aggravate the relationship between the proposed function of motion-blur (i.e. to emulate photographic artefacts relating to captured motion) and motion-blur as a transformational tool to supposedly distort form. By exaggerating the effects of motion-blur, beyond its remit to emulate rapid movement (caught on camera), to one where the function becomes a device to mutate object movement, might it be possible to determine a software related artefact, indicate a material trait or encourage unexpected results? Motion-blur in a 3-D CGI environment is an artifice, borrowed from the language of photography that presupposes object and movement (as well as limitations of a recording device). Within these tests the intention would be to promote this deceit.

The method for production was therefore based on the following:

2.6.4 Production

(1) Generate surface disturbance and deformation of form through animation process using motion blur and looping.

(2) Apply Structural/Materialist methods of looping and repetition[45] to foreground process.

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[44] Sharits' work for example has been discussed in terms of its foregrounding material through abstract imagery – in this instance film grain becomes as a dominant feature within the film directing the viewer towards film as material.

[45] Looping and repetition was employed as a key strategy in Structural/Materialist film as a way to generate a tension between image and duration and to enforce a conceptual/intellectual engagement with the viewer to the film. See Heath, S. (1978) *Repetition Time*

(3) Create animation(s) that push the parameters of motion blur to the point where the image-effect no longer deals with the illusion of the artificially capturing or representing photo-realistic motion effects.

2.6.5 Capturing Image

(1) Explore a potential division between recorded image (the rendered image) and the object (the actual animation/movement of the object in 3-D CGI space). By using the outlined production techniques recorded via varying types of rendering process; for example either software or Raytrace rendering[46].

(2) Trace movement and process through the application of motion blur. Motion blur in this way might be seen as a method to suggest and instigate material.

2.6.6 Presentation

(1) Present the work via both projection and television monitor devices as a means to introduce scale and assess different levels of image detail, and to vary presentation approaches.

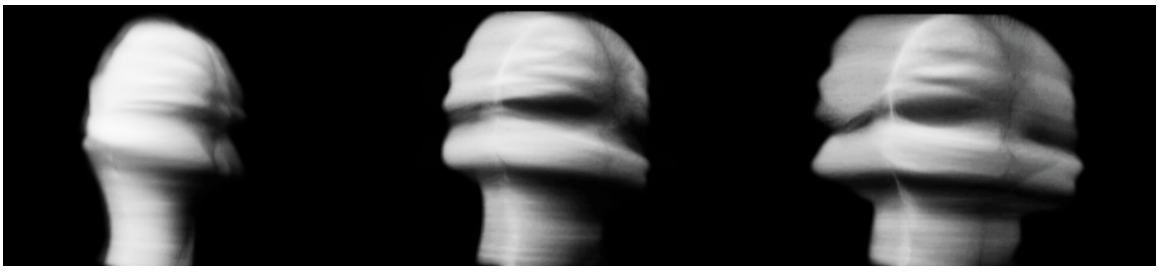

fig:8 Rendered images from *Portrait 1: Series* (2010) - Sequence to show initial distortion tests and an approach centred on looking for a digital signature via motion blur and semi-realistic form.

[46] Different rendering processes within a 3-D CGI software application afford qualitatively visual results. Raytrace for example is a plugin for 3-D CGI software applications that employs complex algorithms to deal with light and shadow.

2.6.7 Outcome

It was intended that these initial experiments would help to reveal a specific signature of process for 3-D CGI. That through the distortion and deformation of the form via methods of animation, as outlined above, that a definable surface trait particular to 3-D CGI might begin to emerge.

Feedback from the experiments emerged from two primary sources; reflection on process and effect, and a discussion about the work conducted with academics within the field of the Animation at Edge Hill University and at Nottingham Trent University.
Feedback from the discussion, and assessment from self-reflection can be summarised in the following way:

(1) That the animations might be regarded as providing an elementary step in capturing the process of 3D-CGI.

(2) That the works represented the visual depiction of movement through space and to a basic level, the potential to depict process. (The blurring of the image and the sense of a visual echo of form moving through space in duration see fig 8.)

(3) That the animations might speak of how virtual form conceivably inscribes a rendered imprint on the frame as it moves through its looped trajectory, but the animations did not provide strong evidence of a material signature (that the looping repetition of the image forced a distorted image of the form but this does not necessarily define the medium. Figures 9 and 10 show examples of how process was employed as an attempt to reveal material traits specific to 3-D CGI.

(4) That further investigation is required to establish a tangible dialectic tension between the abstract and figurative states within the image.

From the results a superficial link between the concept of transformation and the animated form did exist. To support this observation recommendations for subsequent development include suggestions; to further explore relationships between abstraction and figuration more deeply; that the role of the camera and the positioning of the camera within the image might be thought of as central to the experience and interest of the work and investigated more rigorously. It was also surmised that the use of motion-blur to suspend the illusion of form, provide trace of movement and suggest process had some viability. Therefore the notion of motion blur as a mechanism for establishing material might be maintained for future refinement.

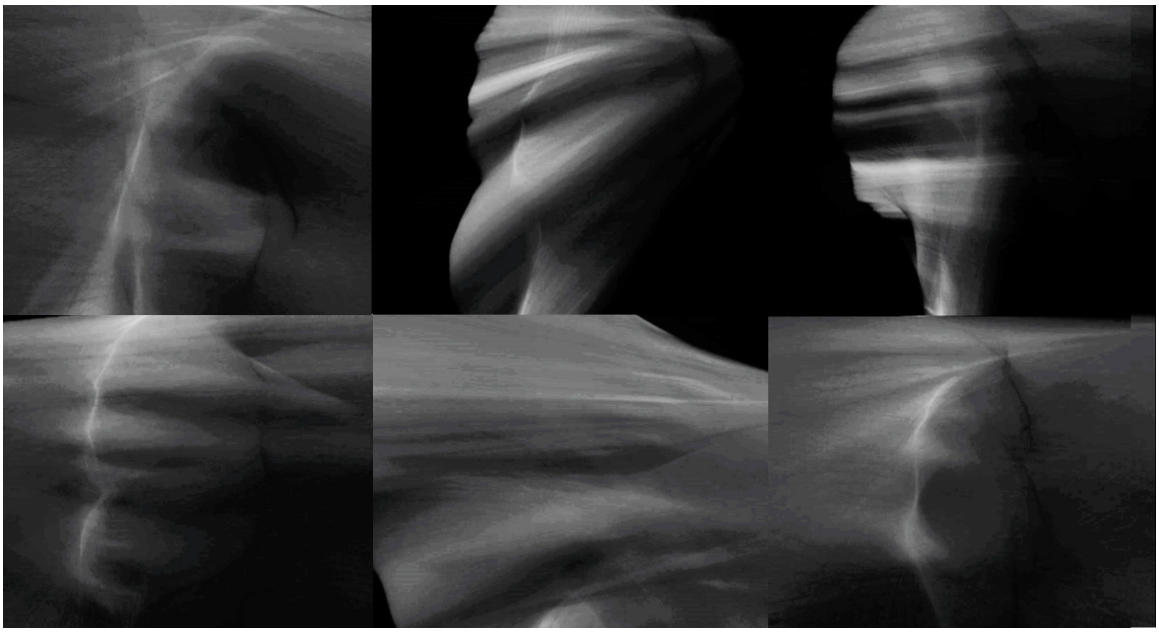

fig:9 An example of rendered images from *Portrait 1: Series* (2010) ~ Sequence demonstrates increased levels of motion-blur and distortion in attempts to foreground material traits.

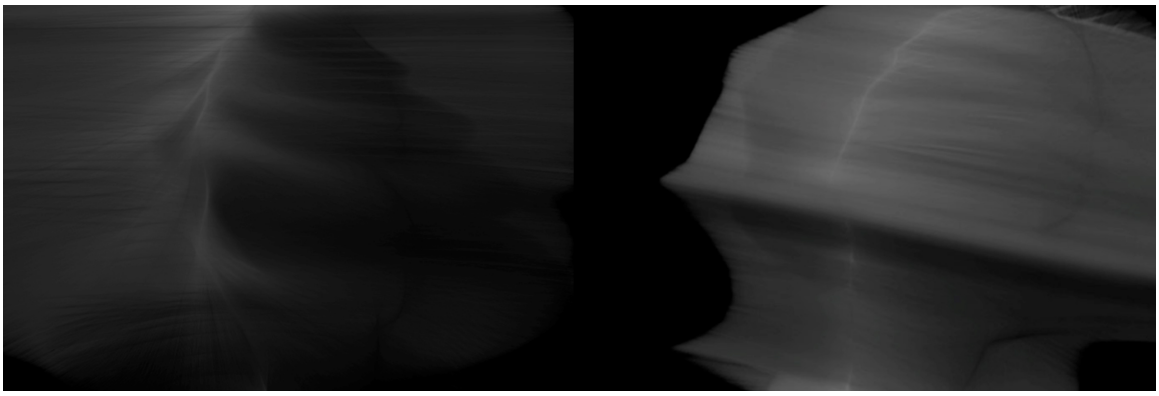

fig:10 Further examples of rendered images from *Portrait 1: Series* (2010) ~ Sequence to illustrate transformation from figurative image to abstraction and the implication of motion/durational trace.

Generally, feedback pointed towards the need for a clearer or more established relationship between the viewer and the animated work. It was suggested that an intellectual, phenomenological transformation[47] approach relating to viewer and the animation might provide a beneficial route to discussing material. Further, it was deemed that a Structural/Materialist precept that includes the viewer might offer a useful base for future discussion, i.e. Gidal considers the role of the viewer in relation to filmic transformations and process in that:

> The structural/materialist imperative is slightly more complex, as it is not one demanding the documentation of the filmmaker's literal role in the production. Rather, it is the imperative of a process of pro-filmic (that which the camera is aimed at) and filmic transformations, through the viewer. (Gidal, 1989, p.72)

The CG image within an exhibition/open space and possibilities of multi-screen environments might provide useful avenues for investigating transformation.

This work sought to reimage the photorealistic aesthetic as a means to interrogate medium and material. It anticipated that the capture of movement would lead to an indelible footprint, a tangible link to process through motion blurring and trace of the form through duration. The next step of the research sought to explore this complex relationship between the viewer and the animations whilst maintaining its pursuit of material.

2.7 Experiment 2: *Portraits 2 – August 2010*

The proposal for *Portraits 2* (2010) is for an animation installation/presentation based on the outcomes of *Portraits 1* (2010). The work is an evolutionary response to *Portraits 1* (2010) and concerns three principal areas of investigation; (1) an extension of the relationship between the viewer and the animated work, (2) a developed interest in the juxtaposition between purely abstract and semi-abstract/figurative animation, and (3), an investigation into

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[47] For an in-depth discussion on technology mediated perception and phenomenology relating to filmmaking I refer to Sobchack, V. (1992) *Address of the Eye: A phenomenology of Film Experience,* Princeton University Press

the role of a (computer generated 3-D CGI) camera as a potential observer and recorder of process. The exploration embraces a Structural/Materialist principle designed to interrogate viewing experience and screen, where the,

> View*er* becomes (a) view*ing*. Without stable self, totalized indentificatory projections and introjections can be barred; a first step. The anti-illusionist project foregrounds mechanisms of cinema in the viewing, denying possibilities of an imaginary oneness of the viewer. (Gidal, 1989, p.61)

The work culminated in an installation entitled *Portrait 2* (2010) produced as a part of the *'Projection/Reflection'* exhibition held at the CUC gallery in Liverpool (August 2010). The installation referenced phenomenological debates connecting image delivery to perception[48]and presented contrasting abstract/representational animated imagery via multiple screen projections in an attempt to explore relationships between viewer and the image (via multiple display). In this respect the intention was to coordinate the exhibition environment in a manner that would encourage the position of the viewer as central to the viewing experience, thus promoting an integrated experience (for example suspended, back-projected screens would be set at eye-level, with the main animation screen at a right-angle to the side screens as a way to surround or enclose the viewer).

The project sought to adopt a similar methodological approach to that offered by Structural/Materialist filmmakers such as Malcolm Le Grice[49] who's films act to "…Counteract the passivity of the spectator and bring the cinematic experience into the context of their reality." (Le Grice, 2001, p.195). The work looked to test the following questions:

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[48] Sobchack. V. (1992). Also Bergson's account of the world as being experienced through our senses and his examination of the 'present experience' provides a useful reference.

[49] Malcolm Le Grice provides a good theoretical discussion to do with multiscreen projection and presentation and the intended relationships between image and viewer. Also Youngblood, G in his book *Expanded Cinema* (1970) provides a useful contextual chapter 'Multiple-Projection Environments'.

(1) By introducing an inclusive viewer experience can the link between animation and material be enhanced in a way that counteracts "the passivity of the spectator" (Le Grice, 2001) and assists in introducing the role of the viewer as a part of the 3-D CGI experience.

(2) By combining multiple (and contrasting) images is it possible to form a visual dialectic[50]?

(3) How can motion blur be further developed as a technique to enhance materiality?

2.7.1 Method

The installation was conceived to employ three principles relating Structural/Materialist methods:

2.7.2 Production

To maintain and develop the cyclic, repetitive animation method relating to Structural/Materialist film as a way to inhibit linear narrative content or illusionistic representation[51] and as such get closer to realising a material basis or distinctiveness for 3-D CGI.

2.7.3 Capturing Image

That by further exploring the potential of motion blur to record and capture movement and process as well as suggest and trace digital 3-D CGI movement and transformation, it might be possible to establish materiality for 3-D CGI.

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[50] The tension generated via presenting contrasting images in this respect acknowledges visual montage where a disruption and dislocation in the viewing experience is effected through this method as a means to promote notions of material. This is very different to effects such as Eisenstein's parallel montage where the consideration is to support narrative content. (see Gidal, 1989, p.7)

[51] Gidal's chapter in Materialist Film (1989) notes *that "Repetition takes you, as a subject-viewer, back to attempt to see "what is" and back into, and out from, the process of material-effects-in-film. Constant reification/non-reification forces an inability to make natural either of these levels of the cinematic. Impossible arrest."* (Gidal, 1989, p.148)

2.7.4 Presentation

To position and frame multiple animations as an installation where the viewer is predicated as an essential part of the experience. To contrast (by juxtaposition) abstract and semi-figurative 3-D CGI animations in the pursuit of a possible visual dialectic. Presentation via public exhibition would also generate opportunities to garner feedback and promote discussion around the ideas central to the project.

fig:11 Shows an example of one of the animated head sequences from CUC exhibition 2010

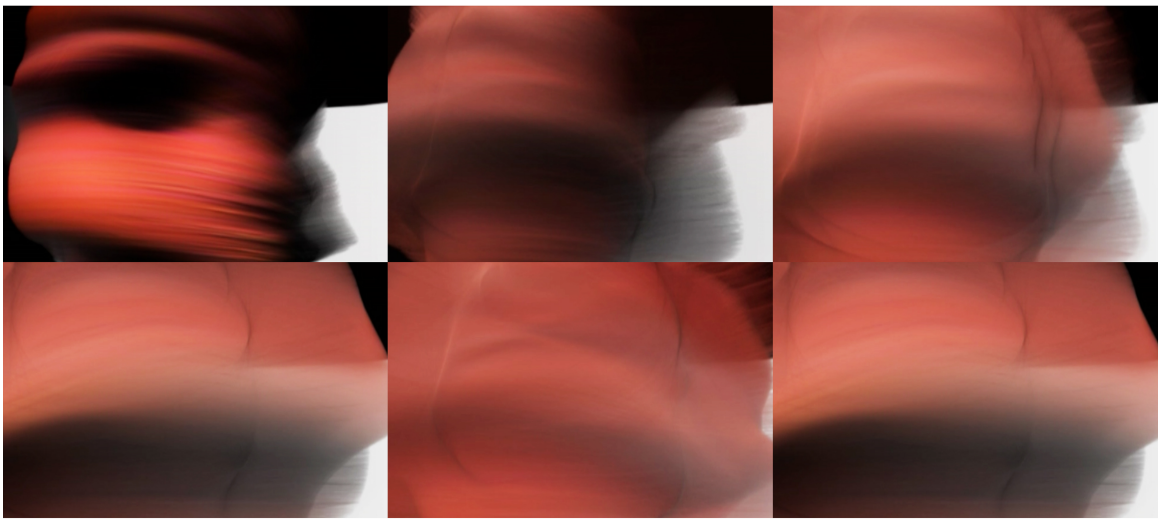

fig:12 Developing composition as a means to foreground object and material ~ from CUC exhibition 2010

2.7.5 Outcome

The installation consisted of two elements, (1) three large wooden picture frames suspended from the ceiling, displaying back-projected animated images, and (2), a large end-wall projection positioned perpendicular to the first set of animations. The three picture-frame, back-projected images presented semi-representational, computer-generated looped animations, based on head movement, procedurally abstracted, blurred and distorted. These images were contrasted against, and contiguous to, a projected abstract film, again based on animated head movement but which included heightened levels of visual abstraction.

The intended result was to evoke a visual contrast between the two sets of images in terms of implied speed within the animations, suggested digital construction, abstraction, colour, orientation and content. Visual contrast in this way was employed as a means to provide the viewer with a sense of visual differentiation as a means to promote awareness of (3-D CGI) process.

During the event discussions with several visitors indicated an interest in the production and process of the work with questions asked regarding methods of construction, what the content of the images represented, the role and nature of

the blurred images as well as enquiries about which software had been used in the development of the animations. Generally, the feedback provided a positive step towards supporting an interest and enquiry into process and material.

The arrangement of the exhibition/installation was intentionally silent with the aim to promote an emphasis on image and process over effect as well as attempt to uncouple the expectation of sound accompanying image. However, overwhelmingly, comments and feedback suggested that audio would have been beneficial to the experience adding to the enquiry rather than distracting from it.

Finally, the work sought to explore philosophical and ideological comparisons in terms of implied (visual) language, heritage and meaning, as well as to foster the individual histories and experiences of the viewer,

> The reproduction of the viewer is always in relation to those histories. In that sense, materialist practice is defined through redundancy, i.e. the viewer is in history by being a viewer, as opposed to being a voyeur, the latter being a state which necessitates the repression of any reflexion (through unconscious fear of being caught substantiates the tension). (Gidal, 1989, p.86)

Such a dialogue opens up an interest in the relationship between the viewer and the film (including on-screen and pro-filmic perspectives) where a central discussion concerns content (Le Grice, 2001) and its presentation. Questions that emerged from the exhibition related to; how content within 3-D CGI might be understood, managed and by directing the viewer? What connections might exist between the role of the camera (its angle) and the viewers' perspective?

In a related discourse within the medium of film, Gidal offers some solutions. He submits that, in terms of image presentation and by manipulating viewers' eye-lines, relationships with viewer subjectivity and their histories can be influenced (i.e. via directing viewer expectation and controlling what is known/available to the viewer). How these concerns might translate to a virtual environment, in relation to 3-D CGI are intriguing. Also, given the broader scope for 3-D CGI application, a recent upsurge in VR and the scramble to develop content for virtual environments, such ideas are perhaps especially

pertinent today. Here, thoughts on subjective perception were both tantalizing and timely. However, at this stage of the investigation these are ideas that point towards alternative avenues of investigation and are concerns that largely fall outside the boundaries set for this project.

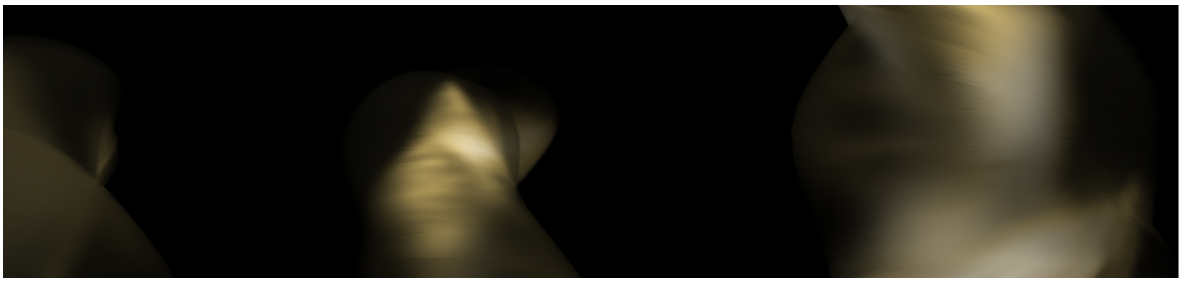

fig:13 Stills from the *Portraits* (2010) film presented as the centre piece for the presentation at CUC exhibition 2010

2.8 Conclusions

The aim of this chapter has been to establish a contextual position for 3-D CGI as medium, to determine where 3-D CGI sits within a digital terrain as well as to try to disentangle relationships between image, software and its underlying programming code. The chapter also sought to ascertain the qualities of 3-D CGI as a medium, to draw conclusions based on its relationship and comparison with related media, namely video and film, in an attempt to uncover specificities for 3-D CGI as a medium. The latter part of this chapter has been concerned with testing ideas introduced as a result of the first section, to introduce methodologies to assist a practical investigation. As such the chapter can be seen to address two general areas: (1) a basis for understanding the traits and nature of 3-D CGI as a medium, separate but inextricable to that of digital and (2) a set of principles (based on Structural/Materialist definitions of film) acting as rubric for discussing 3-D CGI animation as a medium.

The work generated for the portraits series aimed to establish and test a method for understanding the material of 3-D CGI. The investigation referred to a conceptual and practice-led methodological approach based primarily on Structural/Materialist film, where the supposition is concerned with the activities of production, recording and presentation. The exploration of the method through animation practice resulted in a questioning of illusion as a

basis for understanding the image (through abstraction), an assessment of the role of the viewer in the experience of presenting 3-D CGI animation, as well as the contingencies and possibilities of a dialectic, formed through the combination of abstract and semi-abstract/ figurative animation.

The legacy from this activity is the development of two main themes or strands, (1) the idea and importance of multi-screen installation (as opposed to single screen presentation) as a mechanism to engage with and begin to understand transformation (from an intellectual and image based perspective). Here the quest of academics and filmmakers such as Le Grice and Youngblood, who initiate routes to forming relationships between material, viewer and technology, by developing (or expanding) a concept/content away from single screen presentation can be interpreted as a useful foundation for interrogating 3-D CGI, and (2) the deformation of the 3-D CGI form using techniques of motion-blur to disrupt the constructed representation of solid structure and to provide a semblance of transformational trace.

Finally, and in addition, the work introduces questions about the role of the camera. What is the function of the camera within 3-D CGI? How might a better understanding of the camera within the context of 3-D CGI help us to determine the specific nature and materiality of a 3-D CGI medium?

It is these questions that I intend to explore within the next set of work where scale and distance become important aspects within the image configuration, composition and presentation.

Chapter 3: The Dialect of the Camera

3.1 Introduction

In the previous chapter, three dominant strands emerge as possible avenues for investigating and discussing a specificity and materiality for 3-D CGI:

(1) The quality of the image: The notion of an aesthetic quality associated to process as material. The proposal for a model that works within accepted generalisations of what 'materiality' is or might be, i.e. the distinctive 'artistic' mark of the material, the abstracted quality that presumes and identifies a material's nature, or the point within its supposed physical boundaries at which we recognise and separate one material mode from another[1]. Also in the previous chapter I explored a proposed dialectic between the (photo)representational image (relating to what we might conceive of as recognisable form or narrative) and the visually abstract (concerned largely with mark-making or the dissolution of form and narrative). The predominant technological mechanism employed in this practical exploration was the application of digital 3-D motion-blur, which in this instance acted as a means to disrupt literal form. Motion-blur also worked as a tactic to discuss materiality through (literally and conceptually) suggesting and tracing transformation[2], which in turn referred to and expanded upon a presumed experiential knowledge of film and its process[3], where,

[1] This point is discussed in previous chapter where the conversation is directed towards a dialogue between film and video, see Spielmann (2008).

[2] Questions asked by Structural/Materialist film relating to codes and representational systems, concern what Gidal discusses as *"…the physical reproduction and transformation of forms, a reproduction, at some level of the profilmic…a transformation to the filmic, the film event, so to speak."* (Gidal, 1989, p.16)

[3] These precepts echo the work of artists who investigate material and image relations such as Gerhard Richter where ideas of material, objective technologies (of the camera) and a (subjective) reliance on viewer expectation, are employed to read and miss-read his blurred/photographic paintings circa 1965.

> […] blurring, in the photographic idiom, also implies movement, representing, as only a snapshot can, the moment of transition from one state of being to another. (Paulson, 1990, p.193)[4]

(2) A second strand emerging from chapter 2 can be linked to *presentation* where concepts realised via expanded cinema were introduced as models for exhibition and performance[5]. A combination of location, presentation and associated technologies[6] acted as a method to receive and review the work[7] and through the installation of multi-screen image environments the project attempted to provide dialogic opportunities to exist between viewer and image.

(3) A final strand relates to the dialogue between the camera and its environment. This third imperative acts to question the operational status of the (virtual) camera within 3-D CGI, to question the association between the camera and the profilmic and to problematize the relationship between the camera and the viewer. It is this, the curious phenomenon of the invisible, bodiless camera that assumes the focus for this chapter, to ask - how might an analysis of the 3-D CGI camera bring us closer to dealing with its connected medium where the aim is to define 3-D CGI's materiality and distinction?

The central question within this section of the thesis is not what *is* the camera within 3-D CGI, but instead, how might we *comprehend* the camera within 3-D CGI as a mode of capture or as a vehicle for determining process?

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[4] Ideas where there is a material transition between one state and another to mark or differentiate material, echoes Galloway's research relating to the material nature of digital interface. Also relevant is Heidegger's conceptualization of space and the transitional qualities of the edge or boundary to act as an interface between spaces.

[5] Elsaesser, 2015, refers to the new possibilities of the digital in relation to discussing space, screen and image.

[6] For example, projection, video monitors, audio equipment.

[7] In his discussions about expanded cinema and viewer engagement Youngblood posits that multi-screen environments transport cinema into the phenomenon of performance, which itself becomes the medium. Youngblood, 1970, p.387

3.1.1 Structural/Materialist Film and the Camera

One part of this investigation, concerning profilmic/filmic relationships,[8] acknowledges and incorporates a Structural/Materialist ideology where the ambition is to capture or record that which is in front of the camera. The camera in this context is a part of, and as a subject engenders, many of the key debates and discussions within an overarching Structural/Materialist discourse. Such examples can be seen within the writings of Michelson[9], Dusinberre[10], Le Grice[11], where the camera is described as an instrument whose traditional function to communicate narrative and to mediate the personal expression of the auteur (or artist), is explored and tested.

> A hand-held camera, for example, comes to be interpreted as representing the film-maker's subjective vision, and as the culture develops, this inscription of meaning for hand-held camera movement becomes pre-determined – becomes part of 'the language' – and refined in subsequent films within those terms. (Le Grice cited in Gidal, 1987, p.156)

It is the concept of the camera, as a part of a Structural/Materialist thematic to reject attempts to introduce formal (illusionistic) narrative structures[12] and to counter an ambition to impose a personal creative signature (manifest as individual expression in the work), that informs and instructs this chapter. This idea is re-presented here as a method in the context of this project to deal with material in relation to a computer-generated, synthetic, constructed environment

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[8] Here I refer to filmic as referring to the film as its medium, its processes and distinct properties, and the profilmic as that positioned before the camera.

[9] Annette Michelson discusses Michael Snow's film *Wavelength* (1967) and the role of the camera as a mechanism to manipulate the space and content in front of the camera. (Annette Michelson, A. (1976), 'Toward Snow' in: Gidal, P. (ed), *Structural Film Anthology*, London, BFI, pp.38-44)

[10] Deke Dusinberre critiques Gidals *Room Film* (1973) with reference to camera work and the world captured through the camera as a method to discuss process. (Dusinberre, D. (1976), The Ascetic Task: Peter Gidal's *Room Film* 1973, in: Gidal, P. (ed), *Structural Film Anthology*, London, BFI, pp.109-113)

[11] Malcolm Le Grice introduces the camera as a device to explore objects in front of the camera in a way that offers the viewer access to the mode of production. (Le Grice, M. (2001) *Experimental Film in the Digital Age*, London, BFI, pp.73-75)

[12] Including illusionistic devices within filmmaking. For anti-narrative polemic see *The Anti-narrative* (1978) Gidal and also Heath in *Screen* (Vol. 20, Issue 2, pp.73-93)

and its associated 'virtual' camera where specifically two dominant threads are in focus; the *act* of the camera as a device to interrupt the illusionistic potential of the image within film; and the facility of the camera to capture and *record* an objective, arbitrary object.

3.1.2 The Camera: Act of the Camera

Core Structural/Materialist principles, outlined within various associated texts[13] (e.g. denial of narrative, opposition to illusionistic cinematic screen-space), assist here as a starting point for a discussion of the camera and in locating the camera (within moving image) as central to its practice. The functional associations of the physical camera as (generally) supporting cinematic narrative, and as an initiator of illusionistic film space and experiences, became for Structural/Materialist filmmakers, a technological axis for debate and experimental practice.

> From *White Field Duration* there has been a deliberate attempt to reintegrate the camera 'act' into the film procedure as a whole, in such a way that factors of reproduction, documentation and the representation of 'incident' dealt with as problematic, rather than unquestioningly utilized as illusionistic devices. (Le Grice, 1978, p.70)

In 3-D CGI this technological pivot is radically repositioned but remains central to the production and the realization of a 3-D CGI image. For example the virtual camera mirrors crucial attributes from its real-world referent[14], (i.e. spatial representation using single point perspective, F. Stop possibilities, camera lens type, adjusting focal distance etc.) thus aligning its function to support and follow established film-based narrative structures, codes and conventions. However the environmental restrictions within which a virtual camera operate and act are without physical restriction, as such there exists the potential to release the filmmaker from the constraints of cinematic convention if he/she pleases. It is this *act* of the camera (as alluded to by Le Grice) that

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[13] Stephen Heath provides a useful summary account of the Structural/Materialist mandate in his book *Questions of Cinema*, 1981, Chapter 7 '*Repetition Time*'.

[14] This relates to my original description of 3-D CGI as being *imitative* as discussed in previous chapters.

offers a significant difference between the virtual and the actual camera and sets the technological mediation between camera and operator in the computer-generated environment as being uniquely different. This invites an investigation into how the *act* of the camera and the representation of the event (the pro-filmic incident) might be problematized within 3-D CGI; how might we discuss materiality or the mechanisms for breaking narrative and illusion within this remit?[15]

3.1.3 Arbitrariness

One mechanism, introduced within this chapter, to support such an investigative strand relates to the *arbitrary* where the concern is for a semiotic distancing and interest in non-signification of the image/object. As a concept this references and links the project to a Structural/Materialist methodology[16]. Typically, the *arbitrary* subject within Structural/Materialist film can be understood as an attempt to limit a politically or ideologically imposed meaning, or provide "The construction of non-identity in the filmic process…" (Gidal, 1989 p.12)

However, there is evidence in much Structural/Materialist film work where the concept of the arbitrary conforms to a secondary meaning, the characteristic of unpredictability. An at times chaotic act of the camera that provides a complementary measure to fulfill a film's ultimate individual aim. For example in *Room Film* (1973), Dusinberre alludes to the:

> […] erratic camera-movement which masks the precise repetition while suggesting a great repetitiveness as a whole. Despite the other tactics in the film which contribute to its visual impact - graininess, tinting, under-illumination, loss of edge of frame, etc. - it is the camera-work which remains most central in determining that impact. The camera not only contributes to the incoherence of the imagery, but also to the incoherence

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[15] Farocki's *Parallel* (2014) series provides a visual discourse on the significance and deceit of the camera within 3-D environments (specifically video games) where the role of the camera moves from, cinematic, to subjective eye, to investigative tool. In each case the relationship between user and environment is seen to shift depending on the remit of the camera. (see Farocki, *Parallel III*, 2014).

[16] The idea of the arbitrary here is presented as a concern for non-signification rather than with a concern for randomness.

> of the space. It never constructs a discrete space; that it was shot in one room remains an assumption on the part of the viewer…It undermines the establishment of a unity of time, yet it struggles to maintain literalness of the recording and the viewing experience. (Dusinberre, 1976, p.113)

Within a virtual environment possibilities do exist for emulating elements of chance or imitating arbitrary camera movement. For example, such effects can be achieved through key-frame animation and tweening techniques to control the set-up and movement of the camera. At a deeper level of interaction programming code can be manipulated to generate randomness[17] in relation to a digital environment[18]. Alternatively, motion captured from a real-world camera can be traced via motion-tracking techniques (often associated to rotoscoping) or by using manual methods for animating the camera via key-framing processes. These approaches do not offer a direct equivalence or satisfy the same indexical relationship to that offered by a real-world camera. However, there is a qualitative difference in the control afforded to a virtual camera worth noting for investigation, one that also presents a problematic in terms of achieving or generating a sense of 'a camera uninterested (or at least disinterested) in the objects it scans' as referred to by Dusinberre. Such assumptions can be seen to support the notion of the *camera* as a central mechanism in directing the viewer towards the ambition of a film[19].

> The erratic and often unfocussed use of the camera effectively yields a camera uninterested (or at least disinterested) in the objects it scans. The camera-movement is not mechanical, as is the editing procedure, but appears almost random or arbitrary. So that the film privileges the very process of the recording apparatus and on the part of the viewer; by

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[17] The instruction to impose a pre-determined randomness (generated via the software itself) on the camera movement, could be viewed as adding a further level of autonomy and distancing from human intervention. An alternative position can be argued that suggests such automation might be regarded as forming the fabric of the 3-D CGI as discussed by Wood (Wood, 2015, p.51).

[18] Preprogrammed camera-work and 'the impossible camera' form a part of contemporary film language often employed as a mechanism to promote cinematic 'spectacle' with such techniques considered part and parcel of (special) effects technology, for example in *Panic Room* (2002).

[19] Which in this case is concerned with process, recording process and forming a situation where process is foregrounded.

> making the perception of an image on the screen difficult and by rendering those images banal and almost 'meaningless,' the film rigorously reduces the semantic element and forces the spectator back to her/his own capacities for the meaning-making. (Dusinberre, 1976, p.113)

To what extent the treatment of the camera as outlined by Dusinberre is pre-meditated and developed as a part of the 'production planning' of a film, and at what point the camera is used as an extension of the director/cameraman as a response to environment and process is perhaps a necessary question.

Furthermore, Dusinberre's description of the *act* of the camera where his discussion elucidates the 'erratic' nature of the camera, introduces a useful assessment and be can be seen in stark contrast with qualities associated with the digital virtual camera; which has often been described as mechanistically predictable. Does such a comparison draw attention to the possible shortcomings of digital animation/film, a feature which some deem as adding to 3-D CGI's nature as repetitive and unsurprising, lacking 'hesitancy' and 'friction'? A similar view is highlighted by Hamlyn in his discussion around digital and analogue processes as well as the difficulties of attributing medium-specificity within the digital domain,

> The lack of friction in the work, the lack of hesitancy or surprise, the quick realisation that a predictable interplay of sequences is being mechanically played out is what makes the work rapidly become boring, the brilliant colour oppressive. (Hamlyn, 2003, p.18)

This critique of what Hamlyn describes as "the lazy end of digital video work" is a criticism attached to much 3-D CGI work of this category where a characteristic of weightlessness or "lack of friction" can easily pervade[20]. Examples to counter this view do exist,

For example, Wood argues that *automation* is an inherent quality within Maya, that the Maya-ness of Maya is partly in the inorganic nature of the movement. Noting that the smoothness and lack of gravity is an embodied feature within

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[20] Due to lack of real-world physical environmental constraints.

the camera, the plasticity of movement generated by the tweening from one digital key frame to the next representing 3-D CGI's distinctiveness (Wood, 2015).

Ideas around an inorganic nature for 3-D CGI become a part of a central theme in the work of artists such as John Gerrard where, for example, in *Cuban School* (2010) it is precisely the features highlighted by Hamlyn that (used as stylistic markers) form a critical part of the work's distinctive vocabulary. As the camera slides effortlessly through these large-scale, vast landscapes the camera communicates to record its barren, immense horizons, almost lifeless spaces. In these cases it is specifically the combination of smooth repetition and the predictability of the camera that makes these works fascinating, eerie, otherworldly.

Within Gerrard's work, it is the very absence of apparent human intervention that assists (in this case) to claim the computer as the author, the operator of the camera and purveyor of these imagined spaces. The emotionless observing camera, the apparent lack of formal narrative and the arbitrariness of the subject matter act might be seen to suggest its material and process. Furthermore, these are hyper-real existences, representing records and replications of real spaces, images reconstructed within computer-generated spaces, remediated by a 3-D CGI camera, and presented to effect an acute awareness of the manufacture of the building and its location within a pseudo game-based environment[21].

[21] See Farocki's *Parallel* (2014) series.

fig:14 John Gerrard, *Cuban School (Community 5th of October) (2010)*

(Image Source: johngerrard.net)

It is in perhaps this way that Gerrard's work can be seen to invite a commentary on video games culture which in itself might open a conversation about spatial relationships between game-space and player-space, nevertheless a discussion that falls outside of this essay;

> Circling the same site over and over again it becomes apparent that this is what life in a computer game must be like, never quite convincing and a little monotonous. Gerrard's work may be more interesting for future generations as records of a recent past than for us as low-res versions of a dystopian present. (Gritz, 2011, Frieze, http://www.frieze.com/article/john-gerrard)

Through Gerrard we are provided with an example where the possibilities for the relationship between subject, object and author can be revised and interestingly opposed with regards to authorship and presence. Within Gerrard's work[22] for example, one might conceive a contradiction that places the computer software at the centre of its production, the idea of the auteur introducing a conceptual reversal of what Hamlyn discusses as the *"interventionist camera"*.

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[22] Ideas that are generally reinforced by Wood (2015)

> […]Brakhage's camera is never quiescent, but always twitching, hovering, circling around its subject. It is this restlessness that reminds us constantly of the presence behind the eyepiece…The more the images are the product of interventionist camera operations, the more they can be understood as having been generated by the author. (Hamlyn, 2003, p.90)

It is these concerns, introduced and developed in the previous chapter (via the *Portraits* series, the act of the camera, relationships between the camera/viewer/profilmic, and arbitrariness), that emerge as questions and areas of interest, and that are carried through to inform and forward this investigation into a materiality and distinctiveness of 3-D CGI. The subsequent practical experiments seek to explore these ideas within the methodological framework (outlined in chapter 2) of *process, capture* and *Presentation*.

3.2 Camera and the Arbitrary ~ *Pylons Series*

This chapter introduces a series of animations *Pylons* (2011) that marks a departure from the essentially figurative (subject oriented) animation that formed the focus for the *Portraits* (2010) series discussed in chapter 2. *Pylons*, instead is directed towards a camera-centred approach where the emphasis is on developing and recording an interplay between subjective and objective dilemmas[23].

Methodologically *Pylons* (2011) remains based on core tenets of Structural/Materialist film where the aspiration is to understand process through process. This stage of the practical work introduces additional fundamental themes from Structural/Materialist film (including generating work through a reliance on found objects and the reworking of existing footage[24]). *Pylons*

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[23] Gidal introduces various examples where subject and object are situated in opposition, particularly in terms of On-screen and off-screen spatial inconsistencies, (Gidal, 1989, p.54). Also Sobchack introduces a useful polemic introduction on subjective/objective relations specifically within film, *in Address of the Eye* (Sobchack, 1992, p.119)

[24] LeGrice's *Berlin Horse* (1970) provides an example of film that has been reworked, expanded and distorted to alter the perspective effect.

(2011) begins by claiming two fundamental principles as central to its method of investigation, (1) the *arbitrary*[25] object and (2), the *act of the camera*.

Key questions asked and addressed via this stage of the research are; (1) how can the virtual camera act as a mechanism for mediation within 3-D CGI to reveal process and/or assist in developing subjective/objective relationships between the viewer and the work? (2) How might it be possible to introduce a readymade and/or arbitrary object within the artificially constructed environment of 3-D CGI as a means to explore process where the aim is to reveal fundamental qualities of the medium/material.

To address the above questions, two sets of experiments were devised; firstly, a studio-based series of animations designed to act as a preliminary investigation, and secondly, an installation work located within a public arena sited at MOSI (Museum of Science & Industry), Manchester.

3.2.1 Experiment 1: Pylons: Up/Down ~ July 2011

In July 2011 a series of animations was undertaken where the aim was to explore the above themes. The work was devised with a particular focus on assessing potential relationships between *object* (as an arbitrary, non-politicised 3-D model) and the virtual camera as subject (in this case as a subjective eye[26]). The aim of the work was therefore to evaluate the animations as mechanisms for discussing ideas around space and material where the mode of production is 3-D CGI[27].

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[25] Gidal introduces the concept of the arbitrary as *"[…] that nothing be accepted as natural." (Gidal, 1989, p.11)*

[26] Dusinberre talks about the *anthropomorphized analysis* and *subjective eye* of the camera in his 1975 essay on Gidal's *Room Film 1973*. (Dusinberre in Gidal, 1976, p.113).

[27] Deliberate attempts were made by Structural/Materialist filmmakers to *"reintegrate the camera 'act' into the film procedure as a whole"*. (Gidal, 1989, p.112) Pylons adopts this position as a point for experimental exploration.

The components within the animations, the *camera* and the *object* were initiated with specific remits, i.e. the function of the camera in the set up was to be considered as the fundamental mediator between viewer and *object,* meanwhile the object within the work (in this instance) would be presented as incidental. The idea of *object as an object* (i.e. as an *object* containing a semiotic value) was not to be a central concern in this investigation. Object was, instead, to be introduced as part of the project apparatus, employed to encourage a reorientation of the viewer's spatial understanding from a (photo)-representational viewing experience to an abstract and academic viewing experience. In approaching the work in this way the project acknowledged Structural/Materialist ideas as illustrated in Dusinberre's discussion on *Room Film* (1973) (Dusinberre, 1976, p.113).

An audio component was designed to run alongside the animation that would parallel the intention of the visual work. One aim for the audio was for the sound to act as a mechanism to disrupt the unity between image (viewed on screen) and understanding (an expectation or interpretation based on combined image and audio information). For example, the audio for *Pylons: Up/Down* initially sought to reinforce for the viewer a conception of the electric pylon within the scene, the pylon and the electricity audio effects aiming to converge sensory and perceptual expectation. Later within the animation the audio track shifted attention to play a distinctively structural role in a way that is intended to guide the viewer towards the movement of the camera, foregrounding the relationship of the camera to the object. Here the audio responded to the timing and pace suggested by the animation where clicks and fizzes within the audio track corresponded with the visual cues on screen.

Similarly, in this way audio was employed as a way to contradict film structure, i.e. with reference to Structural/Materialist film *Pylons: Up/Down* used loops and repeated sections of the animation with the intention to reveal process. Audio was added at specific points within the film as a way to interrupt coherence between the looped sections, i.e. to encourage the viewer to question whether the section was repeated or not.

3.2.2 Aim

The series of animations *(Pylons)* proposed to challenge the operational role of the 3-D CGI camera where an exploration of the function and the influence of the camera was set against a de-emphasis on the significance of the object (presented as arbitrary). The work attempted to manoeuvre the role of the camera as an observing, subjective, passive, static, camera (as presented within the previous chapter in *Portrait* series) to one that is active, animated, investigative, within the *Pylons* work within this chapter.

The *Pylons* project proposed to place the camera at the forefront of the analysis where the aim was to acknowledge the role of the camera as a method for revealing a material basis within 3-D CGI.

The aim of *Pylons* was to examine the following questions:

(1) Can the camera within 3-D CGI be employed to privilege and reveal process? (Process in this context represents the basic mode within which 3-D CGI operates. As formulated by Structural/Materialist film, the concern for process is in the activity of its being, not the description of process or documenting the activity of 3-D CGI's ability for reproduction, simulation or representation).

(2) By utilising the camera and working with Structural/Materialist filmmaking methods such as looping, and repetition structure, (how far) is it possible to discuss object and subjective relationships and study them as opposing forces to foreground material within 3-D CGI?

(3) Is it possible to introduce the arbitrary into a 3-D CGI animation?

3.2.3 Method

Pylons (2011) adopts and is influenced directly by techniques developed in Structural/Materialist film where process and method are linked to dialectics between the film and the viewer, which is in turn concerned with a visual perceptual experience[28] (Gidal, 1989).

The objective focus for the films *Pylons: Up/Down* (2011) was to be a 3-D CGI model selected from an existing 3-D CGI library[29] (the meaning of the object in this instance is introduced as 'meaningless', i.e. it has no value outside of its function to support the movement of the camera) which in turn would act as a basis for camera movement. As a mechanism to avoid suggestions of landscape, distance, scale or position the single 3-D CGI model, would be located within a horizon-less environment devoid of additional geographic references. Furthermore, as a means to make spatial references more difficult to assess, rendering the images would employ settings for motion blur and methods for edge softening that were developed via the *Portrait* series.

To introduce measures of control and consistency the experiments were carried out with five specific criteria:

(1) That the scene environment should contain a single object.
(2) As far as possible the camera should be animated to exhibit an unpredictable manner with the single rule that the camera should travel primarily along a single axis; 'up' to the top of the object and then travel 'down' to its base.
(3) That the object within the scene should be a 3-D CGI mesh object selected for its potential to possess an *arbitrary* quality, i.e. that it does not directly or indirectly signify or represent "a prior essence, truth or nature" (Gidal, 1989, p.46).
(4) To prevent an implied narrative, where possible the speed of the animations should vary and at times avoid (or limit) sequential tweening[30].

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[28] *"In which the viewer analyses his own understanding of what he is seeing as he is seeing it*". (Hamlyn, 2014, discussion)

[29] The pylon as an object was chosen for its non-specific geographic or cultural meaning, it also provided opportunities to explore scale.

(5) That audio be used as a structural mechanism to reinforce relationships between the camera movement and the arbitrary object within the scene.

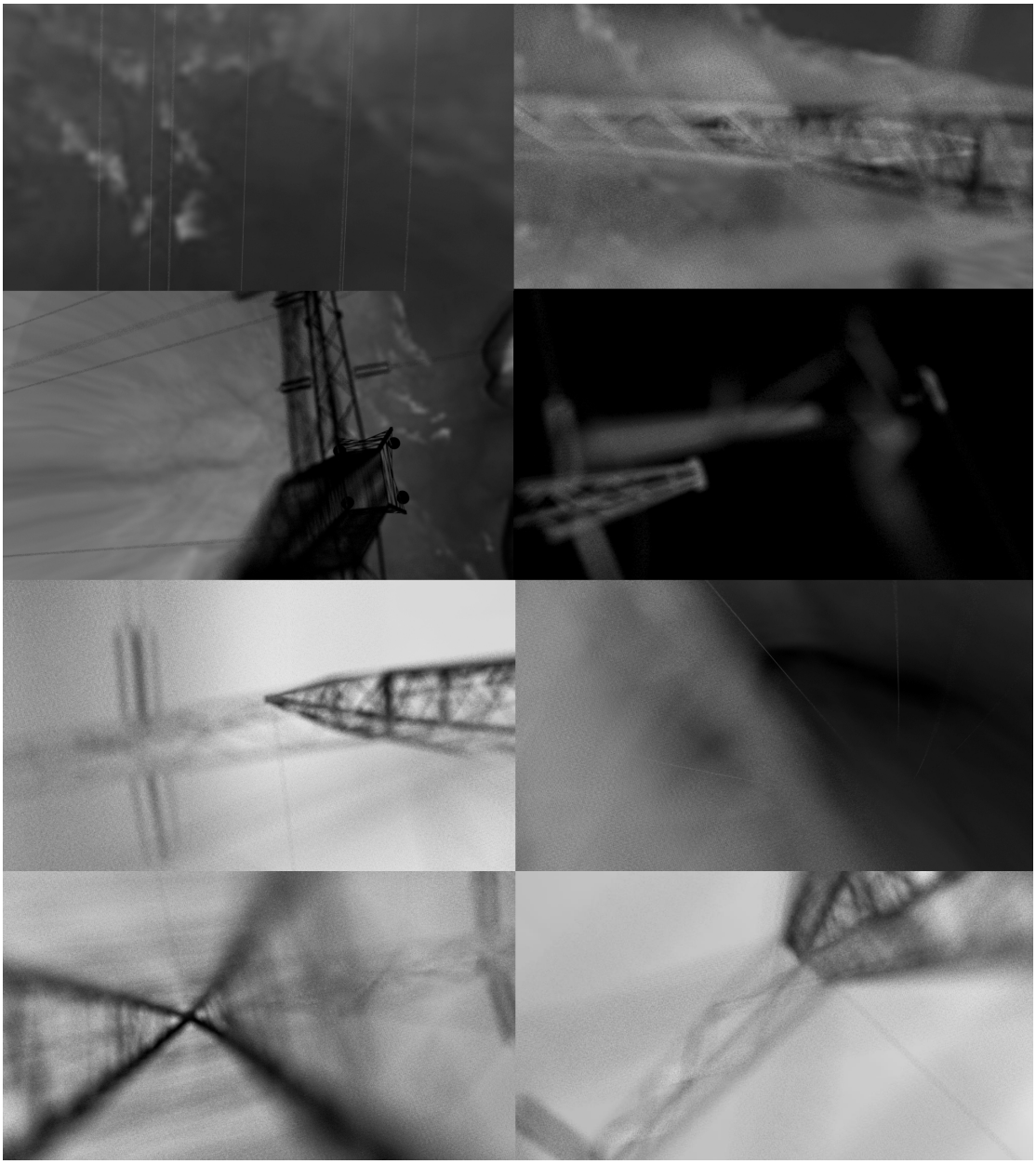

fig:15 Rendered images from *Pylons: Up/Down* (2011) ~ An example sequence from a series of animation tests designed to examine relationships between the virtual camera and arbitrary object.

3.2.4 Outcomes

Four main themes emerged from this set of experiments: 1) the notion of the 3-D CGI model as object, 2) the function of the camera as a device to interface or

[30] Tweening: a sequence of still images that when played in sequence provides the illusion of movement. Altering the rate and consistency at which the still images are presented can impact on the illusion of movement by the viewer.

mediate with the visual space of a 3-D CGI landscape, 3) the arbitrariness of the object within its environment, (4) audio assisted in acknowledging the function of the camera via a reference to timing structure of the film set against the composition of the audio.

(1) Firstly, the film privileged a predominantly visual and intellectual interest in the *object*; that work generated an interest in the position of the camera in relation to the object, the movement of the camera through the abstract spaces that the film aimed to create, and an ambivalence of spatial awareness. However, the work did not necessarily foster an academic concern for the material of 3-D CGI, that the emphasis on viewing the film was placed on determining object identification rather than drawing attention to ideas around material.

(2) The second outcome emerging from the *Pylons: Up/Down* project, concerns the role of the camera. Within these tests the intention of the camera was to be conceived as an *active* rather than *passive* mediator[31] (in that the camera moved to observe the scene rather than remaining static). The conclusion, resulting from the work, points towards the potential for the virtual 3-D CGI camera to act as a *subjective*[32] mechanism for engaging with and communicating visual spaces within 3-D CGI. For example, liberated from the restrictions imposed by real-world physics, the 3-D CGI camera can be seen as further breaking an indexical connection to real-world experience, thus helping to reinforce a suggestion of the *virtual* camera as opposed to the *real* camera. In this way the camera can be recognised as both the creator and observer of the scene (that which is in front of the camera), this in turn provides a potential avenue for dealing with and foregrounding material, process and spatial concerns.

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[31] Between 3-D CGI environment and viewer.

[32] Here I refer to the subjective within a Structural/Materialist context, which is extended to include both the maker and the perceiver.

(3) Because of its synthetically constructed nature the already complex subject of the *arbitrary* is presented with an additional dilemma when positioned within 3-D CGI[33]. The implementation and implications of the *arbitrary* within 3-D introduces an interesting challenge, a challenge that has been initiated within the *Pylons: Up/Down* work, but not fully interrogated within this animation, and an idea that signals further investigation.

(4) Finally, the audio element of the film assisted in directing the viewer towards the process-driven aspects of the film. The link between the electrical effects of the audio and the image, and the structure of the film in terms of its timing set against the composition of the audio helped in directing an audience towards the intention of the film which was to discuss process and object.

To summarise, by placing the virtual camera, rather than the object, as central to the investigation, and by animating the camera through its environment (as opposed to the camera remaining a static observer) it was possible raise the idea of a *subjective* and *reflexive* (i.e. the camera as possessing the ability to discuss itself within a supposed film context) virtual camera as a way to access and reveal process. Through this research it has also been possible to introduce the notion of the *arbitrary* object as a possibility within a 3-D CGI world, offering potential avenues for exploration in the next stage of this research.

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[33] For example Manovich discusses the computer image as linked or *"hyperlinked to other images, texts and other media elements."* (Manovich, 2001, p.290). This potentially complicates the semiosis of the 3-D CGI image as it simultaneously points to itself as well as other referents.

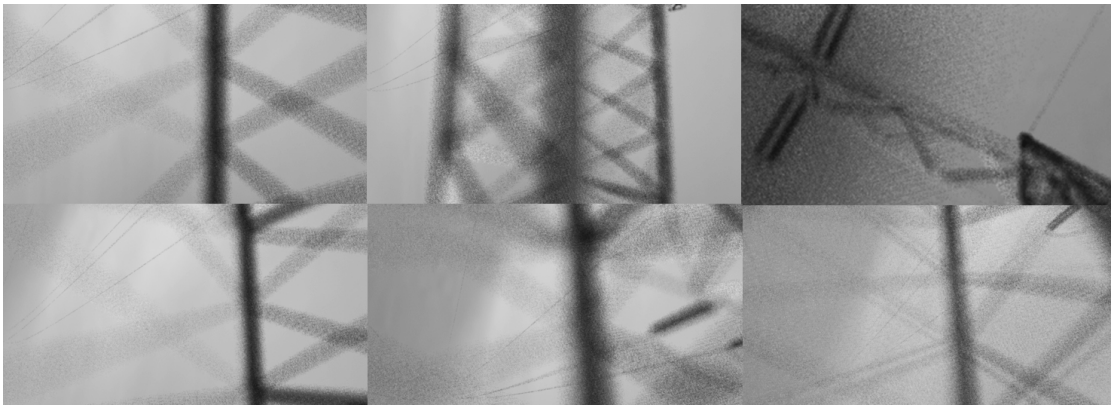

fig:16 Rendered images from *Pylons: Up/Down* (2011) ~ An example sequence from a series of animation tests designed to consider the act of the camera as active.

fig:17 Experimental rendered image from *Pylons: Up/Down* (2011) showing a point in the journey 'up' the structure.

3.3 Experiment 2: *Pylons 2* ~ October/November 2011

3.3.1 Introduction

Pylons 2 (2011) further investigates the camera as a vehicle to scrutinise 3-D CGI for its distinctiveness and material qualities. The work builds upon the findings from *Pylons: Up/Down*, with the specific intention to interrogate the three main resulting threads; object and subject relationships; the role of the camera to communicate (of and about itself); and the notion of the arbitrary within 3-D CGI. The project also set out to address more directly, a mediating

relationship between viewer and image, where the viewer is regarded as integral to the process, a component and witness to the experience, an intrinsic element to establishing materiality[34].

3.3.2 Aim

Pylons 2 proposed a three-screen installation work with the aim to refine and extend ideas from the previous experiments. The project thus planned to address three primary concerns:

(1) In the previous work the camera was instigated and discussed in terms of its subjective and objective relationship with the profilmic event. By extending the activity of viewing to include the viewer as co-author the work proposed to explore and question the role of the viewer. When the viewer is deemed integral to the work how might this further our understanding of 3-D CGI process. The relationship between viewer, the space (of exhibition), the camera and the profilmic (the space in front of the camera) are at the forefront of this investigation at this stage of the enquiry.

(2) If through examples such as Gerrard's *Cuban School,* it is possible to begin to comprehend the virtual camera as a device to interface and record a virtual environment, then how might this concept be developed to capture and record environments within my own studies as a means to assist a highlighting of process, material and space? In the previous experiments, *Pylons: Up/Down,* the camera was introduced as central to the work. *Pylons 2* seeks to develop this strategy by employing multiple scenes; each screen incorporating a virtual camera as key component and with each camera operating with its own remit (as a subjective camera). By introducing additional screen environments the project asks

[34] For a discussion relating to the viewer as part of the process see Sobchack in terms of technology mediated experience and phenomenological, also Youngblood or Elsaesser for expanded screen/cinema experience. Le Grice (1994) also offers a discourse relevant to this subject in his paper on Digital Systems for Experimental film, reproduced in *Experimental Cinema In The Digital Age* (2001) see pp.234-237.

whether it is possible, via image juxtaposition, to gain an 'expanded'[35] insight into the potential of the virtual camera where the viewer can reflexively review the process of 3-D CGI and comprehend spatial differences.

(3) Through refining the ideas emerging from *Pylons: Up/Down* is it possible within 3-D CGI animation to discuss and present more fully ideas relating to the arbitrary?

3.3.3 Method

The presentation of 'Pylons' at MOSI (2011) was designed to evoke an 'extended' relationship between object/animation and audience, not necessarily 'shift'[36] the role of the audience (Hamlyn, 2003), but to encourage a more involved spatial engagement between the image and its environment. To support these ideas the work references existing debates concerning installation art where "[…] the viewer's active participation in the exhibition space serves to underscore the embodied and material conditions of film viewing." (Mondloch, 2010, p.10). Also, by adopting similar exhibition approaches to those developed by Structural/Materialist filmmakers (for example bringing to the fore the physical presentation apparatus) the installation attempted to draw attention to and support different visual and spatial perspectives. Where:

> Screen-reliant installation artworks such as filmstrip/Soundstrip self-reflexively foreground the viewer-screen interface in a way that tends not to occur in mainstream narrative cinema or even in experimental film. Film in Sharits's locational environments/installations is exposed as a material process and presented as an environment: film is considered to be a space. This space is made up of immaterial projected images but also the physical apparatus; the screen, film, the projectors emerge as sculptural objects in their own right. (Mondloch, 2010, p.10)

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[35] See Le Grice (2001) His chapter Mapping in Multi-Space – Expanded Cinema to Virtuality offers a useful perspective relating to notions of expanded user/viewer experience within digital media. (Le Grice, 2001, pp.273-288)

[36] This refers to Hamlyn's commentary on The Festival of Expanded Cinema (1976) where Dusinberre's comments on the aim of the festival relate to *"shifting the complacent expectations of the audience"* (Dusinberre, cited in Hamlyn, 2003, p.45) via a 'perceptual shift'.

In this way the use of large monitors at MOSI (selected for their monolithic physical properties), and the positioning of the monitors within the environment of the exhibition space was intended by design to strengthen associations between screen object, presentation apparatus and installation environment; providing the viewer opportunities to interact with the physical and virtual aspects of the exhibition as well as feeling part of the visual experience.

The installation consisted of three single monitor screens and an additional, single projection. The three screens were arranged in such a way as to operate and to be viewed simultaneously with the purpose that the viewer would conceive of the three screens (and the single projection) as a distinct, phenomenological experience [37] . The aim for the installation was to generate opportunities where the viewer could engage with the work on different perceptual planes, for example, 1) objectively in terms of the monitors as physical entities, the measurable spaces within the exhibition area and the images on the screens as representing 'objects' within a virtual environment. 2) Subjectively in the sense that the combination of images, animations and the personal experience of the exhibition environment itself would form a subjective arena in which an implied, imagined space might be brought forth. Audio also played a part in constructing this experience, i.e. audio was included in the design of the overall space of the exhibition as a way to connect the physical space of the exhibition area to the images on the screen. For example audio was employed as a mechanism to involve the viewer in the space. The aim here was to fill the exhibition space with abstract audio content which would in turn provide an ambient foundation on which to relate images to darkened space, i.e. involving the viewer in the space of the exhibition through generating an enclosing audio space, extending the presence of the image beyond the screen. Equally the audio was employed to connect the space of the exhibition to the exhibits, unifying the various components of the exhibition including the projected image on the floor.

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[37] Existential phenomenology has been a consistently useful (underlying) reference throughout this research with specific references made to Sobchack's *The Address of the Eye: A Phenomenology of Film Experience* (1991), which emerges here as a means to discuss viewer and image.

Conclusions relating to the exhibition were reliant on various information streams: through meetings with peers during the installation; through a process of self-reflection, including exhibition activity, design process, set-up and at the conclusion of the event (reflexive practice of practice); also informal discussions with visitors and other contributors to the exhibition were collated to inform conclusions.

3.3.4 Screens and Cameras

To add to the visual dialectic and to reinforce an objective/subjective dialogue the virtual camera was presented in both active (as in animated within the 3-D CGI environment) and passive (representing a static non-animated camera) states. In other words the 'cameras' in *screen 2* and *screen 3* acted as the stationary observers of their falling and rotating focus, which acted in opposition and in contrast to the "mobile anthropomorphic eye" (Gidal, 1987, p.57) of *screen 1*. The focus for each of the three screens was structured in the following ways:

3.3.5 Screen 1 ~ Horizontal

The intention of *screen 1* was to provide a predominantly subjective aesthetic. Within the scene the camera travelled through an unfixed, indeterminate landscape in a constant horizontal, linear motion.

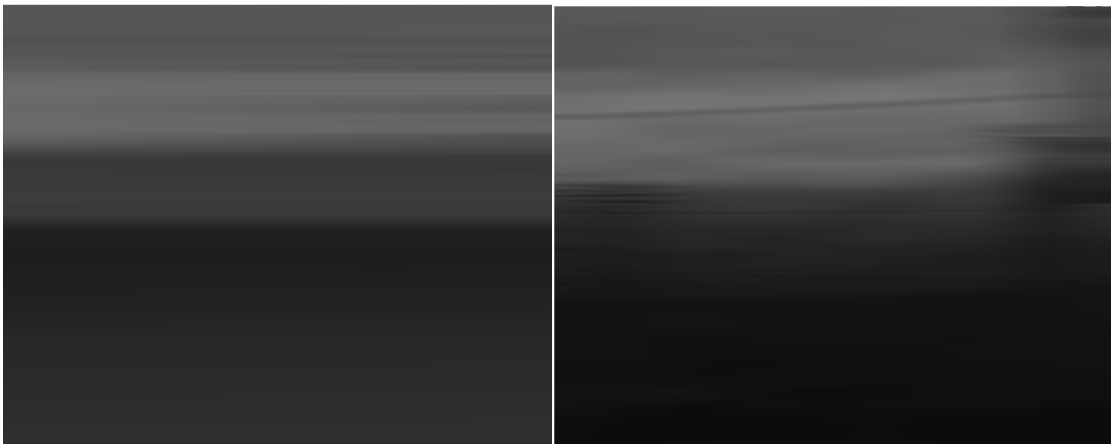

fig:18 Rendered still sequences from *Pylons 2* (2011) ~ Landscape oriented animation designed to assimilate horizontal movement.

The virtual camera in this screen is designated as an active subject and the motion and direction of the camera intended to move along a horizon, never

towards it. Space in this view was presented with the purpose to deliver a suggested distant horizon oriented view, but a view that denied a specific delineated horizon.

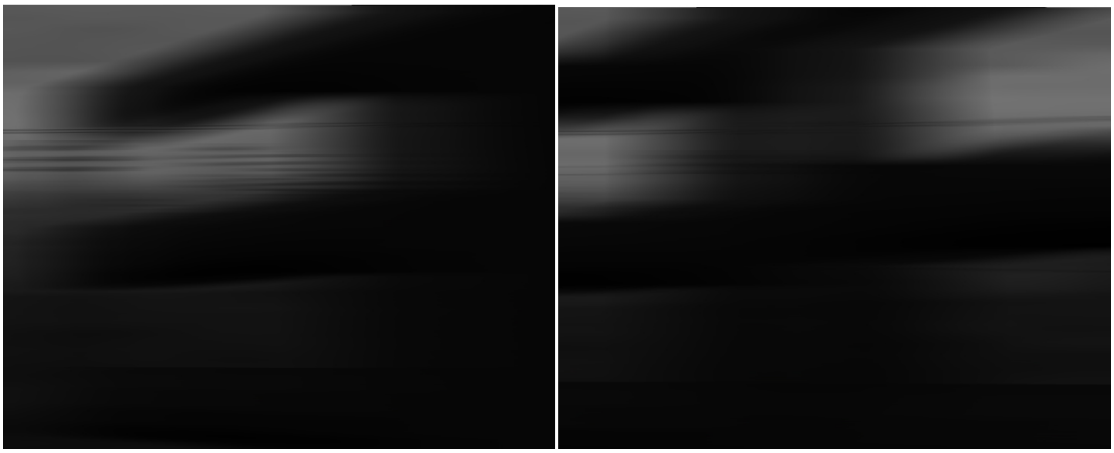

fig:19 Rendered still sequences from *Pylons 2* (2011) ~ Landscape oriented animation designed to assimilate horizontal movement.

3.3.6 Screen 2 ~ Vertical

Screen 2 offered a *vertical* comparison to *screen 1's horizontal* orientation. Whereas the purpose of *screen 1* was to present the viewer with an unspecified screen space (in which the subjective scale was directed at a supposed, distant horizon determined by the viewer), *Screen 2* was conceived to direct the viewer towards a shorter perceived subjective space, a visual space that is much closer to the camera in terms of pro-filmic distance. The camera in *Screen 2* was animated in way designed to provide the viewer with two alternative readings in terms of the virtual camera's movement.

fig:20 Rendered still sequences from *Pylons 2* (2011) ~ Portrait oriented animation designed to assimilate vertical movement.

For example the camera could be deemed as either travelling vertically (traversing a static object), or the camera could be read as being static with objects falling past its supposed lens. The objects and the space relations in

Screen 2 (i.e. the scale, material, size) were intentionally rendered as a mechanism to encourage the viewer to consider and review screen space/camera relations.

3.3.7 Screen 3 ~ Rotation

The arrangement for the third and final screen, *screen 3* offered a static virtual camera positioned before a rotating object. *Screen 3* differed from *screen 1* and *screen 2* insomuch as the object presented as a focus for the camera is an identifiable object (an anemometer). The intended association for the object is one that is recording and measuring environmental forces within a physical (real-world) environment, introduced here as a paradoxical reference within a virtual environment which is itself devoid of real-world or environmental stimuli.

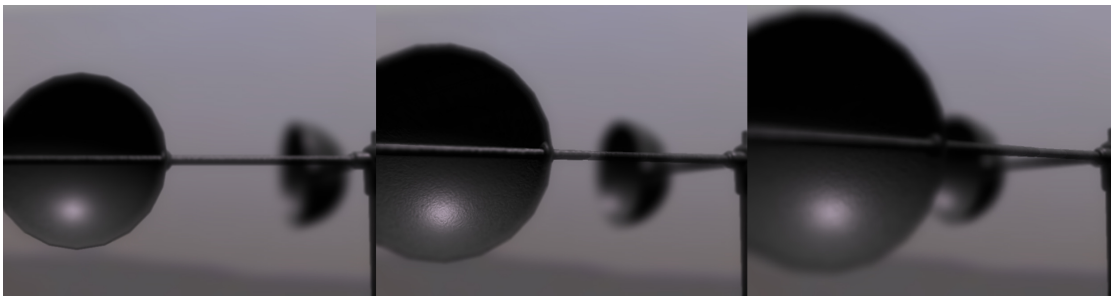

fig:21 Rendered still sequences from *Pylons 2* (2011) ~ Object oriented animation

Projection Screen ~ A projector was located in the ceiling space where it was positioned to point towards the floor within the exhibition area. The projected image incorporated the silhouette of a pylon where the image gradually shifted its position across the exhibition floor.

The rationale for the image was to add a further variant to the spatial information available to the viewer, an additional plane of spatial understanding, suggesting perhaps an external light source, providing a potentially contrasting subjective reference.

3.3.8 Outcomes

As a result of the exhibition questions were raised concerning process and medium. Discussions that took place during the set up and event itself brought

to light a concern for the act of making over and above a quest for perceptual, realistic illusion or narrative, i.e. the process of constructing the images foregrounded questions relating to that process, how were the images manufactured, and the material process involved? Also, from a pictorially subjective point of view, it was noted that viewers attempted to establish geographical locations within the abstract works, to read into the animation's points of reference, tried to establish distance or sought to orient themselves within the intentionally conflicting environments presented to them. This subjective connection between the works and the creation of personal imagined landscapes speaks of new spaces, generated by the viewer, instigated by 3-D CGI. Audio assisted in this respect by providing a foundation for the=

Main discussion points can be summarised as relating to:

(1) Ideas around the authorship of the material, if the animations were based on or included live footage and manipulated.
(2) If the material was manipulated and if so how?
(3) Questions were asked about the construction and production process of the animations/images.
(4) Questions about the profilmic and the arbitrary.
(5) Comments relating to space, interpretations of space within the frame as well as the spatial relationships between the works within the exhibition.

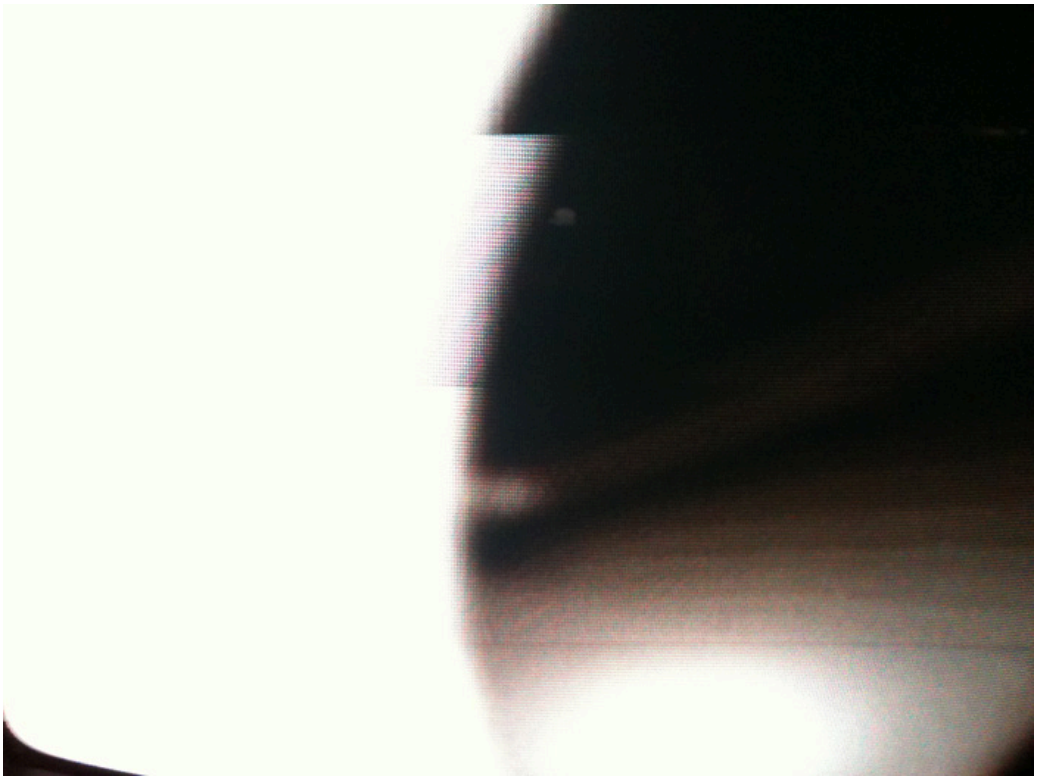

fig:22 Photographs taken at the installation site at MOSI, *Pylons 2* (2011)

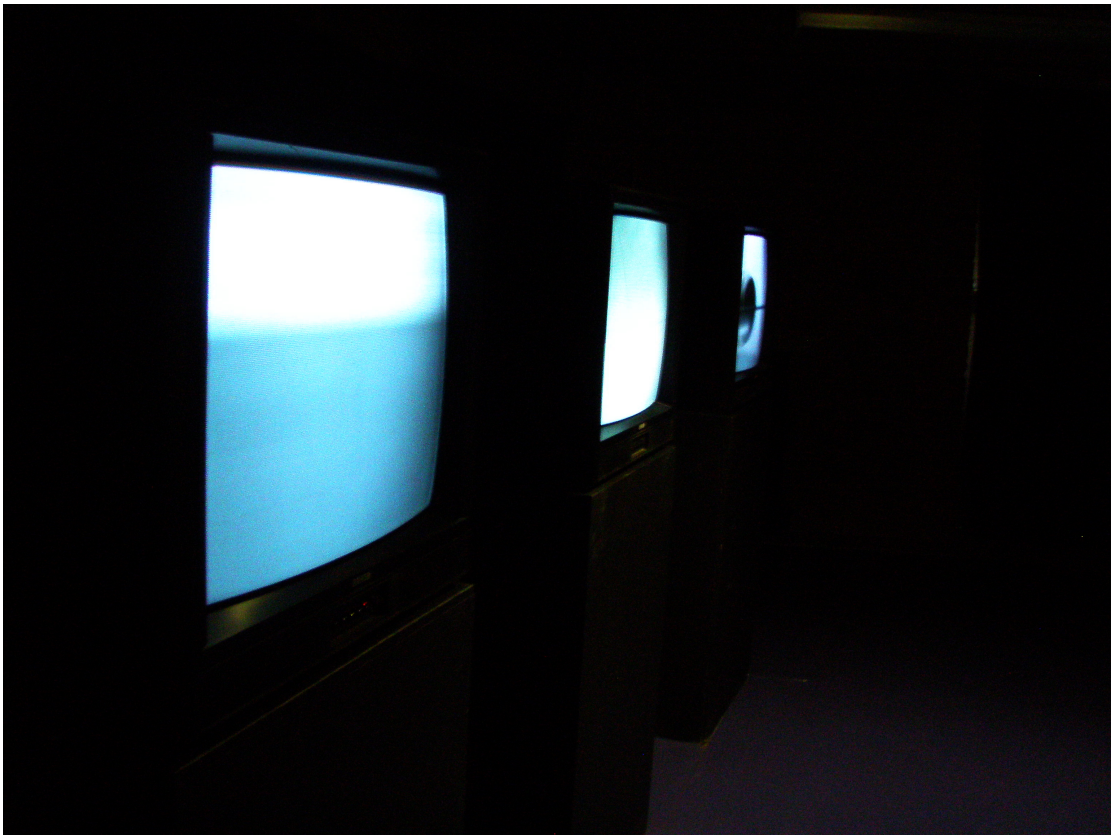

fig:23 Photographs taken at the installation site at MOSI, *Pylons 2* (2011)

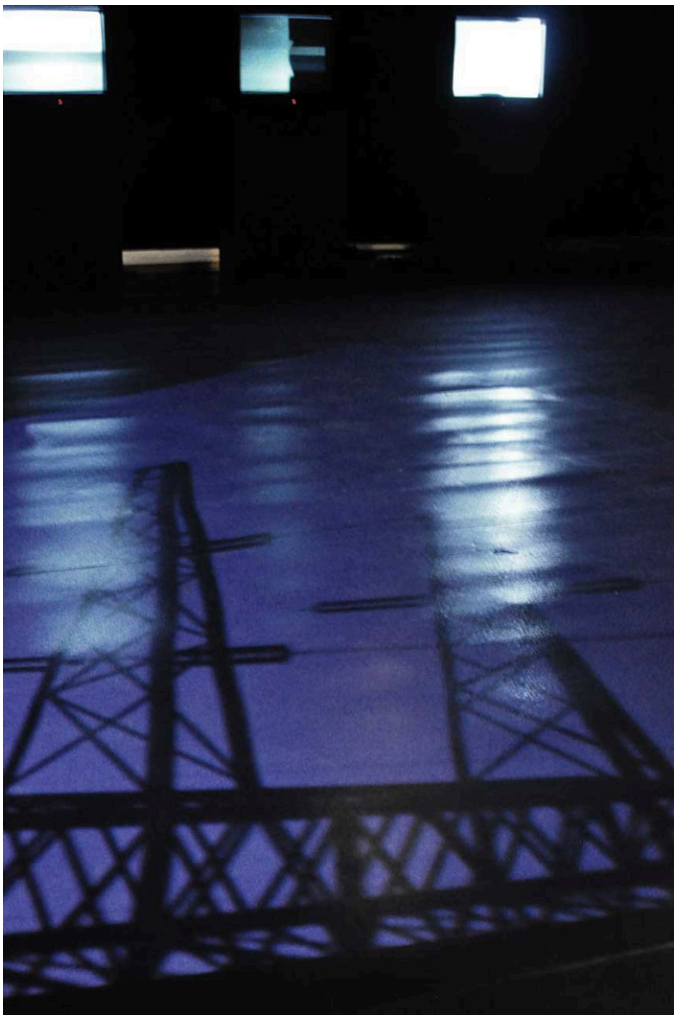

fig:24 Photograph taken at the installation site at MOSI, *Pylons 2* (2011) showing floor projection

fig:25 Image taken at the installation site at MOSI, *Pylons 2* (2011) showing floor projection

3.4 Conclusion

The work produced during the *Pylons* series opens a discussion in two key areas; 1) *capture and process*, the virtual camera in relation to 'recording', a reworking of Gidal's 'process is instituted as process' translated within a 3-D CGI environment; and 2) *presentation and consumption*, how we interface with the spaces that the virtual image produces, the staging or delivery of the 3-D CGI image and our interaction with it.

(1) Capture and Process: Structural/Materialist film seeks to discuss the concept of 'process establishing process' via the manipulation and application of pro-filmic devices such as the "dissolution of imagery through extremes of darkness and light" (Gidal, 1989, p.16) or the opposition to fetishization relating to profilmic meaning (Gidal, 1989, p.35). Within 3-D CGI an ambiguity concerning the remit of the virtual camera as well as the relationship between the virtual camera and what we might conceive as pro-filmic in the virtual world offers a different hierarchical structure between image, filmmaker, and viewer when compared to traditional film practice. The virtual camera within a 3-D CGI environment in most instances exists as integral to the production of the virtual 3-D image, a mediator between image (what might be considered as filmic) and the pro-filmic.

> Movies made with a camera involve light and some variety of photo-sensitive material: the film stock, CCD chip, etc. The results of the encounter between light and sensor become the images.
>
> A virtual encounter between a simulated camera and virtual light acts to mimic the properties of a real encounter, whatever the parameters of the virtual camera may be; however, because this encounter is virtual, it offers the possibility for cameras whose form and function are impossible in the physical world; the dynamics of encounter between virtual sensor and virtual light can also be modified in ways inconsistent with physical reality, and can even violate the laws of physical reality if the programmer chooses.
>
> The digital variants of this pairing become apparent through CGI. Digital imaging either simulates the optical effects of cameras, or it alters the image graphically as a two-dimensional construct. (Betancourt, 2004, pp.22-23)

In *Pylons* these relationships triangulate to establish a dialogue between image, viewer and process, where concerns about subject and object, as well as the spaces that are formed as a result of this activity, was noted.

(2) presentation and consumption - Space as Material: Via this project I argue that, unlike film where the carnal properties and traces of production (such as surface scratches and impurities generated during processing) can be a measure of materiality, that instead, in 3D CGI materiality might be measured in terms of its spatial/temporal properties and the manipulation of these characteristics.[38] The work here posits that the concept of *materiality* in relation to 3-D CGI might not reside in its supposed surface properties, for example;

> It must be made clear that a film which deals with/through grain or scratches for example is no less referential or significatory than one which contains recognisable photographic images. All events are contingent on other events and all carry, to some degree, an inscription from those on which they are contingent. A scratch, in standing as a result of its making, not only refers to the material on which it is made, or the material fact of its making, but also initiates a complex signification through the 'how' and 'why' of the act. (Le Grice, 2001, p.168)

but instead in 3-D CGI's ability to form and reform our experience of space.

Furthermore, the process of production and presentation of the work so far has led to the proposition that properties associated with 3-D CGI virtual space might be explored beyond the limitations of the screen, or more specifically beyond the confines of the pictorial space contained within the image. By attempting to extend the virtual space into the realm of an actual space, can these qualities be examined (in a physical space) and how might this be investigated? The introduction of audio into the presentation of the work and into the exhibition space also played a part in conceiving of virtual space as existing beyond the screen. These ideas lead the project in the next section of

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[38] This might be seen as opposing more common attempts to define digital material through digital artefact and technological traces 'glitch aesthetic' or 'glitch art' theory (for example see Cross, S. (2013) *Glitch, Please: Datamoshing as a Medium-specific Application of Digital Material,* Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces).

this research where the concern is to establish characteristics unique to 3-D virtual space in relation to a real-world space. To expand the language in-line with the principles of Structural/Materialist film as a way to further acknowledge and expand the material aspects of the medium, ideas initiated and investigated via the installation at MOSI.

Finally, as Power points out it is the

> [c]apacity for simultaneous multi-projections needs to be built into the compositional space and many problems remain to be solved with such systems. However, the seamless integration of multiple perspectives with appropriate lighting, shadows and effective artistic control may provide a projection palate freed from the hegemony of the quasi-objectivity of perspective, enabling the animator to choose dialogically what aspects of the scene to accentuate, from what angle and to what aesthetic effect. (Animated Expressions: Expressive Style in 3D Computer Graphic Narrative Animation, Pat Power, Animation 2009; 4; p.107)

It is the liberation of 3-D CGI from its linear perspective-driven perception and visual culture conditioning that I take forward and which forms the basis for the next chapter.

Chapter 4: Object and Environment

4.1 Introduction: *Object, Space and 3D*

The previous chapter considers a connection between 3-D CGI, space and (screening/viewing and presentation) environment[1]. Here space is presented as a malleable[2], pictorial mechanism to support digital visual (spatial) representations where it asserts varying perceptual roles; subjective, objective, physical, virtual.

In this context, space can be thought of as a concept employed to manipulate a viewer's perception of a scene (as in Chris Landreth's *Ryan* (2005) see fig.26) or introduced as an overt mechanism to discuss fabricated space within a scene (for instance in John Gerrard's spatial landscapes, the idea of CGI space is initiated as a way to examine his computer-generated vistas). Space as a device within 3-D CGI can also be worked to suggest or foreground material aspects of production, to underline process within animation, for example in David O'Reilly's *Black Lake* (2010) the spectator is taken through the image space via a system of visual loops where the notion of space is revealed as a part of the process, as integral to the film's construction. Thus the concept of space as a visual device and as a means to foreground process is not fixed, embodying the potential to both manipulate and be manipulated.

[1] Specific reference is made here to the exhibition at MOSI (Manchester) as discussed in Chapter 3.

[2] Aylish Wood attempts to unpick ideas around digital space in relation to 3-D CGI. In chapter 2, *Software and the Moving Image: Back to Screen* (2015) she discusses digital space in its various manifestations, from screen space, interface space to representational space (p.60).

Fig:26 Still from Chris Landreth's, *Ryan,* (2005)

Fig:27 John Gerrard, *Cuban School,* (2010)

(Image Source: johngerrard.net)

Fig:28 Still from David O'Reilly's, *Blake Lake,* (2010)

This chapter unfolds through practice, ideas relating to space to discuss 3-D CGI; space and object, space and image, space and environment. Via these topics the work initiates an exploration of presentation methods for 3-D CGI, examines the role of spatial (presentation) environments, and finally, contemplates how these concerns might work together as a means to address notions of medium distinctiveness for 3-D CGI animation. To advance this enquiry I introduce and reference artists and filmmakers whose works investigate perceptual, phenomenological, experiences of the viewer and/or comprehend relationships between image, the *presentation* space and the arena for exhibition (the stage for the image) as critical to delivering their message. For example Anthony McCall's *Line Describing a Cone* (1973) looks at the immediacy and reality of the 3D projected image,

> *Line describing a cone* deals with one of the irreducible, necessary conditions of film: projected light. It deals with this phenomenon directly, independently of any other consideration. It is the first film to exist in real, three-dimensional space.
>
> The film exists only in the present: the moment of projection. It refers to nothing beyond this real time. It contains no illusion. It is a primary experience, not secondary: i.e., the space is real, not referential; the time is real, not referential.' (McCall, Cited in Hatfield, 2006, p.62)

In a related fashion, Lis Rhodes *Light Music* (1975) discusses in comparative terms environmental and spatial qualities (Curtis, 2007).

Such illustrations provide models of practice that could be used to assist a navigation towards a 'physical' or 'realworld' experience for 3-D CGI. For instance, in Lis Rhodes' *Light Music* (1975) a focal point of the work is the staging of the apparatus within the smoke filled space of the exhibition, "[…] making tangible the pulsing light-beams." (Curtis, 2007, p.234)

> Light Music is an innovative work presented originally as a performance that experiments with celluloid and sound to push the formal, spatial and performative boundaries of cinema. An iconic work of expanded cinema, it creates a more central and participatory role for the viewer within a dynamic, immersive environment. (Tate: Lis Rhodes Light Music, http://www.tate.org.uk/whats-on/tate-modern-tanks/display/lis-rhodes-light-music, Accessed January 2014)

Can such ideas or formulas act to shape an exploration within 3-D CGI? Can virtual objects be made tangible within a real-world space?

Fig:29 Anthony McCall, *You and I Horizontal,* (2006)

(Image Source: Spruth Magers "Installation view at Institut D'Art Contemporain, France – Photograph by Blaise Adilon)

Fig:30 Anthony McCall, *Line Describing a Cone, During The Twenty-Fourth Minute* (1973)

(Image Source: Spruth Magers "Installation view at the Whitney Museum of American Art Exhibition "Into The Light: The Projected image in American Art 1964-1977 (2002)" – Photograph by Hank Graber)

Fig:31 Lis Rhodes, *Light Music*, (1975)
("Installation view The Tanks: Art in Action (2012) TATE" – Photograph by Author)

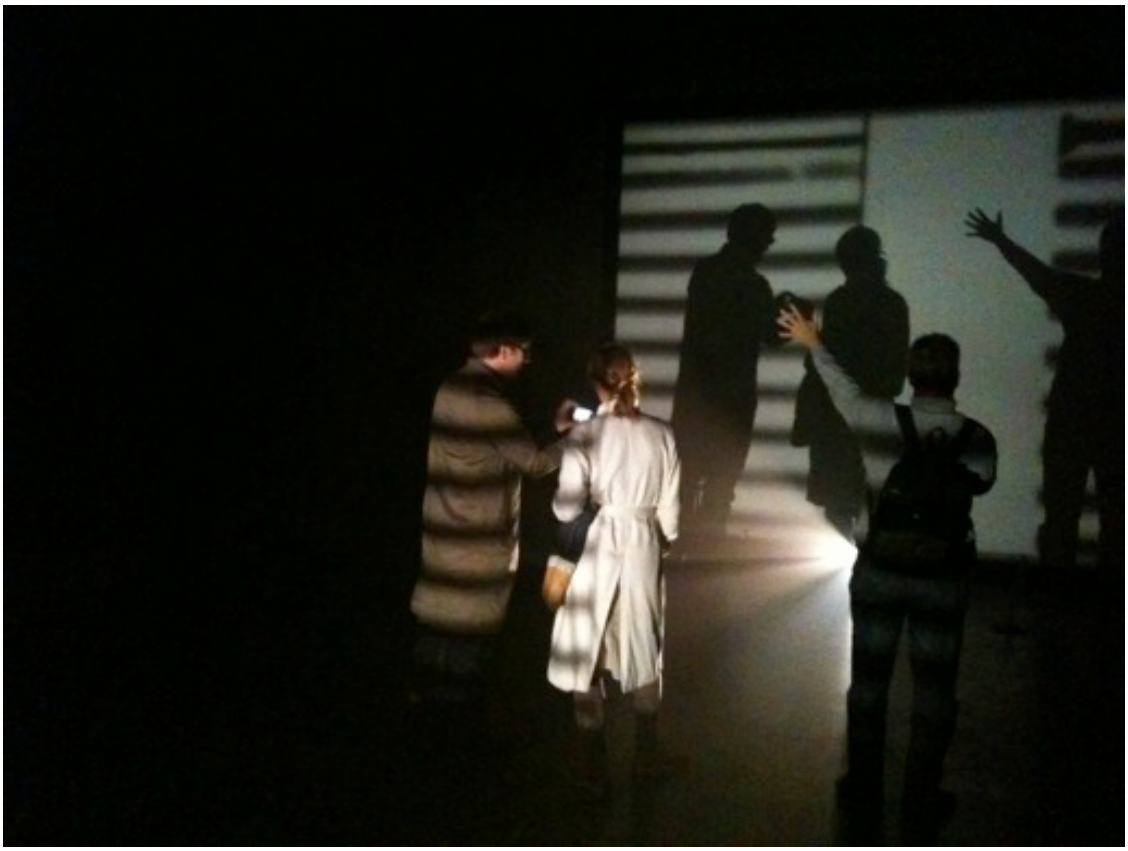

Fig:32 Lis Rhodes, *Light Music*, (1975)
("Installation view The Tanks: Art in Action (2012) TATE" – Photograph by Author)

James Turrell's *First Light* (1989-1990) series provides a further model where 3D images/objects in real space environments offer a philosophical connection to artists working within an architectural, spatial domain. Turrell's work, which concerns relationships between space and light, determines the illusion of space with light. Or more precisely, Turrell manipulates light as 'material' within a space as a way to transform the perception of that space. Space affected by light, to manifest an image. Such work highlights an ambition to re-present space through the management of light, and to re-present light through space (Turrell, 1998). "It's about perception. For me, it's using light as a material to influence or affect the medium of perception." (Govan, 2011[3])

Turrell's manipulation of light prompts and addresses questions concerning the presentation of 3-D geometric forms as a means to problematise the optical (illusionary) transition from two-dimensions to three-dimensions, an idea that relates directly to 3-D CGI which is to built upon a similar intellectual construct,

> […] how does a three-dimensional sphere manifest in a two-dimensional world? Mr. Square sees it only as a dot widening into a circle that then shrinks back to a dot and disappears. But the sphere speaks to Square, and then it takes him into the world of three dimensions. (Turrell, 1998, p.25)

4.1.2 Presentation of Space: Space and Environment

Space within the context of the case studies above is central to process and in these instances space can be seen to offer three spatial contingencies: 1) the exhibition area itself as a spatial arena containing image, viewer, and a stage for the projection event, 2) spatial objectification of the image, i.e. the equipment or the medium is arranged in such way that the image is presented as a three dimensional manifestation within the exhibition area; for example

[3] (Turrell. J, interviewed by Michael Govan, http://www.interviewmagazine.com/art/james-turell#_, published 2011)

Fig:33 James Turrell, *Projection Pieces,* (1968/9) - *A Turrell Projection is created by projecting a single, controlled beam of light from the opposing corner of the room.*

(Image Source: jamesturrell.com)

projected light as object, 3) in the case of *Light Music*, the incorporation of a two-dimensional visual space, i.e. the abstract content of the film projected as a planar image in addition to the other forms of presentation within the exhibition.

Fig:34 James Turrell, *Projection Pieces*, (1968/9)

(Image Source: jamesturrell.com)

The work of Rhodes, Turrell and McCall outline possibilities for the image to exist in multi-spatial, multi-dimensional forms and provide pertinent reference points from which to develop and to inform this part of the research project. From such a foundation, questions can be raised concerning the multi-dimensional presentation possibilities of 3-D CGI animation; for example, how might a 3-D CGI object be presented or re-presented within a real-world physical space?

This section of the thesis seeks to test ideas to do with space, environment, the transitional spatial possibilities of the image, and concerns for moving the viewer's perceptual relationship of form from one of dimensional representation of an image (primarily as a 2-D screen presentation) to conceive of another (ostensibly a 3-D illusion in the physical world). As a basis for the research the work discussed here builds upon conclusions from the previous chapters where the relationship between computer space, image space and exhibition space is posited as having the potential to exist beyond the limitations of the screen, or more specifically beyond the confines of the pictorial space contained within the image on screen.

4.1.3 Terminology: Internal and External Space

Computer space is discussed here as the mathematically generated space created within the computer, an abstract space that can only be realized visually via appropriate display equipment designed for its realization and presentation (such as a computer monitor and/or digital projector) and which I shall call *internal space*. In contrast the physical space, the environment within which the image is presented, the stage, the exhibition space or the geographical location within which the presentation exists or is manifest, I shall refer to as the *external space*.

To better understand space and the relation between space and 3-D CGI the challenge set here is to represent a 3-D CGI space within a real space, a method to bring forth the idea of space as a leading component within 3-D CGI. It is therefore the interaction between these states, (the *internal space* and the

external space) as well as the existential phenomenological relationships that bind these two spaces that act as the primary focus for this section of the thesis. As such the work discussed within this chapter presents an exploration of 3-D CGI as a tangible spatial interface where one mode of spatial representation operates in relation to or within the domain of another, an extension of Galloway's shifting, mutating interface that transfigures media in respect to their associated technologies[4]. Equally the ideas contained here allude to or reimagine what Kandinsky refers to as *inward* and *external* phenomenon, a thought articulated in his narrative *Point and Plane to Line* (1926) that discusses *External/Internal* planes and the boundaries that separate them.

> Every phenomenon can be experienced in two ways. These two ways are not arbitrary, but are bound up with the phenomenon – developing out of its nature and characteristics:
>
> Externally-or-inwardly.
>
> The street can be observed through the windowpane, which diminishes its sounds so that its movements become phantom-like. The street itself, as seen through the transparent (yet hard and firm) pane seems set apart, existing and pulsating as if "beyond."
>
> (Kandinsky, 1979, p.17)

Within the same text Kandinsky, referring to material traits, declares the 'plane' as a thing that receives information, or in his words 'content' where "The term "Basic Plane" is understood to mean the material plane which is called upon to receive the content of the work of art." (Kandinsky, 1979, p.115). The description here of a 'plane' is pertinent to the argument contained within this thesis. A *plane* (the connection of three points in space as filled) exists within a 3-D CGI world as a primary state, the most basic perceivable (renderable) form, a polygonal triangle representing the building block from which all other complex virtual geometry is constructed.

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[4] For example Galloway introduces polemics concerning the boundaries of media and our interaction with those media as variable. Here the interface can be determined as the image set within the frame, the frame itself or any combination of semiotic or hardware oriented systems. (2012, see pp.34 -39)

Furthermore a similar analogy might be drawn here between Kandinsky's plane and the geometric, computational 3-D CGI version of a plane as only becoming materially authentic until it receives content - referring to the mapping of texture onto mesh geometry, the surface of the 3-D CGI object. A discussion around 3-D CGI in these terms can be seen as useful in establishing an understanding of the process and a supposed material basis for a 3-D CGI object. For instance the content (the texture map) or the projection of this content onto the geometry of the plane in 3-D space provides the fundamental foundation for material illusion within 3-D CGI. For example, the projection of a wood texture onto a 3-D CGI plane simulates the (visual) material properties of wood. If the projection of the texture (the content) changes to one that resembles concrete then the meaning, the codification of the plane changes, the connotation is now one of concrete. It is this layering of image information or 'content' that might be put forward and conceived as a significant process when suggesting a material basis for 3-D CGI objects, in turn this is a concept that forms the origin for a proposed series of investigations undertaken as a part of this project where the concern is space and material.

A final reference that informs the research at this point in the study lies within the central methodology serving this project, a strand nascent within Structural, Structural/Materialist film (and later, Expanded Cinema), which concerns the representation of space. Within this field the constituting elements, the film, the observer and the technology that act together to support the image are often regarded as physically and intellectually linked and as such integrated into the design and manufacture of the works.

For instance Woody Vasulka's *The Brotherhood* (1990-1998) and *Theater for Hybrid Automata* (1990) connect the potential of the computer to distort preconceptions of space from both an "epistemic"[5] and "dramatic"[6] perspective.

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[5] Vasulka talks of a computer space based on the 'digital intelligence' a space without "symbolic interpretations" (Vasulka, W, and Weibel, 2008, p.457).

[6] Dramatic in this sense referring to a theatrical, spatial performance of space.

> Theatre, the media, and film in particular, have developed certain syntactic sets through which a representation of space is mediated. The space itself carries a dramatic function. Particularly in film, the narrative system develops out of a syntax of one shot relating to another. I am trying to figure out how these rules of dramatic presentation are developed and what rules might define a digitally-organized space. (Vasulka, W, and Weibel, 2008, p.458)

For Vasulka the arrival of 'digital' bestows possibilities for a reevaluation of internal and external spatial relationships. The above quotation highlights an interest in the ability of the computer to re-organise physical space, reinforcing a collaborative possibility to exist between the *internal* function of the computer and the *external* interaction of the viewer to one that can be defined spatially.

Fig:35 Woody Vasulka *The Brotherhood,* (1990-1998)

(Image Source: http://v2.nl/archive/works/the-brotherhood-table-iii)

Fig:36 Woody Vasulka *Theater for Hybrid Automata,* (1990)

(Image Source: http://v2.nl/archive/works/the-theater-for-hybrid-automata)

4.2 Practical Project ~ *Pyramids*

To interrogate these ideas (i.e. the connection and interaction between space, object and spectator) within the realm of 3-D CGI, a practical project entitled *Pyramids* was proposed. The work *Pyramids* sought to support the main aim of the overall research project (to discuss the distinctiveness and materiality of 3-D CGI) by imagining computer space as reaching beyond the limitations of the screen and seeking to represent a virtual 3-D CGI space within the real-world as a physical entity. The experiment asked the following question: *Can a 3-D CGI virtual synthetically constructed world/object be represented in a physical external world environment in such a way as to foreground or reveal process, while at the same time support an ambition to increase awareness of material distinctiveness within 3-D CGI?*

4.2.1 Pyramids Project Aims

The basic aims for the project can be articulated in the following ways:

(1) Imitation and Construction

By reversing the *internal* and *external* conceptual paradigm for imitating and referencing 3-D CGI space the project aimed to physically replicate in the real world, the synthetic conditions of an object/environment from a 3-D CGI virtual world. For instance, the *external* space to act as stage for replicating and imitating the mechanisms and apparatus employed within the *internal* (3-D CGI) space; camera position, lighting arrangements, spatial reference, texture information etc[7].

(2) Process: Revealing of Material Through Process

The common process for attributing a textural/material property to an object within 3-D CGI is through an internal computer-based projection technique where (one accepted mode) is to project a texture map of a material onto an object. For example, the process to assign a material attribute of 'wood' onto a default 3-D CGI pyramid object is through the 'projection' of an image of wood material onto the pyramid via a system of texture mapping. The basic function and process can be (in a basic fashion) replicated within a real-world environment through projecting a wood texture onto a real-world pyramid object. This is a simplified explanation of the process of texture mapping but the general principle remains fundamentally consistent[8]. The basic tenet for the *Pyramid* project was therefore to replicate this practice as a means to demonstration this key method of 3-D CGI material construction - revealing space and process through recording process in-line with Structural/Materialist ideology. In this way the project

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[7] Parallels can be drawn between this work and Raban's *Pink Trousers* (1977) where the relationship between the camera and projector is synchronistic; the same device employed as a duel mechanism for both projecting and recording. The work here also shares a similar directive with Raban's *Pink Trousers* in that the pyramid project is intended as an anti-illusionistic piece of work design to comment on process. See http://www.luxonline.org.uk/artists/william_raban/pink_trousers.html

[8] Texture mapping in 3-D CGI is a process in which the user applies a texture (usually a 2D bitmapped image) to a 3-D CGI object. The texture (image) is 'mapped' onto the 3-D CGI object via in relation to the object's associated UV coordinate system which in effect acts as a skin or envelope around the object onto which the texture can be placed and rendered accurately. Other methods for texture application are available for example textures can be applied directly to a 3-D object through 3-D paint tools. However the common process for applying textures to a 3-D CGI object is via texture-mapping.

also references Kandinsky's notion of "the material plane which is called upon to receive the content".

(3) Presentation and existential application of 3-D CGI spatial properties. The intention for presenting the *internal* space to affect *external* space. That is, the aim to replicate and repeat the geometry and textural/material qualities of the internal object, thus reversing a philosophical and ideological construct associated with this form of 3-D CGI presentation; A supposed 3-D object theoretically manifest as a potentially physical real-world 3-D object[9].

4.2.2 Pyramids Objectives: Project Themes

To address the above question and associated themes, the *Pyramids* project set out to:

(1) Reflect on the properties of the virtual object; the process of its manufacture, the propensity of 3-D CGI to communicate or represent material states (stone, metal, wood etc.) and to interrogate the notion of the 'plane' as receiving content.
(2) Investigate spatial/dimensional concerns of 'internal' representation versus 'external' representation, 'virtual' against 'physical', 'edges' and 'interface'.
(3) Foreground 'process' as a mechanism for revealing material.

4.2.3 Elements of the Project

The proposed work was to comprise of the following elements:

(1) A static 3-D CGI model of a pyramid. The position of the pyramid and the position of the camera were fixed and the model arranged at 45 degrees to the camera revealing two exposed sides (see fig.37).

[9] The project also refers to Manovich's discussion of a new language emerging from 3-D CGI as a process of fabrication but also as the translation from idea to 3-D model to physical object is generating new language and syntax.

(2) A physical real-world wooden model of the virtual pyramid was built to the same dimensions as the computer generated one (see fig.38).
(3) Animations produced in 3-D CGI were projected onto the real-world pyramid object. In this instance the projector was directed to replicate the position of the CGI camera located in the 3-D CGI environment, i.e. the distance from projector/camera from object to be consistent in both worlds.

4.2.4 Pyramids: Practical Methodology

The method for this section of the research proposed several mechanisms for gathering data. These included:

(1) To gather information and to inform the practical direction of the project the investigation included practical hands-on participatory research workshops that took place on – (*20th October 2012*) at Edge Hill University, followed by a further practical research workshop (*7th to 10th November 2012*) at Beijing Institute of Graphic Communication.

(2) As a means to test the physical aspects of the work including the practical set-up, an exhibition of the related practice work took place at Edge Hill Arts Centre.

(3) To support analysis and to foster a dialogue relating to the themes of the project a series of artists talks at FACT Liverpool (November, 2012), Cornerhouse Manchester (March, 2013) and Edge Hill Arts Centre (February, 2013) was organised. It was intended that through the presentations and talks that the linked debates would provide valuable opportunities to gather feedback and to develop a deeper understanding of the work that had been undertaken.

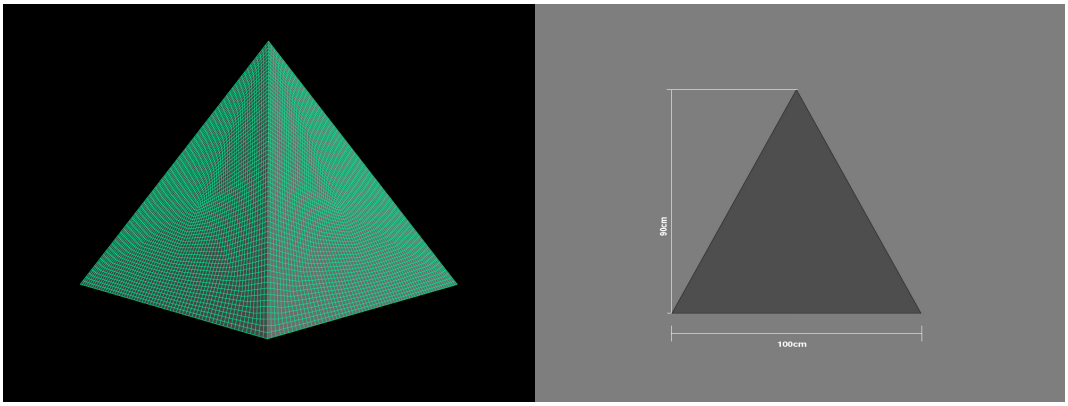

Fig:37 Part of the methodology for *Pyramids* project involved constructing a CGI and physical versions of a pyramid.

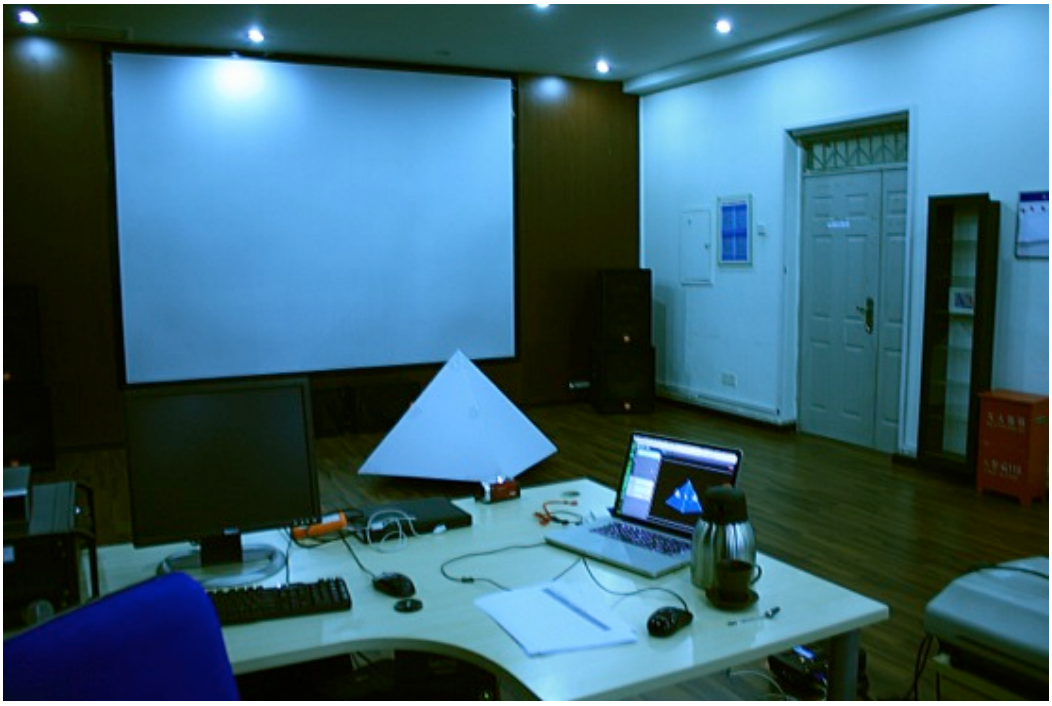

Fig:38 *Pyramids* (2012), Practical Workshop BIGC

Fig:39 *Pyramids* (2012), Practical Workshop BIGC

(Image working with Chinese students, Beijing Institute of Graphic Communication)

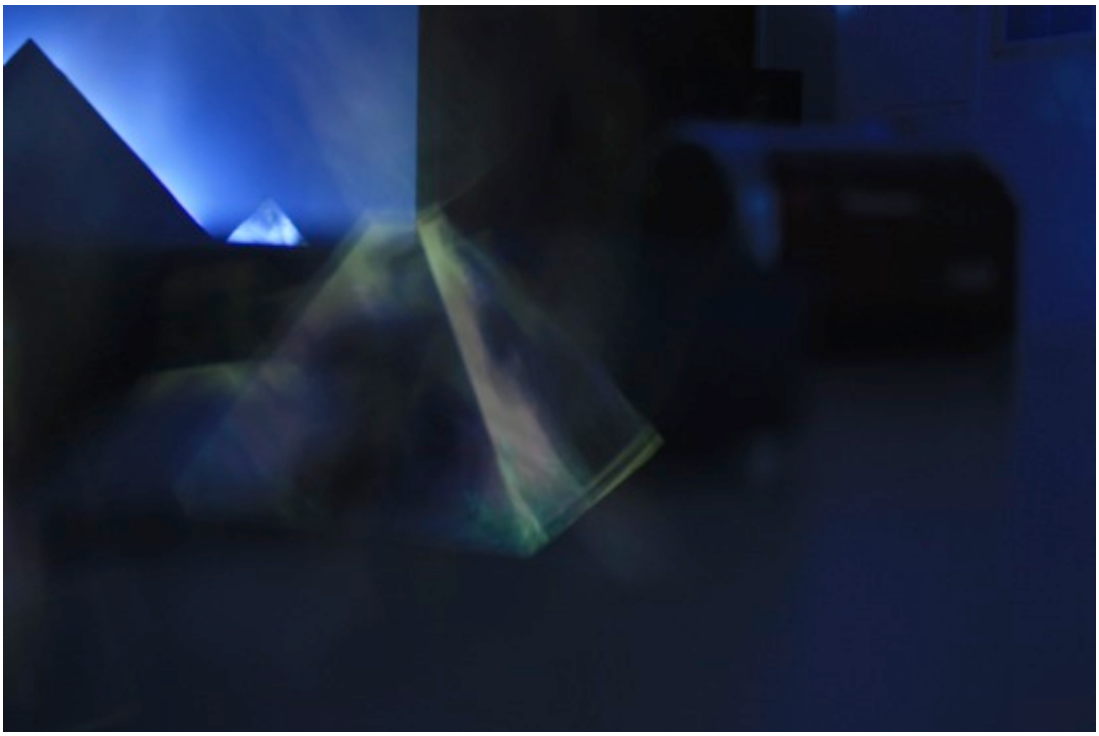

Fig:40 *Pyramids*, (2012) Practical Workshop BIGC

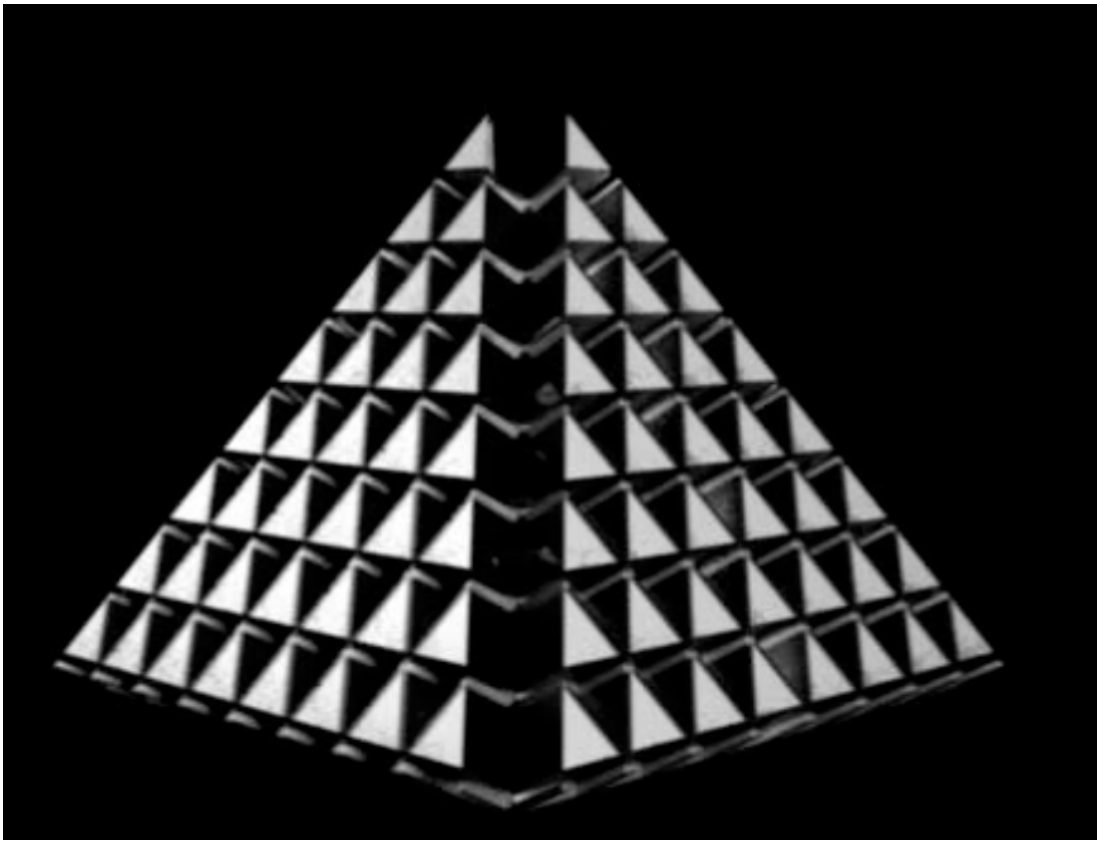

Fig:41 Still from film, *Pyramids,* (2012) BIGC

Fig:42 *Moving Horizontals & Digital Distance* (2012)
(Image from artist talk session, FACT, Liverpool)

Fig:43 Moving Horizontals & Digital Distance (2012)

(Image from artist talk session, FACT, Liverpool)

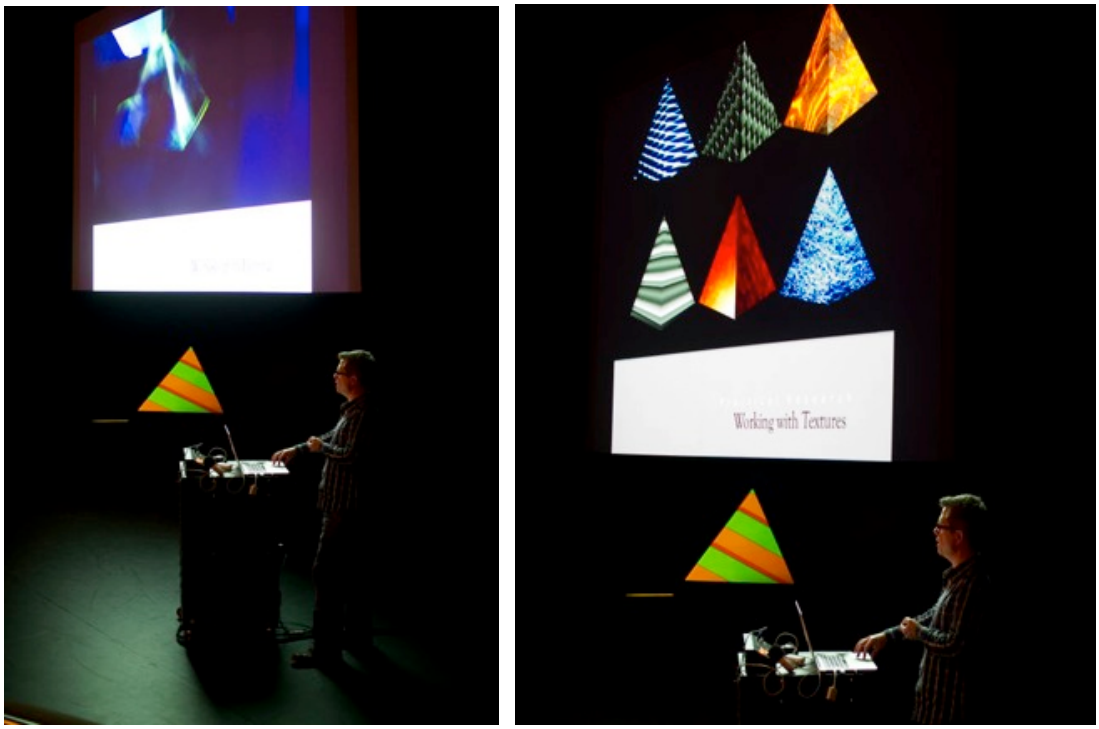

Fig:44 *Plane Spaces* (2012)

(Image from artist talk session, EHU Arts Centre)

Fig:45 *Plane Spaces*, (2012)

(Image from exhibition space, EHU Arts Centre)

Fig:46 *Plane Spaces*, (2012)

(Image from exhibition space, EHU Arts Centre)

4.3 Project Conclusions

The conclusion to the *Pyramids* project, via the activity highlighted above, was that the experiment did promote a sense of material illusion offering opportunities where it was possible to interface with a virtual object in a unique way.

4.3.1 Projection and Description

Discussions suggested the intention to successfully describe the 3-D CGI object, i.e. the virtual pyramid, in a physical space depended upon how well the applied (projected) surface properties appropriately represented traits that would denote the object as (visibly) materially real; the notion of the 'content' of the plane to suggest a material state. In this respect it was noted that when animations were not successful in describing the pyramid form as materially real, that this was largely due to the motivation for the projected animations being concerned less directly with the pyramid as a material form. Rather in these instances animations tended to err towards the concept of the pyramid as a substitute projection screen, i.e. the pyramid offered an interesting base for exploring multi-plane animation projections without necessarily fulfilling the brief which was, to describe the 3-D CGI pyramid in material terms.

4.3.2 The subject of audience expectation

Through a combined dialogue[10] it was suggested that the synthesis of projection and object could be construed as dealing with and presenting the practice of projection-mapping (a process employed within 3-D CGI as a means to imply material nature via illusion and artifice). Discussions also concerned the translation of the image from one image state (3-D CGI) to another image state (within the physical world) thus forwarding the notion of a variable state for the image, as unfixed either spatially or materially, an idea that acknowledges Galloway's concept that, "one must always think about the image as a process, rather than a set of discrete, immutable items" (Galloway, 2012, p.37). Further references to Galloway's work such as the conception of interface, the flat

[10] For example the artist talks, exhibition and workshops.

screen that negates material (supporting the idea of virtual), and the notion of the *Unworkable Interface*,[11] were also considered. In this respect it was conceded that the experiment blurred the moment,

> […] where one significant material is understood as distinct from another significant material. In other words, an interface is always a process or a translation. (Galloway, 2012, p.33)

In addition, the projected event was aligned to and can be seen to address a Structural/Materialist concern, i.e. the dialectic between illusion and the viewer's experience (Gidal, 1976, p.3). The experiments attempted to make the viewer aware, as a viewer, of the reversed polar intentions of work where on one hand the presentation dealt with the illusion of perspective (the *internal* computer generated perspective to reveal the supposed form of the pyramid), and on the other hand, the work was to do with manipulated texture projections on the physical *external* object that acted to reinforce surface materiality. In this way the viewer was asked to perceptually consider both states without prejudice avoiding rigidified concepts of 'freedom and individualism'[12] which, as discussed by Gidal in relation to narrative cinema (Gidal, 1976, p.4), act to inhibit viewing experience.

In this respect the project opened an important dialogue about the spectator's visual encounter and the experience of the viewer. Comparisons were made to the work of both Lis Rhodes and Anthony McCall, where in this instance the 3-D CGI image was discussed as a sculptural entity, a virtual image manifest within a physical context. Conversations referred to the immediacy of the image, a focus of form and object which in turn led to a debate about film and exhibition experiences, the spectator's encounter with film and the experience

[11] Galloway discusses the issues, semantics and false expectations offered by the computer screen in his chapter 'The Unworkable Interface' Galloway, 2012, pp.25-53)

[12] Gidal puts forward that the illusionistic space of narrative cinema is reinforced by photorealistic perspective space in a way that 1) Denies reference to material process of film and 2) That inhibits notions of spectator 'freedom and individualism' within the viewing experience. (Gidal, 1976, p.3-4)

and the perception of the viewer in relation to what might be described as its sculptural aspect.

The above ideas function to connect material to the viewing experience, assist in linking concerns to do with illusion, material function, object and the role of the audience. As such it is these thoughts that emerge, as a result of the practical work produced and that form conclusions from the investigative themes outlined in this section of the research.

The work in this section also fostered a concern about the viewing audience. Here it is not the act of the viewing experience that is of interest, but the anticipation of the viewing experience, the preconception, notions that the spectator comes armed with an expected understanding of what 3-D CGI is/does, how it looks, its aesthetic, or how it operates as a medium.

It is these ideas, space, material, the role of the viewer and importantly, in terms of pictorial space, an anticipated move away from a central reliance on visual perspective as a means to convey illusions of space on a 2-D screen, that provides a foundation for further investigation within this study and a focus for the subsequent chapters.

Chapter 5: Space and Material

5.1 Introduction

In chapter two of this thesis I introduced phase one of this practical project where the goal was to initiate a reflexive practical discourse relating 3-D CGI to its material based on activities of production, recording and presentation. The emphasis was on surface, the exploration of a medium through its mark-making and the concept of defining a material through its *trace* and durational, digital facture[1]. The emphasis of the research (at this point) was on developing analytical approaches to animation production that concerned the dissolution of form, the implementation of motion-blurring, the breaking-up of the object (its objective representation) and questioning the representational space that such objects inhabit.

5.1.1 Review and Position

In chapter three, I aspired to discuss material through the introduction of the *act* of the (virtual) camera. That the position and the possibility of the camera and its intention (or lack thereof[2]) might instigate a route through which we can traverse the complex immaterial landscape of 3-D CGI in order to locate its own material. Chapter three also proposed an investigation of the arbitrary object in relation to a 3-D CGI environment, where the object is assumed as incidental, a semiotically suppressed component within a synthetic profilmic landscape. Finally in chapter three, methods for the presentation and display of a practical animation research project borrowed from a set of Expanded Cinema principles, where the paradigm for exhibition is concerned with releasing the 'object' from the confines of its screen-centred heritage, aspiring instead to incorporate the viewer and equipment of presentation as part of a material (indexical)

[1] For example Greenberg's intention to locate a mediums material to determine a representation and reading of space within the frame.

[2] In chapter 3 the camera was introduced as a disinterested observer of the scene where the interest in the camera was its position within the environment and not its (supposed) profilmic interest.

experience[3]. Chapter 4 takes these ideas further where it attempts, via a practical exploration, to reverse a material/immaterial hierarchy.

The conclusions arising from this combined research activity (which includes a study of presentation spaces, screen spaces, image spaces, represented and implied spaces), converge to steer the investigation away from dealing with traditional, physical[4] or artefact-driven, explanations of what material might be (applicable in instances such as video or that of film) to a philosophical or conceptual interpretation of a material, where the traits for 3-D CGI might be discussed as an interaction with the qualities of space.

Building on the observations and analysis outlined in the previous chapters, a new focus for the research emerges where, in attempting to establish a materiality and distinction for 3-D CGI, the idea of 'space' becomes fundamental to its enquiry.

5.2 Traditions of Space and Perspective

The representation of space within Western visual cultures has evolved from a mathematical (re)construction of our three-dimensional world, based on systems of linear perspective and Euclidean/Cartesian theoretical models of space (P. Heelen, 1983). As a historical lineage, 3-D CGI emerges as a distant relative of Quattrocento image-making where it is forged from (and privileges) the perspectival conviction adopted by Western visual and cultural ideologies[5];

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[3] Spielmann alludes to the possibilities of an image operating beyond the limitations of screen via feedback mechanisms see (2008, p.10). Also, Youngblood provides useful examples where through expanded cinema models, technology is employed to diversify from single, fixed screen experiences.

[4] Here I refer to a traditional modernist understanding of material being associated with physicality that might be discussed, for example by Greenberg in his discourse on painting.

[5] Perspective is presented here as the 'dominant' visual mechanism for describing space. Other methods such as isometric and axonometric projection (used extensively within Asian art as well as within video games production) as well as hyperbolic representations of space are acknowledged here. However linear perspective is the dominant method of spatial visualisation.

which in turn continues to understand space as objective (i.e. measured and metric)[6]. It is in this way that the narrative, the function and the basis for 3-D CGI image-making is framed. For example its essential relations are with (a perspective-driven) photographic idiom whose methods are honed to assume a position from which to command and manipulate objective spatial relations. Therefore when we conceive of the image produced by 3-D CGI we are at the same time measuring its cultural position and its location within this heritage.

Consequently we might consider our system for *understanding* visual space[7] (when referring to 3-D CGI) as linked to and assimilated from, that of film and photography (which is itself a codification system for establishing space and spatial relations[8] predominantly based on an objective understanding). This subject, (referring to film) is discussed in Stephen Heath's article *Narrative Space* (Heath, 1976) where he talks of an absolute relationship between the camera (including its associated paraphernalia; lens, projection, film etc.) and space. For Heath it is the spatial construction that binds space to frame to narrative, which in turn acts to suggest a strong relationship between space and film.

Within 3-D CGI it is my belief that the complexity of this relationship is even more profound, further integrated and increasingly irreducible. If in our consumption of the 3-D CGI image we add to this mix the additional perceptual complexities associated with a virtual camera (within 3-D CGI as discussed in the previous chapter), and include a further dimension offered through multi-screen and image-object[9], as well as the spatial potentials that exist between

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[6] Ivin's text *The Rationalization of Sight* (1976) on perspective and the emergence of perspective within Western societies provides a comprehensive account.

[7] Visual space in this context refers to the space as perceived and understood by the viewer via perceptual means, predominantly visually.

[8] For example I have discussed this in previous chapters in terms of 3-D CGI adopting features such as motion blur and focal distance as implied filmic concerns.

image and viewer, then it becomes a complex visual and intellectual system where at its centre is the notion of *space*.

It is against this backdrop that this chapter takes the first step in the proposition that space be considered as the leading quality of 3-D CGI animation, a quality that distinguishes it from other media formats. To support this claim I introduce current 3-D CGI work by animators who can be considered as working with and/or expanding the traditional spatial territories within which 3-D CGI animation operates. I do not, at this point in the thesis, attempt to *prove* a definition for space, and although I introduce the concept of space (within the context of this study) as falling broadly into two categories, subjective and objective, I do not enter into a mission to qualify these assertions or their existence. Instead the intention here is to present the ideas and the work outlined within this chapter as illuminating a possible avenue for research leading to a focus on space within 3-D CGI and its potential.

In his essay *Art and Objecthood* (1967) Michael Fried discusses a pressing dialectic facing modernist Artists circa the 1950s and 1960s; a subjective/objective conflict between pictorial illusionism and image surface as object (Fried, 1967). This chapter explores a potentially similar tension concerning (abstract) film-space, pictorial (spatial) illusionism[10], within 3-D CGI and image relationships with the viewer.

Through referencing Structural/Materialist filmmaking this section of the thesis examines how the disruption of the illusion of space within the image might assist in revealing process or act as a way to suggest or explore medium. Via this approach I consider relationships around camera, viewer, animator, object and production where the aim is to address the material nature of 3-D CGI and

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[9] For a useful discussion on image as object see Fried and his essay *Art and Objecthood* (1998). Also, the importance of extending the display to incorporate multi-screen experience lies in the juxtaposition of varying layers of profilmic landscape/object representations.

[10] Heelen provides a comprehensive, scientific account of the illusion of space and our perceptual responses to both illusion and phenomenal geometry. (Space-Perception and the Philosophy of Science, 1983)

its operational/functional space.

5.3 Refiguring Space: Space as Material

Many Structural/Materialist films lay claim to challenging the illusionistic space of cinema in favour of alternative methods and solutions to analyse the medium of film. Consequently, it is typical for films within this body of work to be considered as delivering works that largely underscore film as material, film as object, or film that exits in an attempt to define the idea of space in a conceptually different way to mainstream, perspective-driven, photo-realistic illusion. For example, Paul Sharits's films,

> […] are clearly "artistic" experiments - (nearly) abstract, non-narrative works that, although they use film, fall outside of the realm of what one typically thinks of as mainstream cinema. Both works unambiguously seek to trouble the perspectival illusionism that structures dominant cinematic forms, whether by emphasizing the function and materiality of film or by drawing attention to the subjective nature of perception itself. To this end, they ask their audiences to consider similar questions: What does it mean to be denied entry into the films' illusionistic space? What are the constitutive elements in how one experiences a film?[11] (Mondloch, 2010, p.8)

Mondloch presents Sharits's films as a means to confront or an attempt to deny an audience's access into the illusionistic space afforded by mainstream cinema, surmising that the representation of space within film is not fixed but flexible.

Through this part of the research my intention is to explore and add to this discourse by questioning how screen space is depicted and received. The examples provided might not necessarily or directly seek to refuse the viewer access to illusionistic space (as in Sharits), but instead endeavour to speak about attempts to disrupt experiences of visual space (Gogel, 1990[12]) or break

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[11] Also see Sharits' essay *Words per Page* (1972)

[12] Gogel's article about phenomenal geometry discusses the illusion of space and our perceptual markers: *"The geometry of perceived space (phenomenal geometry) is specified in terms of three basic factors: the perception of direction, the perception of distance or depth, and the perception of the observer's own position or motion."* A theory of phenomenal geometry and its applications" (1990)

conventional expectation concerning film space and its remit[13].

The supposition at this juncture of the thesis is that space within 3-D CGI is fundamental to its function to construct and present visual space. I also put forward that when visual space (generated by 3-D CGI) becomes distorted, manipulated (away from expected perspective representation) or foregrounded, (via abstraction, representation, replication), that a viewer's understanding of that space and its associated narrative is altered. This hypothesis hinges on the idea that inconsistencies (either simple or overt) or visual nonconformities that occur within a pictorial-illusion can be sensed perceptually and have measurable effects. As a result, this process in turn can act to assist in breaking an illusion of space thus helping to provide distinction of process and ultimately a sense of material.

> […] complex cognitive models of reality, which are already formed in a person's mind, control, consciously or unconsciously, the fixation and duration of eye movements. These models of reality, which all of us have, consist of hypotheses about the perceptual world that are constantly being tested against current visual sensations. (Solso, 2001, p.133)

Consequently, our contextual experience leads us to a certain visual expectation. When our expectations are not fulfilled we are in disagreement and a tension arises. As we have seen in Structural/Materialist work it is often the building of an intellectual tension that disrupts expectation which can assist to reveal material traits.

Animators such as Chris Landreth, David O'Reilly and John Gerrard play with an expectation of spatial representation by relocating the idea of space beyond its normal illusionistic configuration and representation within a 3-D environment, often with the ultimate aim of generating disorientating relationships between image and viewer (Coleman et al., 2004). It is this extension of an illusionistic space within 3-D CGI that I intend to explore as a way to address material concerns of 3-D CGI.

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[13] In his book The Language of New Media, Manovich discusses spatial constructions within new media that can be deemed as a media type. (Manovich, 2001, p.251)

5.4 Manipulating The Representation of Objective Space

The invention of single point perspective has often been heralded as one of the most significant events of the Renaissance[14] and undoubtedly the importance and effect of this visual system resonates far beyond its role as a mechanism for illusion or the two-dimensional representation of objects to form places in space[15].

In his article *The Mapping of Space: Perspective, Radar, and 3-D Computer Graphics* (1993) Manovich reminds us (through Ivin) of the far-reaching (social, cultural and representational) applications of perspective that binds a knowledge and understanding of objects located in the actual world, to representations of those objects, adding that "…perspective allows us not only to represent reality but also to control it." (Manovich, 1993, p.3). It is through an investigation of the power of perspective (as a consequence of our facilities for perception and experience) and its influence to control our response to representational space afforded by 3-D CGI, that might bring us closer to an understanding of 3-D CGI. For example, in *Ryan* (2005), Chris Landreth seeks, through a complex system of nonlinear perspective projections, to capitalize on perceptual mechanisms for visualizing the geometric world[16] and our conditioned approach to accepting linear perspective as a true two-dimensional depiction of it.

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[14] See Ivin cited in Manovich, (1993, p.2)

[15] Ivin (1976) broadens the discussion and relative influence of perspective from purely visual device to include the impact of a perspective system on the development of physical objects such as engineering and architecture.

[16] Mary Domski compares Newton's absolutist position against Kant's transcendental understanding of the world, which acknowledges the importance of a pre-knowledge of spatial features to our representation of space. Domski, D. (2012) 'Kant and Newton on the a priori necessity of geometry' *Studies in History and Philosophy of Science,* Part A Volume 44, Issue 3, September 2013, Pages 438–447

The film *'Ryan'* made within the canon of documentary filmmaking, aims to expose the psychological profile, and the professional/personal demise, of its main character, animator Ryan Larkin. The animation depicts an emotional (as opposed to photographic) realism and demonstrates Landreth's interest

> […] in what he calls psycho-realism, 'in co-opting elements of photorealism to serve a different purpose; to expose the realism of the incredibly complex, messy, chaotic, sometimes mundane, and always conflicted quality we call human nature' (Landreth, 2004, as cited in Power, 2009, p.118).

fig:47 Preproduction artwork from *Ryan* (2005) demonstrating multiple perspective systems (Coleman and Singh, 2004).

(Image Source: Coleman and Singh, (2004) *'RYAN: Rendering Your Animation Nonlinearly projected',* Proceedings of the 3rd international symposium on Non-photorealistic animation and rendering*)*

During the film, changes in the geometric stability, achieved through distorting single point perspective as well as through controlling visual techniques such as lighting and shadow, (Landreth, 1995), add to a viewer's disorientation in their experience of the scene.[17] (Power, 2009)

In the film, Landreth's objective is seemingly to engage the audience with the character in a particular way and to create a certain mood within the film. Largely the result is achieved via traditional film/space conventions which have been adapted and distorted. Specifically, it is through manipulating the pictorial space within the film that helps Landreth redefine the material nature and reception of 3-D CGI animation where he is able to reconfigure a perceptual reliance on traditional rules for imitating a three-dimensional space.

> To achieve this he uses 3D graphics to reflect the characters' states of mind, and the 3D scenes include expressive non-photorealistic rendering and multiple, warped, non-linear, simultaneous perspectives. (Power, 2009, p.119)

This is perhaps most evident in the bathroom scene in *Ryan* where the change in perspective form and the distortion of familiar spatial cues is at its most acute, presenting,

> […] a novel approach that distorts scene geometry such that when viewed through a standard linear perspective camera, the scene appears nonlinearly projected. (Coleman and Singh, 2004, p.1)

The subtle deviation and alteration of perspective in this film and the introduction of mapping multiple non-linear projections within a single scene brings forward the claim that the representation of space within 3-D CGI is not fixed, that opportunities exist within 3-D CGI to break perspectival convention and that space or the concept of space can be qualified as a part of a mediating vocabulary. Power notes that Landreth,

> […] was motivated by the surreal storyboard and inspired by the artwork of people like Picasso, Dali, Albright and Bacon to develop a system (subsequently implemented in Maya) that could render out multiple

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[17] Patrick Coleman and Karan Singh, note that *"deviations from linear perspective are used to convey cinematic mood and a character's state of mind. Given that humans have a strong mental sense of linear perspective, subtle variations in perspective provide an animator with the ability to generate a sense of uneasiness in the audience to reflect the mood within the animated environment."* (University of Toronto NPAR '04 Proceedings of the 3rd international symposium on Non-photorealistic animation and rendering, 2004)

> simultaneous projections and camera angles to a single frame. These warped nonlinear projections helped express the characters' psychological perspectives and could also be used to create cinematic mood or create a sense of uneasiness in the audience[18] (Power, 2009, p.121)

By adjusting spatial arrangements within the frame Landreth does not deny the viewer access to illusionistic space. Instead his intention is to bring the viewer into a manipulated space, pulling the audience into a normative 'psychological' frame (Hamlyn, 2014), to explore the territory beyond the boundaries of single point perspective. Through a reconfiguring of 3-D CGI environments away from accepted visual normality Landreth might be seen as breaking or extending the rules that define the software and its application[19].

fig:48 Rendered still from in *Ryan* (2005) showing the distortion of image and perspective via camera and perspective manipulation.

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[18] In other words, trying to pull them into a normative 'psychological' frame (Hamlyn, discussion 2014)

[19] This can be seen as an extension or distortion of the work by Gogel, who notes *"An observer, upon viewing a three-dimensional visual scene, acquires an internal spatial representation, which can then contribute to or determine responses to that scene"* (Gogel, W. (1990) *'Perception & Psychophysics'*, 48 (2), p.105-123.)

5.5 Actual and Imagined Landscapes

The first section of this chapter introduces two contrasting spatial models, each of which offers an alternative approach to attaining perceptual spatial realism; one based on denying the viewer access to the visual (illusion of) screen space through abstraction (Sharits), and one that manipulates visual (illusion of) screen space through perspectival distortion and perceptual disorientation (Landreth). Both models seek to challenge dominant image-making techniques, ones rooted in conceptualisations and 2-D representations of actual or physical, real-world, measured space.

In spatial terms it can be argued when discussing 3-D CGI, that as an image, 3-D CGI essentially possesses no *actual* dimensional depth, that the image, or the illusion of the image, is generated on the surface of the screen as a consequence of 2-D projection. Alternative views do exist. For example, Spielmann maintains that spatial encounters can potentially be experienced "beyond the borders of media" (Spielmann, 2008), thus putting forward the possibility of a spatial discourse that determines space (as depth) as realised outside of the confines of its screen.

To support such a view we might also consider the description offered by Lev Manovich in his *Language of New Media* (2001), where he refers to Riegl's understanding of space as a starting point for a discussion on the optical perception of space: where objects exist within a 'spatial continuum'[20] (Manovich, 2001, p.254[21]). By exploring this theory in the context of 3-D CGI and as a basis for dealing with the spatial aspects of the medium of the digital, I further argue that the digital can be classed as occupying a state of instability. It is neither fixed, permanent, nor final. Perpetually in a (potential) state of transmission or transition, consistently malleable in terms of its image and its ability to form and reform space, while at the same time historically linked to a heritage of intellectual thought regarding image and space.

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[20] Making a distinction between haptic and optical spatial perception in which objects experienced in optical perception exist within a unified world.

[21] Also see Manovich, The *Aesthetics of Virtual Worlds: A Report From Los Angeles* (1996)

> Correspondingly, the evolution of abstract thought progresses from ancient philosophy's view of the physical universe as discontinuous and "aggregate", to the post-Renaissance understanding of space as infinite, homogeneous, isotropic, and with ontological primacy in relation to objects. (Manovich, 2001, p.254)

Perhaps when such an idea is applied to 3-D CGI, it can suggest an expansion of the capacity of a medium that is sometimes considered prescribed and locked into a perspective-driven, screen-based illusion of space. Implying a potential liberation for 3-D CGI's capacity to exist and describe space beyond the screen.

> […] although 3-D computer-generated virtual worlds are usually rendered in linear perspective, they are really collections of separate objects, unrelated to each other. In view of this, the common argument that 3-D computer simulations return us to Renaissance perspective and therefore, from the viewpoint of twentieth-century abstraction, should be considered regressive, turns out to be ungrounded. If we are to apply the evolutionary paradigm of Panofsky to the history of virtual computer space, we must consider that it has not yet reached its Renaissance stage. It is still at the level of ancient Greece, which could not conceive of space as a totality (Manovich, 2001, p.257)

If we pause for a moment to ponder the conception of *'space as a totality*' it is possible to imagine an extended function for CGI as a transmedia or intermedia generating system; working with other media forms, integrated with other media forms and presented as other or within other media forms as a 'spatial' phenomenon. The implication here is that space (as a function and mode of communication) is released from a rigid presentation structure and can be described as fragmentary.

This distinction potentially brings conceptual space, and by association 3-D CGI space, into other dimensional domains. If space can be considered as a 'totality' and perceived and received within a supposed real-world as a 'totality', then there exists the potential for the formation of symbiotic *conceptual* and *actual* spatial relationships between image and the real-world. 'Space' (in relation to image) can, in these terms, be seen as 1) integral, conceptually intact as an illusion, and critical to our understanding of a text (either subjectively or objectively oriented) and/or, 2) described in connection to reception and production, including contingencies of process and as a history

of its making. For example, space might be defined within a work as being the varying distance between the viewer and surface of the screen, also at the same time space can be acknowledged in relation to the supposed depth within the screen image, thus creating an implied polarity between the screen surface and the image depth.

Of course this idea is not unique to the digital image and similar spatial concerns have influenced a number of Structural/Materialist films, many of which represent or embody corresponding spatial interests. For example, in *Clouds* (1969), Gidal utilises the qualities of the film (the grain and surface imperfections of the film) and the subject of the film (clouds) to create an interplay between on-screen spatial aspects, leading the viewer from film surface, then into the in-screen spatial illusion of film and back again. Only when a recognisable visual referent is revealed in the film, such as a passing aeroplane, is the film then firmly grounded in film space and as a result the process and production of the film foregrounded, via an intellectual polarity between photo-real and surface-real.

> This is associated with the refusal of the illusion of homogenous filmic space, not only in the sense already suggested, but also by the collapsing of on-screen/off-screen space evident in the movement between the edges of the filmed image – coterminous with the screen – and the edges of photographs, so that the space of the film is subject to a process of constant redefinition. The repetitions, the radical refusal of semioticity, the unfixed nature of the space articulated by the film, all serve to operate against the kind of closure associated with a defined and homogenous film space. (Annette Kuhn, cited in Gidal, 1989, p.45)

In a similar way Kurt Kren's *Trees in Autumn* (1960) can be seen as an investigation into the shift between negative and positive spaces observed in the pattern generated between trees against sky. The constant flow of pattern and image creates a fluctuating spatial arrangement that alternates between flat, textural, surface-spaces and the representational real-world spaces of the photograph.

> In *Baume im Herbst* the new space/time fusion of the experience of branches shot against the sky is the plasticity of the shooting system

> become the relations of the objects – shots, and their space/time observational relations are inseparable. Structural process becomes object. (Le Grice, 2001 p.61)

If we transpose these spatial ideas from Structural/Materialist filmmaking to a 3-D CGI environment, it is possible to also consider space as 1) the synthetically constructed space within which the works originated, and 2) as space and image actualised via methods of presentation and viewing.

5.6 Image Space and Real-World Space

Previously in this thesis John Gerrard has been introduced as an animator who has worked with 3-D CGI in ways that explore an articulation of scale and space through the 'mechanical' use of the camera. A camera that via mechanisms of repetition and recording traverses the digital landscapes that he manufactures. In his work Gerrard also investigates concerns around *actual* spaces, juxtaposing actual and conceptual geographies, presented via monolithic[22] projections within real-world environments. Furthermore, in examples such as *Infinite Freedom Exercise* (2011), and *Live Fire Exercise* (2011), Gerrard anticipates a phenomenological interaction within his work, where the viewer is part of, as well as integral to, complex and visually intricate spatial arrangements. In *Infinite Freedom Exercise* (2011) a lone male figure is situated within a monotonous (3-D CGI) desert landscape where he undergoes a series of physical exercises. A stark panorama divided by a distinct, featureless horizon. The position of the work, located as a projection in the middle of Manchester, invites the spectator, on one level to participate and to be absorbed in the internal space occupied by the on-screen character. On another level the work insists on grounding the viewing experience within the 'real-world', a performance sited in a popular urban environment presenting a visual and spatial dichotomy.

[22] Gerrard's projections are often large-scale installations where the size of the screen is employed as a mechanism to encourage an existential relationship between image and viewer.

> The action plays out against an arid, lifeless landscape whose hyperreal monotony is relieved only by a line of skeletal telegraph poles and the hulking shell of an empty building. The figure himself stands on a gun-barrel-straight asphalt road whose appearance subtly echoes Brazenose Street, and every so often the simulated landscape merges seamlessly with its real-life counterpart, taking our eye on a journey across a Mancunian panorama that has been subjected to a sudden episode of desertification. (Bonaventura, 2011, p.24)

Gerrard's *Live Fire Exercise* (2011) presents a similar spatial proposition between spectator and image. However here, the work, involving six dancers who perform in front of large-scale projections, shifts focus from film to performance where it opens an additional discourse relating to space (performer, spectator and screen), as well as a supposed physicality of the computer-generated worlds that exist on screen.

> Using a very strict definition of sculpture, the worlds I create and the elements within them are very sculptural. And we must remember that the worlds retain their three-dimensional nature inside the computer; a single image is grabbed (up to 80 times per second) and allows us to witness conditions in the world, but there is a stage or landscape that exists within the machine. Interestingly this moment, this fraction of a second, is sent to the screen and immediately thrown away. The work exists as a memory, and the base condition for creating this memory is a piece of software. On balance I would have to place the works in a sculptural[23] category of some sort, but the issue of their presence does need some critical scrutiny. (Gerrard cited in Bonaventura, 2011, p.24)

[23] Gerrard's conception of 3-D CGI as essentially sculptural perhaps adds a useful dialogue offering alternative possibilities in terms of how we conceive a 3-D CGI environment and the role of the camera within it. Ideas reminiscent of discussions posited by Fried and his essay *Art and Objecthood* (1967) where connections between object, image surface and viewer are fundamentally set to question the spaces presented (and occupied) by a piece of work.

fig:49 John Gerrard, *Infinite Freedom Exercise* (2011)

(Image Source: johngerrard.net)

fig:50 John Gerrard, *Live Fire Exercise* (2011)

(Image Source: johngerrard.net)

fig:51 John Gerrard, *Live Fire Exercise* (2011)

(Image Source: johngerrard.net)

Gerrard's monumental projections and awe-inspiring vistas provide an interesting convergence between animation, art and computer-games. In his work Gerrard incorporates the 3-D CGI camera as a part of its visual language and as central to the interchange between viewer and animation, where the function of the camera is not only about the delivery of a narrative but acts as a critical part of that narrative. The camera in these works becomes a portal through which to access the synthetic internal spaces of the computer where its function is to capture the image and record its environment.

> The lengthy time-frame of the works, although an impressive conceptual dimension, only adds a little to the necessarily shorter encounter with the work in the gallery. Instead of wandering the abandoned perimeter of the Modernist fortress in Cuban School (see fig.52), the sleek, circular zooming movement of the viewpoint makes it impossible to forget that what we are seeing is a programmed image – more a synthetic echo than a breathing document. (Gritz, 2011, Frieze - http://www.frieze.com/article/john-gerrard)

fig:52 John Gerrard, *Cuban School* (2010)

(Image Source: johngerrard.net)

The examples provided in this chapter intend to introduce the concept of space as a central component in the act of 3-D CGI image-making, an idiosyncratic characteristic within the production and reception of 3-D CGI as medium. Further, the virtual camera within these illustrations performs to assist this enquiry to 3-D CGI spaces; the spaces in front of the camera, spaces that the camera occupies and the mediation that exists between the camera and the imagined spaces it records.

5.7 Subjective and Objective Spaces

The final section of this chapter continues a discussion about space. Here objective and subjective spatial combinations are introduced via the work of David O'Reilly, where an interplay between structure and ambiguity provide a harmonious spatial conflict. The systematic and analytical method he adopts to explore the nature of the material of 3-D CGI is through a defined set of rules, a series of established parameters designed to contain animation practice and instil aesthetic coherence within the work. "In 3d we essentially create artificial models of worlds, I contend that what makes these worlds believable is simply how coherent they are; how all the elements tie together under a set of rules which govern them consistently" (David O'Reilly, 2011, p.1). O'Reilly's work is concerned with delivering a subversive narrative within an imposed aesthetic

which in itself is intentionally awkward and technically rudimentary, a style which he employs to complement the often abrasive and culturally challenging content of his animations. For example, in *RGB XYZ part 1* (2008) O'Reilly offsets a coarse verbal narrative content against the rasping and deliberately crude treatment of his animation.

O'Reilly discusses this approach as a method to deliver an economy of production, an act of denying involvement in the complexities and refinement of photorealistic animation (which he sees as predominantly inherent within 3-D CGI software), and as a means to set free the creative potential of the software to empower the animator while exploring directly the expression of movement and visual codes within this form of filmmaking.

> My short *Please Say Something* employed a very specific set of rules in its aesthetics. They are all centred around the idea of economy. One of the main problems with 3d animation is that it takes so long to learn and then to use, from constructing a world to rendering it. There are many knock on effects of this, mainly it prevents people from attempting to use it and employ it artistically, the process is very discouraging for the individual to go ahead and make their film. Simple changes can take hours to do, and very often the process is so rigid it doesn't allow any changes at all.
>
> My goal therefore was to shorten this production pipeline to a bare minimum. I removed the entire process of software rendering by using preview renders, which are essentially snapshots of what you see on the screen, they take a split second to be generated. (David O'Reilly, 2011, p.2)

Ultimately what is of interest here are the boundaries or methods that he adopts to frame process. In this way O'Reilly's rules for discussing animation might be seen to reverberate as perhaps an unintentional homage to Structural/Materialist film; a strict set of principles designed to reveal or demystify process; the use of loops initiated to foreground production and reveal the mechanics of 3-D CGI construction, the implementation of structural mechanisms to lay bare the manufacture or underlying systems of its operation[24]. In discussing his film *Please Say Something* (2009) O'Reilly concedes,

> The film makes no effort to cover up the fact that it is a computer animation, it holds an array of artefacts which distance it from reality, which tie it closer to the software it came from. This idea is in direct opposition to all current trends in animation, which take the route of desperately trying to look real, usually by realistic lighting and rendering, or by forcing a hand-made or naive appearance. (David O'Reilly, 2011, p.2)[25]

This conceptual approach to filmmaking is explored further in other examples of his work, such as *Black Lake* (2010) in which the uncut camera leads the viewer through a cavernous water landscape where we are at once traversing the surface of the lake, following a family of ducks, we are beneath the surface of the lake, swimming with a school of fish and then entered into an ambiguous cosmic space, where we pass a small house.

fig:53 Stills from *Black Lake* (2010) showing the transition from fully textured and fully rendered images through to a more skeletal render revealing process and construction of the animation.

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[24] Via discussion Hamlyn notes that "*further parallels might be drawn between O'Reilly's work and Sharits, who modified the projector in his later work, or filmmakers using their fingers to create vignettes when shooting"* (Hamlyn, discussion, 2015)

[25] An additional comparison might be made with David Larcher's analogue and digital video work in the which he discusses and visually manipulates ideas of space, for example in *EETC*(1984-86), *Granny's Is* (1990) and *Ich Tank* (1983-97)

This sequence is looped three times, and with every passing cycle there is a peeling away of the visual surface to expose the geometric framework on which the illusion sits. This cyclical deterioration of form and illusion to reveal process and material can be seen as reminiscent of the techniques and interests of some Structural/Materialist and experimental film/videos such as David Hall's *This is a Television Receiver* (1976) which follows a similar deconstructive trajectory[26] moving the viewer from one visual state of appreciation to then occupy another[27].

In this way *Black Lake* might be seen as offering a unique description of 3-D CGI space. The film begins with the camera guiding the viewer through an ambiguous, pictorial *subjective* space within which the orientation and the boundaries of the space are unclear and where the darkness of the scene conceals visible limits and spatial referents. After the third pass, this offering of an indeterminate, subjective terrain is stripped away to be replaced by an objective, linear perspective landscape, where animation paths, polygonal lines, and geometric planes serve to map the skeletal construction, unveil previously hidden spatial relationships between objects and explore the environmental spheres.

Black Lake opens up the possibility for a conceptual and philosophical model for space, where opposing spatial representations converge and conspire to manipulate a viewer's expectation of space and environment. It is an idea of space that both confirms and challenges Manovich's claims for 3-D CGI space in which he sees computer space as both '*aggregate'*[28] and forming a "…binary ontology…in which the space and the sprites/characters appear to be made from

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[26] In this respect David Curtis provides a useful insight into the work of David Hall and his series of film and video based experimental films (Curtis, 2007, p.222)

[27] Where through a system of copying the image enters a process of degeneration and transmogrification; space is altered from a representation of visual, photographic space to a flattened abstract space.

[28] Manovich in this context regards computer space as aggregate in that space in this sense is not continuous but formed of different spaces, across different networks and systems. (Manovich, 2001, p256-257)

two fundamentally different substances." (Manovich, 2001, p.257). For the purposes of this study it is precisely the accentuation of these fundamental differences, ideas that Manovich discusses as opposing a CGI "*monism"*, that leads us to a greater understanding of material construction and the spaces that such a film creates. Moreover, the juxtaposing of an objective representation of space against a pictorially subjective one forms a shifting intellectual/conceptual understanding of the computer environment where it might be possible to envisage a closer affiliation with modernist ideologies forwarded by Manovich, in which he suggests that this:

> […] understanding of space also characterizes a particular tradition of modern painting that stretches from Seurat to Giacometti and De Kooning. These painters tried to eliminate the notions of a distinct object and empty space as such. Instead they depicted a dense field that occasionally hardens into something that we can read as an object. (Manovich, 2001, p.255).

Almost a decade separates Manovich's *Language of New Media* and O'Reilly's *Black Lake*. Perhaps in that period computer animation, the ambition of the medium of 3-D CGI, and notions of the film's associated space have moved beyond the stage of the archaic as proposed by Manovich[29]. That with animations such as *Black Lake* it is possible to conceive that we might be entering into a period where the study of animation embodies the *"…activity of articulating new concepts akin to philosophy"* (Manovich, 2001, p.255). A period that (at the time of his writing) Manovich suggested was *"…something mainstream computer graphics still has to discover."* (Manovich, 2001, p.255).

5.8 Conclusion

The aim of this chapter has been to discuss approaches to animations that have, in some way, developed and employed spatial aspects as a key component with their production. Moreover it has attempted to introduce a variety of different methodologies and practices that utilise or manipulate spatial techniques or

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[29] Manovich discusses the paradigm of virtual space as being at a primitive stage of its evolution as opposed to being considered regressive and retrospectively reliant on ancient concepts of space. p.257

conformities to deal with or assist in delivering central ideas within the work. Perhaps more importantly, the chapter acts to support ideas that have already been introduced (as a result of the project's initial investigations) and developed in previous chapters. This juncture therefore represents a step towards a refocusing of this research with a move towards a hypothesis that *space* forms the basis for the material of 3-D CGI, space as an essential ingredient that distinguishes 3-D CGI as a process within a broader digital medium.

The main intellectual and theoretical position relating to space up to this point in the research, has been attached the to the lineage of representational perspectival systems of space referenced from the Renaissance and beyond. Variations that deviate from this system have been illustrated via the work of animators such as Landreth, where a philosophical/psychological stance has been made to expand relationships between image and viewer. In other examples, such as in the work of Gerrard, the 3-D CGI illusion confronts actual, real-world space to generate a phenomenological dialogue raising questions around indexical relations. Finally, by looking at the animations of O'Reilly, I intimate that 3-D CGI space can be viewed simultaneously as both objective (through the revealing of the underlying Cartesian structure) and pictorially subjective (generating spaces that are open to visual interpretation, unmeasurable space) within the same animated film. Here examples such as *Black Lake* provide examples where the imagined and the actual, or the imagined and the illusion of the actual, act as systems of representation, coexisting within the same frame. Overarching this research has been a reference to Structural/Materialist film, with all of the examples above examined within this context.

5.8.1 Revising the Method

Structural/Materialist film has provided an overarching practical and theoretical basis for the study of digital materialism for this project. It has supplied a useful framework from which to deconstruct a largely illusion-centric medium, and played a fundamental part in the research methodology up to this point. It does however present a set of principles and systems designed to interrogate the medium of 'film'. As such it is not without its shortcomings when applied to

digital processes or in attempting to deal with or describe the complexities of a digital landscape. Most notable comparative differences are within the basic assumption that the function of the medium of film is to record experience. Film acts, primarily, as a process of recording and replaying ostensibly real-world experience and location. Digital 3-D CGI environments do offer-up and can present a (literally) superficially equivalent spatial reality but this is a constructed, self-referential, reflexive geography.

Perhaps a more pressing issue is to do with the possible limitations of Structural/Materialism as a methodological framework to discuss ideas of space. Space as a subject is certainly included within Structural/Materialist discourse[30] and many conclusions emerging from this project, which relate to and have pointed towards space as material, emanate from this anthology. However, if the aim of this research is to determine the currency of *space* as material within 3-D CGI then an additional, focussed, robust method whose concern is more directly with problematizing space is required.

The final chapter and conclusion to this thesis is represented in the following section.

[30] Structural/Materialist film does comment on and address issues surrounding the illusionistic and anti-illusionistic image which has been foundational in the development of this project. As this research progresses a move away from an essentially reflexive system is required.

Chapter 6: Conclusion: Methods and Mechanisms for discussing space within 3-D CGI

> Each material has its own form and no material can employ the forms of another material. (Adolf Loos cited in Zucker, 1951)

6.1 Introduction: *Space and 3-D CGI Animation*

Conclusions drawn from this practice research project point towards space as a key practical and perceptual element in the production and reception of 3-D CGI animation[1], i.e. 3-D CGI animation is centred around the notion of space (the representation and figuration of space) where, as a software application 3-D CGI's function is to mediate, generate, replicate and form the illusion of objects within space; space or the idea of space as the distinctive quality of 3-D CGI, its material. It is the idea of space therefore, that manifests as a central theme within the conclusion of this research project where I determine three strands:

1. That the conceptualization and presentation of space can be deemed fundamental to the remit of three-dimensional computer generated animation; i.e. the production and construction of space is the essential *active* property within 3-D CGI animation[2]; the material basis for 3-D CGI.

2. That animation work produced using 3-D CGI can be seen as conforming to two dominant (general) approaches to understanding space that (a) is determined by objective spatial theory, where objects and environments within space are understood in accordance with Euclidean topological and geometric structures (Heelan, 1992, p.155) and (b) a subjective pictorial space, where space is conceived

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[1] For example, Chapter 2 considers the malleability of form in space, ideas of constructing space, Chapter 3 considers the interaction between space and viewer, the sculptural space of form and a space beyond the screen, Chapter four relates space to object and environment.

[2] The representation of solid structures in space and the deformation of these structures as a way to discuss material was explored via *Portraits* (2010) as outlined in chapter 2.

perceptually, i.e. through the sense of vision[3]. My supposition is that the integration of both these ideas[4] can be expressed within the production of 3-D CGI animation and that such an idea is fundamental to, and provides a basis for, exploring the application of space as a material mode within this medium.

3. That via this research, I resolve a practical methodology (for 'working' with space in 3-D CGI) that foregrounds 'subjective pictorial space (space within or connected to the image that is understood based on individual beliefs or thoughts – for example space experienced relative to the perceiver[5]) and which is introduced here as an *alternative* communication solution within 3-D CGI[6]. Thus opposing what might be considered the current dominant approach to 3-D CGI animation (one based on the understanding and application of objective space).

6.1.1 Conceptualization & Presentation of Space Within 3-D CGI Animation

Earlier in this thesis Aylish Wood, Alexander Galloway, Thomas Elsaesser, and Lev Manovich are introduced as writers who explore ideas of space in relation to 3-D CGI, where they maintain a position for space as embedded within the fabric of 3-D CGI technologies. The outcomes of this project assert a similar stance. Here however it is not the idea of space as an integrated component within 3-D CGI that is progressed, rather space is deemed as *the critical* component within 3-D CGI. That space, or the concept of space within 3-D CGI, is implied as the material base for working in this visual mode; *space* that distinguishes 3-D CGI from other digital visual formats, *space* that allows 3-D

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[3] For example, in *Pyramids* (2012) examined in chapter 4 concerned object and subjective possibilities via relations between real world and virtual world experiences.

[4] This research appreciates that space conceived as objective and space understood as pictorial can be viewed as potentially opposing theories, however my view within this work is that the two approaches are not exclusive within the context of 3-D CGI. Both being abstract and constructed.

[5] Heelan explores the idea of space and of the world as "…a *geometric structure* only if there exists an unambiguous measure of distance" (Heelan, 1992, p.157)

CGI to be discussed as unique, *space* as forming independence from other digital processes, digital methods of visual construction, or animation.

However, what do we mean when we talk about space within 3-D CGI? How might we make a claim for space and its relation to 3-D CGI without first establishing a position in a definition for space? Previous scholars have in their discussions about 3-D CGI, frequently circumvented the complex particulars of space within their discourse or have inferred a meaning for space where a definition is open for interpretation.

Getting close to the specifics of space, Manovich[7] talks of visual, perspectival space, a measured space as a foundation for 3-D CGI and its relation to real-world space. Here he observes technological advances and synergies formed via both the replication and control of (virtual, 3-D CGI and real-world) environments via accurate digital spatial reproductions. In this instance the application of an objective, Euclidian space informs varied subjects stretching from the realisation of architectural models in virtual space on one hand, to the control and delivery of long-range military missiles on the other. Here space is logical, objective, defined, measured – but at the same time limiting, constraining, monologic.

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[7] Manovich in his essay *The Mapping of Space: Perspective, Radar, and 3-D Computer Graphics* (1993) discusses the importance and function of perspective in contemporary society and culture stating that the connection between automation and space is determined by the computer noting that this perpetuated "the use of vision to capture the identity of individual objects and spaces by recording distances and shapes" (Manovich, p.1, 1993).

Fig:54 Joseph Mallord William Turner, *Lecture Diagram 63:* (c.1817-28) – The pictorial reconstruction of space through the illusion of perspective.

(Image Source: www.Tate.org.uk)

In contrast Elsaesser describes a malleability of digital space, a diversity of spatial understanding and application within the current discipline of 3-D CGI, noting that relationships between space and digital (the translation and transformation of space from one form to another), operate on various levels[8]. Elsaesser suggests an interactive nature for space, spaces of presentation which instigate not portals of illusion or windows into alternate realities bounded by the limits of their frame, but instead he intimates total spaces, unions between the digital image and the environment of its presentation[9].

Offering an additional narrative Aylish Wood draws our focus to "alternative representational possibilities of 3-D" (Wood, 2015, p.87) CGI space, proposing that in the activity of working with and through the experience of viewing synthetic digital 3-D CGI imagery we are required to adopt a different way of

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[8] Indicated via varying screen sizes, presentation methods and manipulation techniques. For example *"The fact that TOY STORY provides a puppet with a point of view, with feelings and effects, testifies to the new malleability of the cinematic image…"* (Elsaesser, 2015, p200-201)

[9] Elsaesser talks of a breaking down of the window and frame analogy within digital cinema, instead positing *"…delimiting a physically plausible space"* (Elsaesser, 2015, p200) as a result of digital technologies and presentation methods (such as the internet). As a direct relative of digital, 3-D CGI travels and has evolved, along this path.

conceiving space. The supposition here is that 3-D CGI offers opportunities to engage with "more-than-representational spaces"[10], spaces unique to 3-D CGI, space as distinct within the digital artefacts that 3-D CGI produces. In this instance Wood's dialogue affirms a central role for space within 3-D CGI. She invites us to conceive of space, and the possibilities of space, for delivering a new digital lexicon. Yet there is a sense that Wood's work is a pretext for a much larger idea, an idea that not only acknowledges the position of space within 3-D CGI but one that also anticipates a plausible method for an investigation of space within 3-D CGI.

6.1.2 The Investigation of Space Within 3-D CGI

What then is space when discussed within this realm? How might space within 3-D CGI be studied or deliberated? What methods can be employed to assist an investigation into space where its relation is with 3-D CGI? The primary outcome from this research project is the submission of one such route, a means to address such questions. While the work here does not directly offer a solution to the problem of understanding space within 3-D CGI, the project does intimate a route through which to explore space within this domain; a possible method for determining a clearer interpretation of how space, as a subject, fits into and drives 3-D CGI production and process.

Differing from other approaches that tackle a similar subject, the method presented here introduces a 'subjective' dimension into the study, i.e. here the study does not rely solely on the foundation or function of linear perspective to realise an illusion of space. Instead the discussion expands the notion of space in terms of 3-D CGI, adding to the debate a 'subjective' interpretative element, a recognition that multiple understandings of space exist within the remit of image generation including 3-D CGI[11]. As such this work opens-up and illuminates one possible avenue for the practical and theoretical interrogation for space and its relation to 3-D CGI, an approach that drifts away from the

[10] Aylish Wood see the section 'The Difference Digital Makes' within chapter 2, pp.85-96 (Wood, 2015)

[11] Heidegger suggests subjective/objective dichotomy in his essay *On the Origin of the Work of Art* (1935-6) where he deals with various spatial appreciations and dilemmas.

grounded principles offered by Structural Materialism and instead looks towards the adoption of a philosophical relationship between space and 3-D CGI.

Fig:55 Joseph Mallord William Turner *Ship in a Storm* c.1840-45 – Subjective space, depth and distance expressed on a 2D plane via subjective space mechanisms.

(Image Source: www.Tate.org.uk)

6.1.3 Revising the Method

The central methodological strand within this research has thus far referenced Structural/Materialist film as a way to determine process and garner an understanding of 3-D CGI. In this respect film-based research mechanisms have been adapted as a means to unfold the various working practices within 3-D CGI; to peel away the layers of 3-D CGI production as a strategy to reveal a material truth for this particular medium.

In this regard Structural/Materialist film has proffered a useful tool and throughout this investigation many of the ideas, strategies and aspirations relating to the theoretical and practical discourse presented within this project emanate from this foundation. One consequential advantage in employing a Structural/Materialist strategy to interrogate the medium of the moving image

lies in the broad intellectual and practical plane offered by Structural/Materialist film as a method. Its diagnostic breadth has enabled access to a variety of analytical tactics and presented an assortment of investigative streams from which to explore the subject of 3-D CGI, thus giving scope to engage with research in multiple ways. For example, for film the Structural/Materialist method deliberates diverse topics including cinematic codes and semiotics, content, duration, performance, materiality, the arbitrary object, the notion of the camera and the role of the audience/viewer, all of which are designed to support a central research aim, i.e. to challenge to the illusionism within mainstream cinema. For 3-D CGI (often considered as an appendage to the medium of film production) a discourse that interrogates 'film's' qualities can be equally useful as a basis, or starting point for a study where the subject is 3-D CGI.

One analytical stream that flows through film theories, history and debates, including Structural/Materialist film, is a concern for 'space'. Within Structural/Materialist film 'space' is interrogated as a mechanism within the filmmakers' visual vocabulary, as a part of the image-making process and as a subject embedded within an overarching debate; the collapsing of "on-screen/off-screen space" (Annette Kuhn, cited in Gidal, 1989, p.47), the undermining of "the establishment of a unity of space" (Gidal, 1989, p.98) articulated in Gidal's *Room Film* (1973), or discussions concerning the spatial separation between "[i]llusionistic three-dimensional space, photochemically reproduced, and two dimensional 'abstract' space [to] form the film image." (Gidal, 1989, p.127).

In these instances the deconstruction of space within Structural/Materialist film assists to extend a discussion relating to space and 3-D CGI. However, the investigative parameters of Structural/Materialist film are generally too limiting to support an in depth discussion about space. As such, the method offered by Structural/Materialist film has its limitations, becoming insufficient or inappropriately attuned to penetrate the depths required to answer questions of space within 3-D CGI. Consequently, to advance ideas regarding the location,

role and material mode of space within 3-D CGI a more robust, resolute and applicably focused approach is now required; a method that acknowledges and interrogates the varying theoretical and practical approaches to space that surface via, sculpture, painting, film, philosophy; a method that is adaptable to addressing the concerns evolving from this research project.

6.1.4 A starting Point for Space

Before attempting to articulate the specifics of a method for dealing with space within 3-D CGI, this section aims to provide a theoretical and practical context for space. Theories for understanding space exist across multifarious, disparate lines of enquiry, many of which are developed as a prerequisite to subject understanding, designed to support or inform discrete disciplines or areas of specialism. For example, Social Sciences, Mathematics, Philosophy, Fine Arts and Architecture each depend on an engagement with space as an active dimensional component that connects research to application. Space in this way represents a functional primary resource, a critical dynamic force. As a subject in itself, space as an idea often evades singular definition. Space can relate to a unique field of study while at the same time be connected to a wide range of academic, intellectual, philosophical, relative, physical, and abstract pursuits associated to that same field. In such a way, space can often be deemed the common element binding related and/or independent areas of thought. Alternatively, if we invert that intellectual model and face inwards, space can present conceptual variations within the same field that are at once equally accepted and valid. For instance within the subject of social sciences:

> We are hemmed in by the three dominant ways in which space is rendered: (1) Space as a Newtonian conceptualisation where it is seen as a category equal to time, thus allying geography to history. Space here is the solution to the question: the interaction and integration of phenomena is explained in terms of space. In other words, space is the container for action - Kant's filing system for observation - an abstract frame of reference independent of matter; (2) More simply, and more commonly, space is understood as a *relative*, but active, term. Here space is a material reality dealing with questions of scale - space as a plane, as a distance, as something that acts as a weak actant and has effect; (3) More open to possibility but often just as constraining in how it is conceptualised, space is turned into something that is *relative to the transcendent*. Space is a

> product of society but also a factor in the production of the social becoming socially constructed, idealised and ideological (Edit. Buchanan and Lambert, 2005, p.89)

An interpretation of the above quotation is that the question of space cannot be answered singularly, but instead via the study of multiple dominant definitions within an individual specialism. Equally, each principal strand might be further expanded to increase key variations within the same primary topic. Space as a 'product of society' divided as such, delineates additional refinement of conceptual ideas; space as a product (a consequence of political, social, and economic activities); space as a process (referring to the coeval and relational nature of space); space as productive (where space emerges as a dynamic component shaping as well as generating change and directing social narratives) (Zhang, Yingjin, 2010, p.2) and so on[12].

6.1.5 Tensions Between Opposing Models

This is of course only one example and we might equally discuss definitions of space within the subjects of Architecture, Art or Mathematics using similar comparative methods. My point (through the above example) is that multiple definitions of space occur, and are able to co-exist naturally[13] within a single field of study. [14]

My conjecture is that tensions that exist between spatial theories, foster a richness of expression that enable alternative practical and theoretical possibilities within 3-D CGI. That it is exactly these tensions, formed as a result of the differences between the opposing spatial models, that facilitate in binding disparate ideas to form a unified and expanded knowledge of 3-D CGI as a discrete subject area.

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[12] The ideas concerning space are presented here as a demonstration that varying routes exist to discuss space within a single subject area. Taken individually these might be present seemingly contrasting or contradictory theoretical approaches.

[13] Bergson provides a useful side note to this dialogue concerning knowledge and understanding in relation to our experience of space; a recognition of a physical, scientific space against a 'virtual' imagined or memorized space. (Bergson, 2004, p.11-18)

[14] Whereby one theory appears to contradict or oppose another. For example, the difference, as mooted by Bergson between haptic space and visual space.

For instance within 3-D CGI the duality of spatial systems supports differences between the actual and the imagined[15], the material and the immaterial, real spaces and perceptual spaces[16]. The idea of space in this instance is understood through polar conceptualisations, presented as a unified system, with elements interlinked yet fundamentally independent. Therefore, revealed here is a dialectic between two polar spatial paradigms, an oft-repeated intellectual dualism between what might be broadly and simplistically regarded as imagined or visual space in opposition (but inextricably linked) to, a physical or actual space grounded in perceptually real objects and distances.

6.1.6 CGI and Subjective/Objective Space

Therefore one theory for understanding 3-D CGI points towards a conversation between space and 3-D CGI in a way that supposes 3-D CGI as both **objective**[17] (rooted in rational space relationships and built upon Cartesian and Euclidean traditions of spatial understanding and representation) and at the same time pictorially **subjective** (the image received through perceptual mechanisms to form imagined and visual space relationships) thus initiating a dialectic between the two.

6.1.7 *Heidegger and Space*

As an alternative position to the obove two opposing theories, objective (Euclidean) space or subjective space theories, Heidegger offers a third route a recognition of space as including both subjective and objective components[18]; our bodies in a lived space, both physically and perceptually. It is Heidegger's notion of space in relation to his essay *Art and Space* (1969)[19], that forms a foundation for the remainder of the discussion here.

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[17] Here objective space is space that is determined by the mathematical and literal interpretation. It is reliant on and described by distance and measurement.

[18] Noted here the term objective does not refer to either Newtonian or Carteisian space where space is measured or determined by a coordinate system. Instead entities exist in space "without presupposing objective space and the derived concept of a system of spatial coordinates" (Arisaka, Y, Inquiry, December, 1995, p.6). Similarly, subjective space does not concern "psychological feeling" (Arisaka, Y, 1995, p.5) but acknowledges being-in-the-world.

Introducing Heidegger's subjective/objective space argument and by revising definitions these definitions (i.e. a move away from objective space as Cartesian, to be instead concerned with physical place, and for subjective space to be concerned with being-in-the-world) a new vista in terms of how we might view 3-D CGI space opens up.

Throughout this thesis I have intimated a link between 3-D CGI and sculpture[20], through their formal, dimensional, processes. In relation to *Art and Space* (1969)[21], and his writing during the 1960s Heidegger also acknowledges a sculptural component and his work coincides with an involvement with contemporary sculptor Eduardo Chillida, where space and (the sculptural) object are investigated. The collaboration resulted in the evolution (and some consider to be a philosophical redesign[22]) of Heidegger's approach to space and borders,[23] ultimately leading to discussions on limitation, the notion of imposing boundaries and 'sculptured structures'[24].

Later, in the 1969 text Heidegger expands, through a juxtaposition of *subjective* and *objective* spaces, the concept of clearing away, emptiness and the delimitation of place. Heidegger deliberates the being of space where he suggests its character and reflects on space's relationship with the sculptural object. 'Sculptured structures' he declares are bodies, defined and formed "[…]

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[19] Within this text Heidegger explores the concept of bodies within space, bodies and place as well as the function of sculpture to frame or enclose place.

[20] For example, I provide a narrative in Chapter 1 that concerns a relationship between early 3-D CGI and sculpture. Burnham and Read plot an evolution of technological biased sculpture, also artist such as Keith Brown exemplify synergies between 3-D CGI and material sculptural form.

[21] Within this text Heidegger explores the concept of bodies within space, bodies and place as well as the function of sculpture to frame, create and capture space.

[22] Chillida's work acts as a physical manifestation of Heidegger's ideas relating to borders, edges and the void, for example in *Desde dentro (From Within)* (1924) space and borders underlies the form and concept (see fig.56).

[23] Chillida's work acts as a physical manifestation of Heidegger's ideas relating to borders, edges and the void, for example in *Desde dentro (From Within)* (1924) space and borders underlies the form and concept (see fig.56).

[24] See Francois Raffoul's review *The Event of Space* (2012) p.100

by demarcation as setting up an inclosing and excluding border" (Heidegger, 1969) where the limit or the notion of the edge is exposed. Here the limit of a sculptural structure (regarded in this instance as a body), promotes a separation of body from its surroundings by imposing "an impermeable barrier"[25], and that,

> [t]he forming of [matter] happens by demarcation as setting up an inclosing and excluding border. Herewith space comes into play. Becoming occupied by the sculptured structure, space receives its special character as closed, breached and empty volume. (Heidegger, 1969)

Located at the centre of this concept is the notion of bodies; bodies as entities with defining limits, bodies in relation to the space beyond their limits, bodies and the very space within which they exist.

Fig:56 Eduardo Chillida's *Desde dentro (From Within)* (1924) anticipates spatial borders via enclosing space through defined edges.

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[25] The overarching proposition here is that edges can be understood as barriers to contain space *as well as* points of interchange or exchange where this an ability to present both impermeable or permeable characteristics.

6.2 (1) Defining borders for gathering space, and (2) Emptiness and the void

Heidegger's 1969 text talks of an inclosing and excluding border. In mapping these ideas to 3-D CGI a question arises in relation to 3-D CGI space: what are we *excluding* and what is it that we are *inclosing?* Limits and demarcation imply tangibility of form; edges and borders suggest bodies, furthermore the notion of boundaries leads to ideas of physicality, a material authentication of being and division. Unfolding this thought, it might be argued that for an edge to exist or a border to occur 'something' is required from which a border or edge must materialise. Heidegger proposes that to perceive space we must first exclude form, and to receive form, form must occupy (empty) space, a boundless space, space without distraction[26].

> For it appears that behind space, there is nothing more to which it could be traced back. In front of it, there is no evasion to something else. What is proper to space must show itself from space itself. (Figal, G. (ed) translated by Jerome Veith, 2009, p.306)

[26] Such ideas explored by Heidegger in his treatises on art *Origin of the work of Art* (1935-37) and *Art and Space* (1969) relating to edges, limitation, and voids, echo thoughts introduced earlier by Fredrich Schiller in 1790s. In 1935 Heidegger held a tutorial lecture series based on Schiller's *On the Aesthetic Education of Man* (1794) where subjective and objective relations were critiqued against an understanding of aesthetics in terms of artistic practice and artistic reception. See *Heidegger and the Work of Art History,* edited by Dr Aron Vinegar, Dr Amanda Boetzkes, Ashgate Publishing Limited 2014, Surrey UK Heidegger's remarks on Schiller's Letters on the Aesthetic Education of Mankind from the published typescript of the former's 1936/37 seminar in Freiburg.

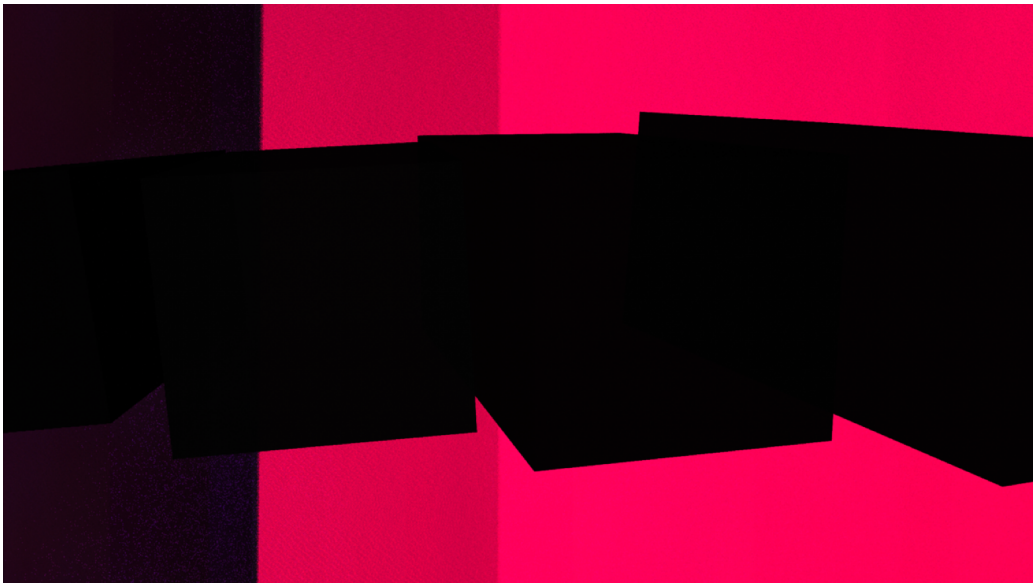

Fig:57 *Cube Space* (2015). An experimental project where I explore the notion of the void and the representation of negative space.

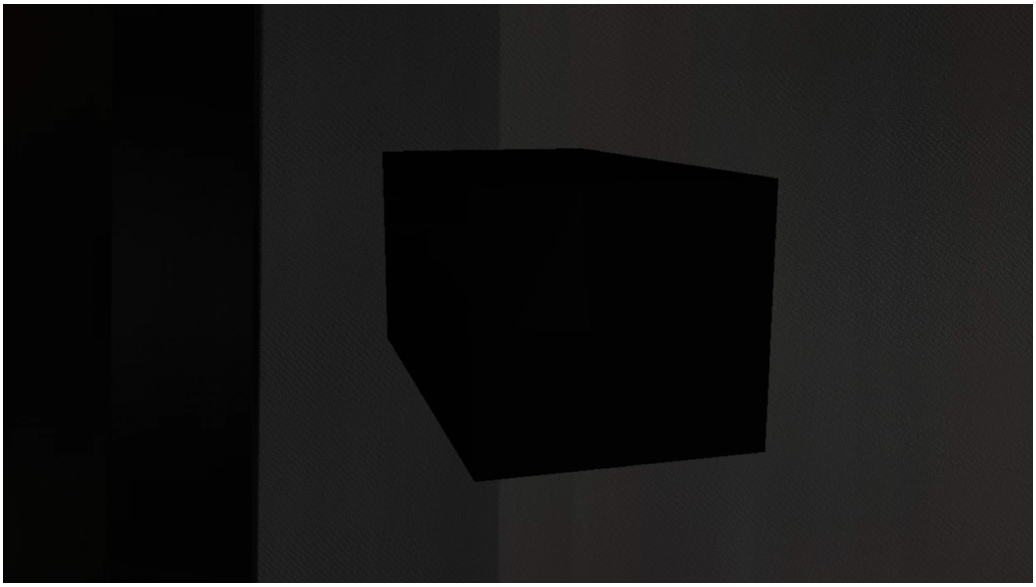

Fig:58 *Black Cuboid* (2015)

Heidegger's depiction of space within this period, it might be argued, pertains to and emerges from the concept of boundaries, the role of the boundary in relation to spatial understanding. It is the possibilities of boundaries to act as points of interchange or exchange between two (perceptually) different spaces that forms the basis for this discussion at this point in the chapter. The notion of the boundary here arises from two main sources; an investigation into Heidegger's conception of borders and boundaries in relation to bodies and an enquiry into the physicality of the edge or border through sculptural entities as

evident in the work of Basque artists Eduardo Chillida and Jorge Oteiza where space materialises through framing and creation of a visual void.

Fig:59 Still from Harun Farocki's, *Parallel II* (2014) – Man falling into the void beyond the 3-D CGI game world.

Fig:60 Oteiza *Caja vacía* (1958)

(Image Source: Reina Sofia (http://www.museoreinasofia.es/)

6.3 (3) The Opposition of the Edge: *Enclosing and Excluding Boundaries*

The 'edge' in relation to bodies is an agent that contains an interplay between one spatial reality and another, an edge as a border (or potential[27] border) and the position of that border within a visual space. An edge with the ability to trigger a dichotomy, dimensional opposites where on one hand we might discuss ideas and possibilities beyond the edge as a condition for creation (a process of exclusion, a void enabling 'things' to emerge) and on the other hand examine both noetic and physical boundaries that can operate to disrupt empty (visual) spaces, edges employed as a means to divide frame space. Contradictory yet interlocked, a point of spatial exchange.

Heidegger describes space (or rather spaces) in terms of delimitation and the setting up of *enclosing and excluding* limits, a space[28] that subsists through establishing delimitation and the forming of resistant barriers that contain space.

Here, *delimitation* and *exclusion*, are not a means to govern space by division in order to generate a position of stability, but as a way to discuss the concept of the *limit* as a resistant barrier separating spaces, a borderline between *present body* (Mitchell, 2010, p.66) and empty space, the *here* from the *there*, the earth from sky. For Heidegger then the function of the limit is extended to operate beyond its role as a divisional boundary, acting instead as the location for separation and change. In this way the limit is not only a position that initiates *stability* but also stimulates a position of *instability*. The point where one spatial entity meets and opposes another, a division that engenders depth and distance where *near* meets *far*, a border between spaces and a point of exchange and transformation. In short, Heidegger's limit is a limit that serves to promote *interchange* and *transition*, the limit as the edge between things, a marker for the embodiment of alternating spatial difference. Alternating spatial differences discernible though variable and esoteric boundaries that exist as indistinct

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[27] Potential borders in this sense refers to the fact that not all borders and boundaries are clear, explicit or defined depending on scale and material substance.

[28] Space here is in relation to sculptural dialogues.

contours while remaining as dynamic and resonant as those with more definition.

6.3.1 Dissolution of boundaries and the expansion of spatial borders

What might we declare as a limit? Heidegger notes that a boundary is not the end of a thing but the beginning of a thing (Mitchell, 2010, p.23). Instead the idea of the edge, or the limitation of form, acts as a device to question both the intent and the position of that edge, the border and its consequence – spatial being. These ideas, expressed significantly in the paintings of Paul Cézanne[29] and dramatically through the work of Joseph Mallord William Turner[30] dissolve the 'edges' within these pictorial worlds where expressions of light and time evoke an integrated edge that unifies the visual space. Here clouds become structural, ephemeral mechanisms for compositional definition or provide access to an animated pictorial depth replacing a dependence on line (and/or perspective),

[29] This is particularly evident in Cézanne's landscapes at the turn of the C20 such as *Le lac d'Annecy* (1896)

[30] Landscape/seascape paintings circa 1830-40 depict a dissolution of the edge and an interest is space via an investigation of light, e.g. *Sailing Boat of Deal* (1835)

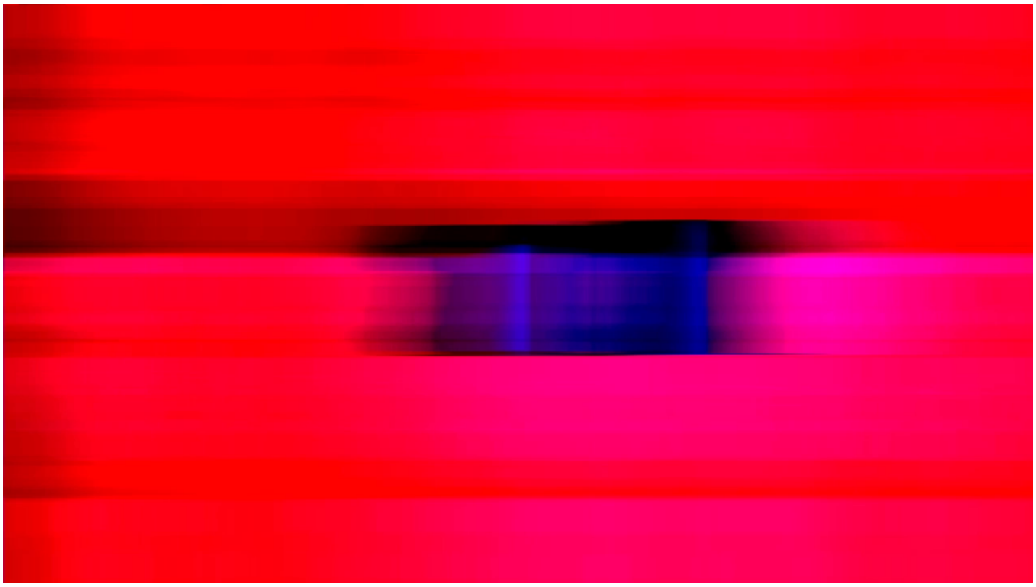

Fig:61 *Blue Cube on Red* (2015). An example of my own practical work that explores spatial representation through the use of colour dynamics and motion-blurred imagery as a means to edges and space.

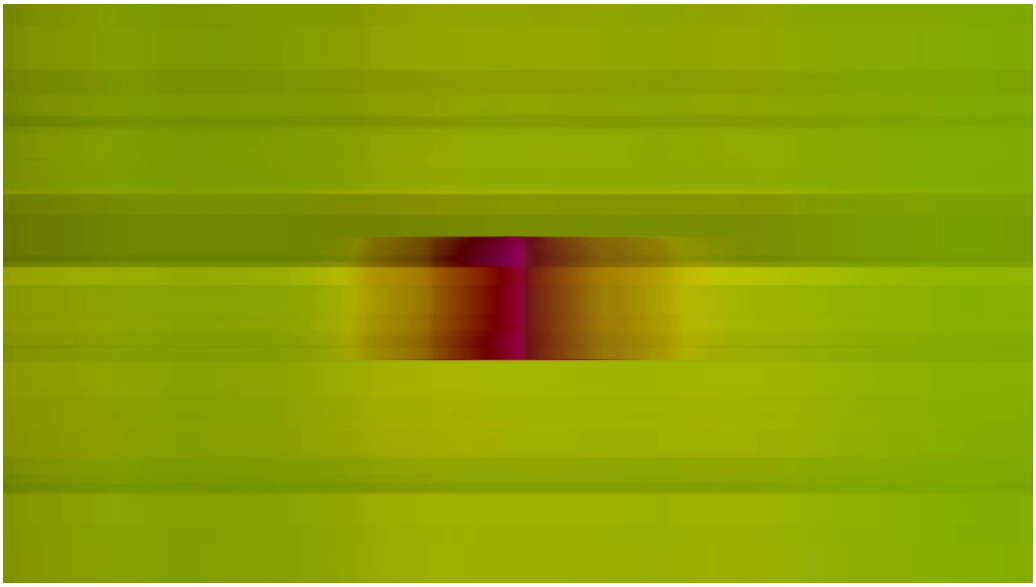

Fig:62 *Red Cube on Green* (2015).

In more recent examples, for instance Anne Veronica Janssens' *Clouds: About yellowbluepink* (2015-16), the cloud analogy[31] is expanded further. Here the dissolution of the edge, the separation of physical, non-physical entities and the

[31] Filmmakers who question the legitimacy of these semiotic constraints or play on our expectation and intimacy with the idea of clouds within a scene provide an interesting adjunct to mainstream visual complacency. For example clouds for Gidal are the means to question the viewer's experience of what they are seeing, to impose subjectivity within screen space and to interrogate film's physical material.

effects of unresolved borders, achieved through the study of clouds, provide a basis for a complete series of works.

An in-depth discussion by Mieke Bal[32] on Janssens' work includes the idea of clouds stating that 'pictorial space' remains undetermined without the introduction of clouds (Bal, 2013). Reinforcing this thought, Van Alphen's text *Art in Mind: How contemporary Images Shape Thought,* conveys that the representational value of clouds (pictorially) embodies a cultural and spatial significance which is accentuated through a compositional manipulation (or the total removal) of clouds in a pictorial sky. Perhaps taking the subject to its conclusion the author further suggests that as the nature of clouds is "without clear contours, without surface, and without concrete substance" that it evokes a unique relationship between viewer and the edge or border of an artwork (Van Alphen, 2005, p6) [33].

Fig:63 Ann Veronica Janssens, Clouds Series – *About yellowbluepink* (2015-16), Wellcome Trust – The dissolution of the edge, subjective space embodied in physical space, space with an esoteric border.

(Image Source: Wellcome Collection)

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[32] Mieke Bal introduces the work of Janssens in relation to her work as spatial and the determining or indeterminate borders of her work.

[33] Claiming that clouds provide a reference to a potential horizon, that without clouds orientation to a horizon is lost and scale becomes indeterminate.

Fig:64 Still from Harun Farocki's, *Parallel I* (2012) – An indeterminate pictorial space, clouds, or in this case the graphic representation of a cloud provides scope for imaging space and distance in what is otherwise a visual void.

6.4 Method

It is the idea of the limit (i.e. how we understand the notion of limitation as a border or as a defining edge within 3-D CGI) that initiates a proposed method for discussing space relations within 3-D CGI. My supposition (and conclusion to this project) is that through the work of Heidegger (as a foundational but not exclusive theoretical underpinning) it is possible to determine three linked modes, three guiding principles that assist in defining space as material within 3-D CGI:

1. Defining borders for gathering place
2. Emptiness and the void
3. Edges as points of exchange

Here then it is the concept of the delimiting edge that is proposed as a central component in a methodology for examining a distinctiveness for 3-D CGI; the

edge as a location for interchange, and the function of the edge in relation to our understanding of space within 3-D CGI.

I propose that in the relationship between space and 3-D CGI borders, limits and edges can function in two primary (contrasting yet complementary) ways to support visual (pictorial) spatial understanding: (1), that the practice of defining and limiting perceptual space through the employment of visual edges can act as a mechanism to conceptually 'gather space' and for which I propose the definition for edges in this state as 'passive' boundaries and (2), that via (a potential) edge ambiguity or vagueness of boundaries it is possible to generate 'spatial ambivalence' for which I propose the term 'active' boundaries. Ultimately I posit that it is the nature of the edge to act as a point of exchange, either through 'passive' or 'active' engagement, that assists our visual perception of space, thus bringing into being the notion of space as material within a 3-D CGI environment.

6.5 Example of Practical Application

To illustrate how such ideas might be applied to modelling and animation within 3-D CGI, three examples of my own work are introduced that seek to describe, employ and interact with space in ways that deviate from dominant Euclidean, or perspective-driven illusionistic approaches. Through the examples below ideas of contained space (via notions of borders and limitation – the passive edge), the concept of spatial exchange (through the use of active edge and dissolved boundaries), and the notion of the virtual void are explored.

6.5.1 Thelwall-1

In *Thelwall-1* (2016) the emphasis is on generating images based on Heidegger's notion of gathering place as well as an introduction to the concept of virtual voids. Intended here is an interplay between (a supposed) mass and a void, a relationship envisioned to illustrate an expanded space, based on subjective experience and a perceptual knowledge from real world space.

To assist in reinforcing these concerns the work imposes a thematic of divided space[34], the notion of 'carpentered environments' as discussed by Heelan, where constructed, mechanised geographies are employed to instil perceptually understandable spatial markers[35].

> […] such artefacts, I believe, are the simple engineered forms of fixed markers, such as buildings, equally spaced lamp posts, and roads of constant width, as well as mobile markers, such as automobiles, trains – and though not the product of engineering but also of relatively stable size, the human figure. (Heelan, 1988, p.251)

Fig:65 Catherine Opie's, *Untitled #1* (1994) from the *Freeway series,* provides an example of carpentered environments while at the same time displaying relationships between edges and voids.

(Image Source: Regen Projects Gallery)

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[34] For example, Catherine Opie's, *Freeway series: Untitled #1* (1994), and *Untitled #7* (1994) offers a structural guide to visually explore ideas of the void, negative spaces, borders, edges and the framing of space.

[35] Based on the concerns discussed within this chapter and referencing similar ideas from Heelan, where, "Perception always takes place in relation to a horizon that has two components, an *outer* and an *inner* horizon. In any individual act of perception, the perceived object has an outer horizon, or boundary, or contour, which separates it from the background against which it appears. Each profile then has naturally a foreground-background structure. The background too belongs to the World, but negatively: it is that which is not part of the structure." (Heelan, 1988, p134)

Fig:66 Catherine Opie, *Freeway Series: Untitled #7* (1994)

(Image Source: Regen Projects Gallery)

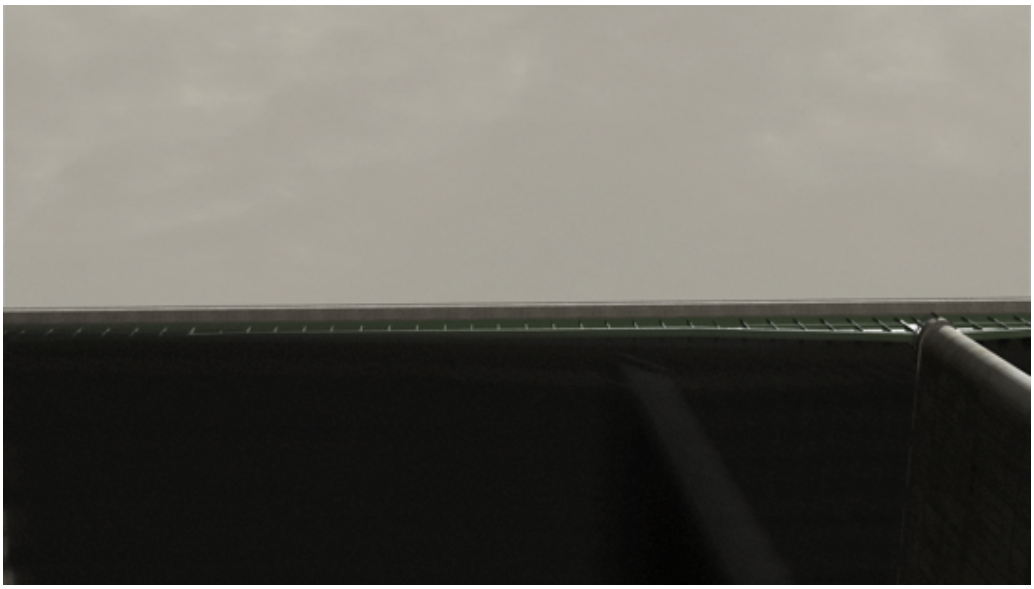

Fig:67 Still from *Thelwall-1* (2016) – The film explores relationships that exist between the edge and the implied space beyond the edge.

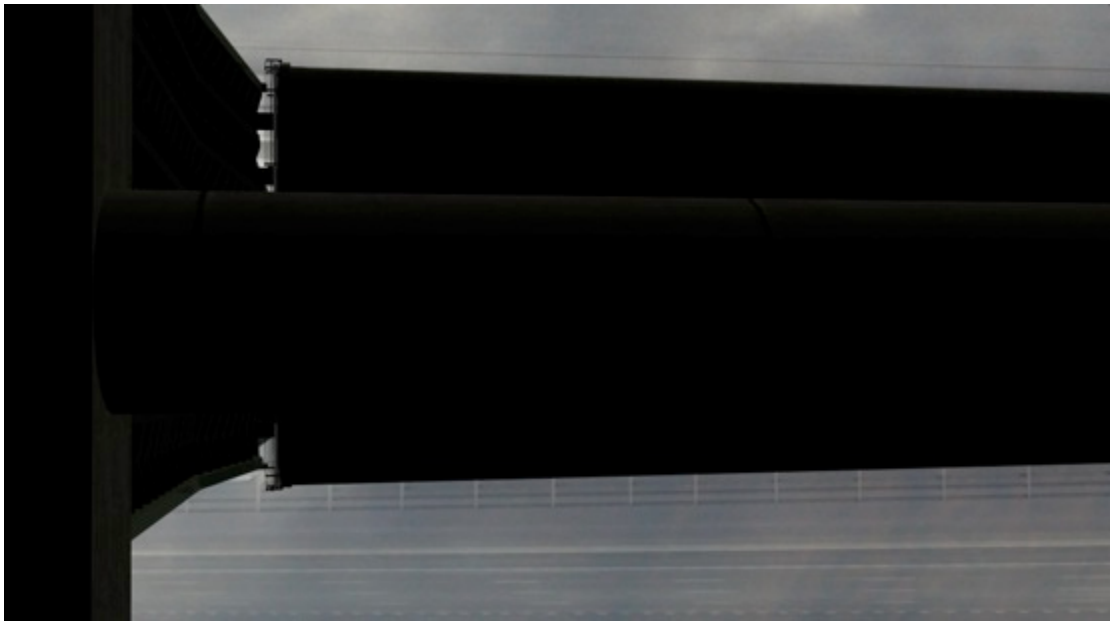

Fig:68 Still from *Thelwall-1* (2016)

Fig:69 Still from *Thelwall-1* (2016)

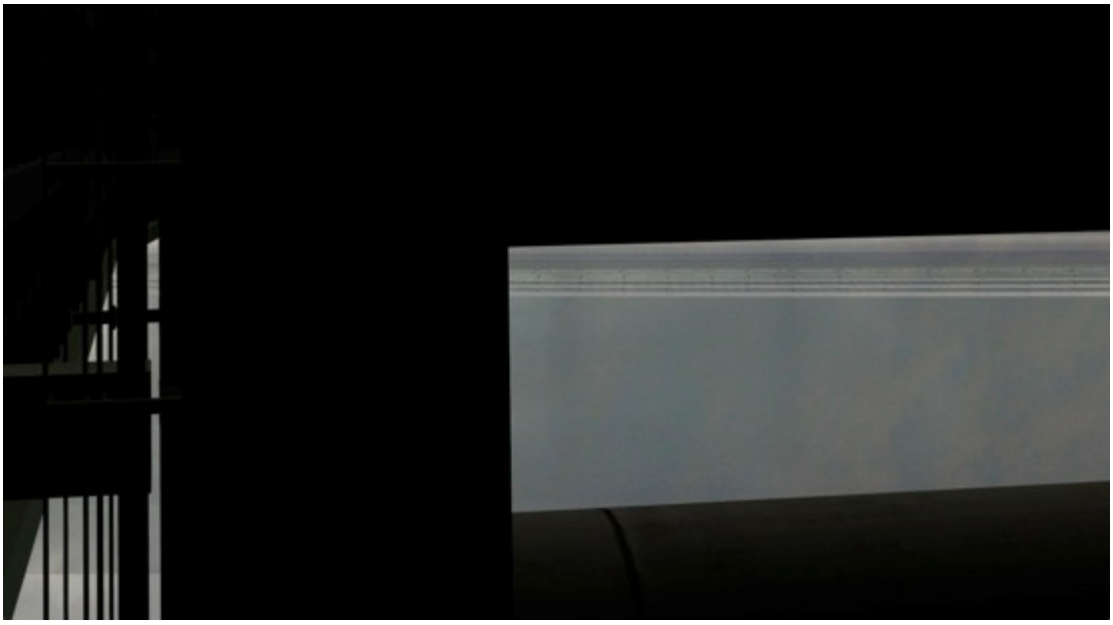

Fig:70 Still from *Thelwall-1* (2016)

6.5.2 Thelwall-2

In contrast *Thelwall-2* (2016) examines ideas of space through the generation of unspecified borders where the aim is to illustrate the notion of an instable edge within pictorial space; The subjective edge as a mechanism to access space, recognisable for its impermanent qualities, a subjective variation of implied scale and ambiguous borders.

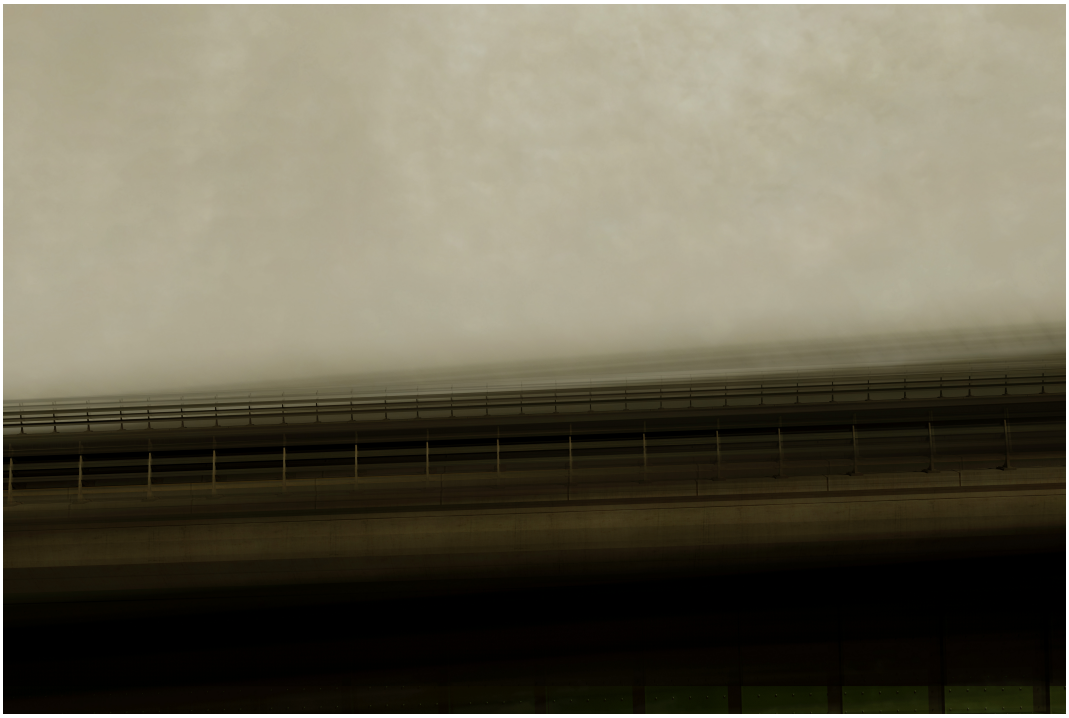

Fig:71 Still from *Thelwall-2* (2016), the film introduces ideas relating to the diffuse edge and indistinct boundaries.

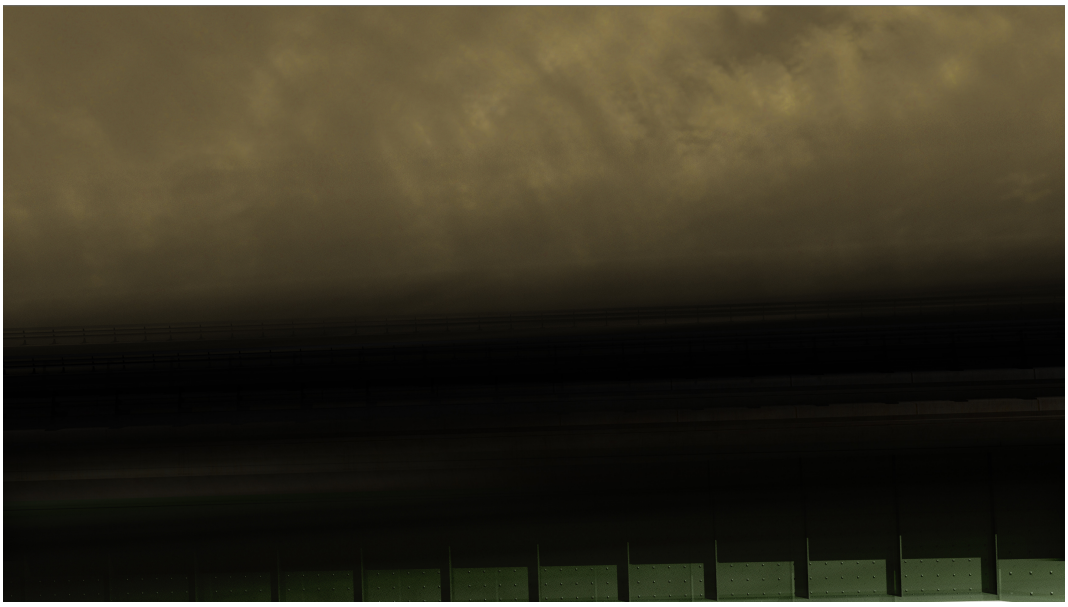

Fig:72 Still from *Thelwall-2* (2016),

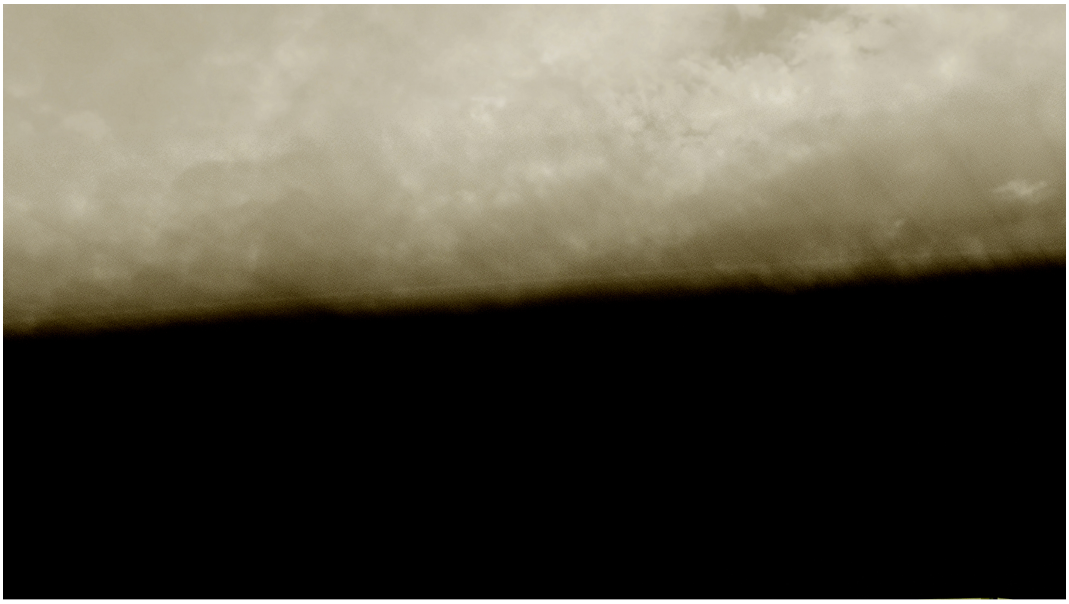

Fig:73 Still from *Thelwall-2* (2016),

6.5.3 Incorporating Structural/Materialist Film Principles

Fundamentally both films *Thelwall-1* and *Thelwall-2* seek to illustrate ideas around 1) relationships between distinct and indistinct borders, and 2) possibilities for generating a heterogeneous space, to incorporate the qualities of defined borders.

Also, influenced by work produced earlier in the project, the two animations mentioned here acknowledge processes and methods drawn from earlier chapters. For example, within *Thelwall 2*, I reference the 'dialectic of the camera'[36] where the camera within the work is employed to imbue smoothness of operation as a means to instil impressions of frictionless environments[37] (to reinforce the visual nature of 3-D CGI). Finally, 'Subject' and 'Object' relationships accessed within the film, refer to discussions introduced in Chapter 3 where Structural/Materialist film methodologies provide examples (such as Gidal's *Room Film* (1973)) to illustrate an emphasis away from constructing discrete space(s) in favour for the ambition "to undermine the unity of space" (Gidal, 1989, p.98).

Thelwall-1 & 2 acknowledge the idea that movement is not best described or inscribed by the narrative or the illusion of a succession of images, but represented instead by the fragmentation of an image (as discussed in projects such as *Pylons*, Chapter 3), recomposed within the visual space created in the mind, i.e. the experience of visiting the Thelwall viaduct, imparts a sense of being dwarfed by the significance of the structure, consumed by the noise that both engulfs and fills the sculptural spaces beneath the tarmacked surface. An impression that when reimagined that cannot be suitably expressed via purely photo-representational means, i.e. constructing an accurate 3-D CGI scale model of the viaduct within a visual perspective system, architecturally correct and lit accordingly to represent a real-world environment is in itself insufficient to capture and express the experience of being there.[38]
In this respect both works use the limit as the generator for openness, the representation of space as "whole while uncompleted" (Mitchell, 2010, p.51), a reference to and at the same time an interpretation of a visual wholeness as

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[36] As mentioned via examples such as Gerrard and similarly in discussions relating to Structural/Materialist film where exposing the relationship between camera and operator is central to much of the work of this ilk.

[37] This idea was initially explored in *Pylons* (2011) see chapter 3

[38] In some ways this approach can be seen to echo representations of space and experience as encapsulated by artists such as Rachel Whiteread, Joseph Beuys and to some extent John Gerrard.

articulated by Merleau-Ponty, where "fictive linkages between parts" (Edie, 1964, p.185) are imposed to form the whole in which 'The picture makes movement visible by its internal discordance' (Edie, 1964, p.185)[39].

Thelwall-1 & 2 investigate this theme using the ideas and principles outlined throughout this chapter; negative spaces, transitory edges and voids.

Audio is also an important ingredient in realisation of the wholeness of experience for this subject. The physicality of the audio while at the viaduct and the abstract qualities of the noise of the traffic passing overhead unseen, were fundamental qualities of this real world experience. Furthermore the audio is unique to this particular place, the sound links the physical structure to its associated geography. Therefore it seemed appropriate to include an audio element within the film as a way to complete the experiential narrative, i.e. audio was added to the animations as a way to reinforce a fragmented represented experience of the bridge.

The audio tracks added to *Thelwall-1 & 2*, generated at the location of the viaduct, were intended to represent two aspects relating to real-world space, 1) the echoing environment of the cavernous structure of the bridge, and 2) the invasive and persistent drone of the vehicles travelling across the bridge. In turn this audio was added to the moving image sequence to 1) assist in providing volume and scale to the visual interpretation of the underneath of the bridge and 2) to create a tension between what you can hear (the implied passing vehicles) and what you can see (an absence of vehicles) within the animated film. The purpose of the audio and image combination was to encourage the viewer to consider the spaces represented on screen and to subjectively question their relationship and position to the images presented.

[39] Merleau-Ponty's illustration of Rodin and the movement implied and received by the viewer of a piece of sculpture.

6.5.4 Planes and Voids

Finally, a proposed third film *Planes* (2016/17) reworks ideas around space and subjective edges. The intention of *Planes* is to introduce conceptual voids by referencing an implied subjective space presented via clouds[40].
Clouds here act as subjective markers within supposed landscapes, digital clouds with measurable substructures located within calculable terrains, offering pointers to digital, 3-D CGI voids.

Fig:74 John Constable *Seascape Study with Rain Cloud* (1827)
(Image source: http://nga.gov.au/exhibition/)

[40] Clouds as discussed earlier in this chapter offer unique compositional and spatial references. In 18th and 19th century painting where the concern was for the replication of light (Constable, Turner, Moorland) clouds act to support a traditional aesthetic, where as pictorial mechanisms within measured settings (what Stephen Bell refers to as the granularity of measurement) clouds provide ambiguous space and atmospheric representations; A world viewed, an embodiment, a response of the world, of by the world, an 'impression' rather than a replication of that world. Later, within the medium of film, clouds adopt similar compositional roles.

Fig:75 A still from Gidal's *Clouds* (1969) film which presents an ambiguous spatial representation.

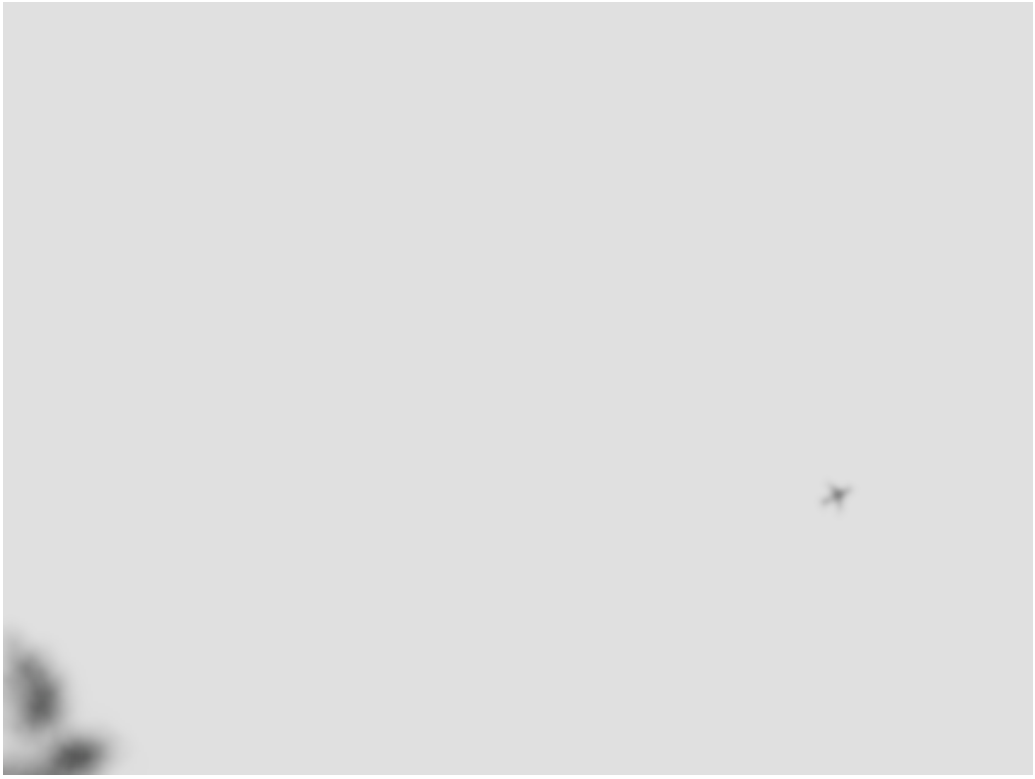

Fig:76 Still from *Planes (2015)* – A digital pictorial *subjective* space

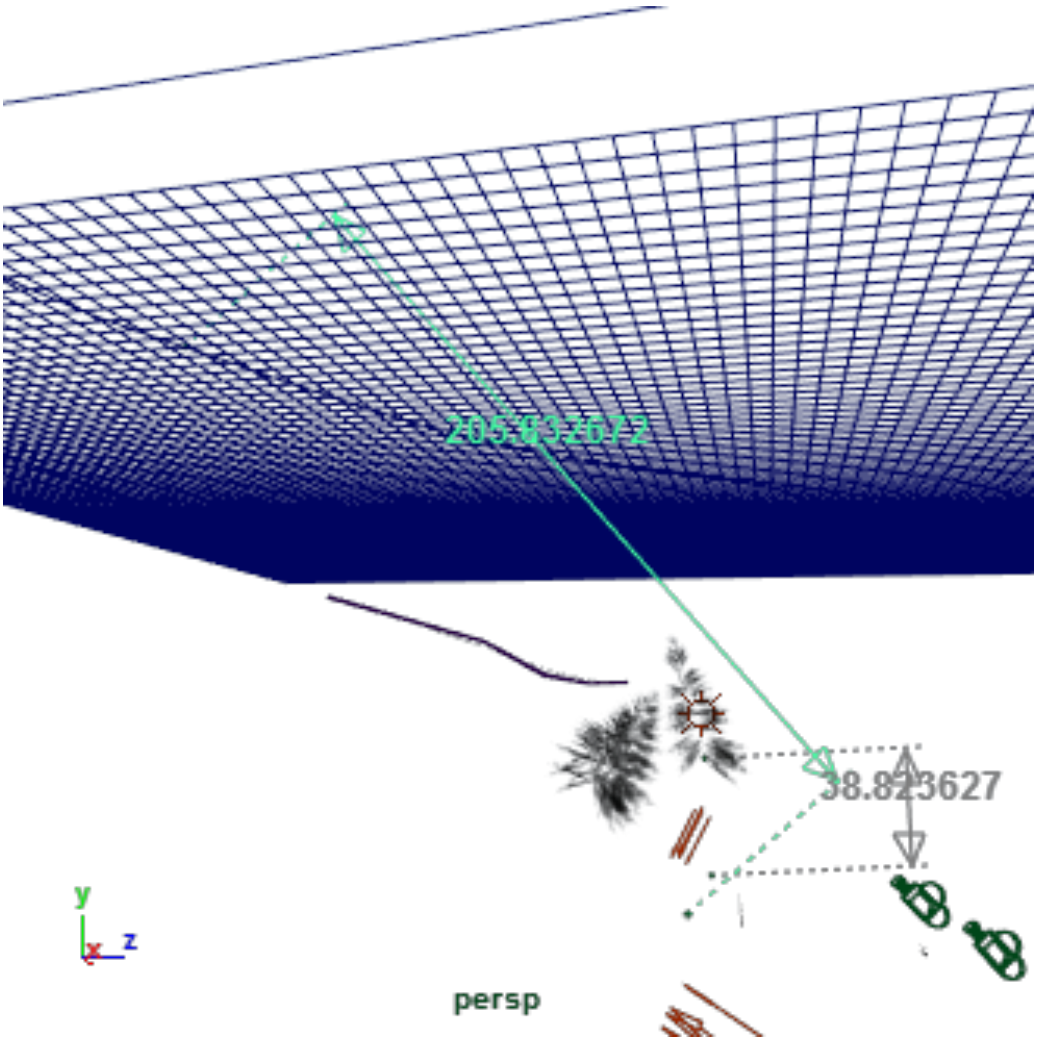

Fig:78 Still from *Planes (2015)* A digital *objective* space

6.6 Method Summary

Through this project I have aimed, to present ways in which to view, to engage with, and further explore the digital, virtual spaces presented by 3-D CGI. By doing so I offer a sculptural and philosophical space, a practical mechanism to be considered and applied alongside (and equal to) the normative, pre-packaged perspective, objective (Cartesian) space delivered within and adhered to in most 3-D CGI software packages.

The legacy of this project is the introduction of a method for taking these ideas forward. A device to deal with 3-D CGI and space, a suggestion for a practical application of a theoretical model based largely on Heidegger's determination

of space, a model that can be summarized as pertaining to the integration of *subjective* and *objective* space; dual mechanisms within the same frame.

As a foundational base the notion of *subjective* and *objective* space can be further broken down, with the concept of limitation, central to Heidegger's theory, providing a container for three themed strands; Borders, Voids and Edges, which as a model can be presented as follows:

1. *Borders* – Borders within this model work to contain visual space, that the notion of place can be gathered, framed or exposed by imposing definitive borders via distinct boundaries.

2. *Voids* - The abstract notion of the void from which forms, objects or things emerge. That it is the concept of the void and the implementation of voids within a work that allows access to subjective space and assists in derailing perspectival space within a 3-D CGI scene.

3. *Edges* – The function of edges is either through *passive*, defined states that act as borders to contain space, or *active,* undefined states that exist to perpetuate interactions between spaces, allowing perceived space to flow - to be in a state of flux.

The above model aims to provide a basic introduction to how these ideas might be considered within a 3-D CGI environment. A combination of the principles outlined above in conjunction with practical application within a 3-D CGI software, such as Autodesk Maya, to define more precisely relationships between space and 3-D CGI, or to further determine the nature, essential traits or uniqueness that might be associated with 3-D CGI as a medium as opposed to more dominant, perspective-driven approaches and solutions. The intention of the work presented here therefore is to represent a staging post, a consideration for those who have an interest in exploring the potential expressive richness offered by 3-D CGI, a mode of production that is too often developed and constrained by the logic of its inception - perspectival illusion.

6.7 Conclusion

This project began by searching for a specific quality for 3-D CGI, a distinctive nature that would separate 3-D CGI from other digital formats or processes. The belief at the start of this research journey was that a photo-realistic Cartesian representation of space, commonly regarded by many as the dominant characteristic for 3-D CGI, does not singularly or sufficiently represent a characteristic quality for this mode of creative production. The conviction of the proposal was therefore that medium specificity for 3-D CGI resided elsewhere.

To address this concern the project adopted a largely modernist position in a discussion about medium specificity, a faith that even in today's digitally loaded, multi-layered media landscape it is possible to establish traits and characteristics that belong to specific software driven processes, (in this instance 3-D CGI. A drive to establish media specificity for 3-D CGI has maintained throughout the project.

At the beginning of the research, perhaps influenced by traditional concepts of what media specificity represented in relation to physical media, this concern was for the digital mark, the search for a surface quality unique to 3-D CGI. Ideas explored during the initial stages of the research, for instance with projects such as *Portraits* (discussed in Chapter two) reflect this investigative direction. However, the results from these experiments suggested that a superficial visual solution was too limiting, that resulting images did not satisfactorily distinguish between the 'digital' mark, (i.e. a characteristic signature of digital media products generally) and a mark produced as a result of specifically '3-D CGI processes'.

However from this work and influenced by Structural/Materialist and Materialist filmmaking methods the project adopted a three-point approach to examining medium and material properties, i.e. *production, recording and presentation*, which opened up other possibilities to consider medium and material properties for 3-D CGI. For example looking at ideas around

presentation and the role of the viewer in both the reading of the text as a part of determining a material base. Thus emerging from the preliminary animation experiments was a recognition of the presentational possibilities of the image, the potential to review the medium of 3-D CGI away from a single screen environment. In this sense space as a way in which to conceive of material in relation 3-D CGI as a medium as a concept, started to take root.

Later with the development of *Pylons* (2011) (discussed in chapter three) and *Pyramids* (2012) (outlined in chapter 4) space became established as a critical part within a reflexive approach to looking at medium within 3-D CGI. Here 3-D CGI was concerned with the production, capturing/recording and the presentation of its own image. Space in these instances sought to conceptually connect internal spaces (objects, environments and camera) within a 3-D CGI environment to external spaces (projections and realisation of the 3-D CG image in real-world space).

At that point in the project space was included as part of an overall strategy, integral to an overarching method to address a distinctiveness for 3-D CGI. As the work progressed space became more central to the investigation, 3-D CGI space as a virtual environment, 3-D CGI space in as essential to the production process and capture (rendering) and 3-D CGI space in relation to the presentation of the final image in the real world. Therefore the idea of space evolved from being a part of the investigation to becoming central to the investigation. At this point the connection between space and medium specificity for 3-D CGI became plausible as a leading proposition. However, opening an avenue of investigation that positions space as potential medium within a digital process invited questions concerning how to define ‘space’ within the context of 3-D CGI. What kind of space is being discussed? Initial, and perhaps obvious conclusions placed space within the realm of a Newtonian, a total space, an objective Cartesian space where geometric objects are placed within a measured co-ordinate-based spatial system. However, reflections on the animations, also suggested an additional approach to spatial understanding a

less specified notion of space, a pictorial subjective space that might be explored alongside a traditional Cartesian one.

Thus far the animations had incorporated space into the research in two ways 1) space as objective in terms of:

a) The construction and production of a 3-D CGI objects reliant on accessing a measured Cartesian space.

b) The recording and presentation of a 3-D CGI image as aligning to perspectival conditions to produce the spatial illusion.

2) subjective space which concerned:

a) Presentation methods where the viewer generated an individual interpretation of the images presented.

b) Pictorial subjective space where spatial information was presented as non-measurable or indistinct with regards to spatial cues within the image.

The question therefore became, if the ambition for the research is to establish a medium specificity for 3-D CGI not (wholly) reliant on a perspectival representation of space, then how might the concept of space be developed to satisfy this goal?

The remainder of the research project set out to address this concern, to comprehend space and its potential as medium specific to 3-D CGI, where connections to both objective and subjective spatial ideas might be employed. The move towards the interrogation of space, a subjective space (as pictorially subjective) alongside an objective Cartesian space, presented a theoretical conflict where apposing models formed a contradiction. To overcome a potential spatial inconsistency the project turned towards Heidegger's spatial

theory, a third option where notion of objective space and subjective space are not regarded as exclusive.

Specifically, Heidegger's theory of space in relation to sculpture was introduced as an alternative route to thinking about space and 3-D CGI. A combined subjective and objective development that introduced new avenues and devices for dealing with space relations through edges, borders and voids. Working with Heideggerian space required a redefinition of 'objective space' and 'subjective space' where the terms take on new roles i.e. objective space becomes concerned with "relational dealings with entities in the world" (Arisaka, Y, 1995, p.6) and subjective space where ideas of being (spatially) in the world are explored. Such a move opens up new vistas for 3-D CGI practice and the final section of the project is interested in how Heidegger's ideas about space might be developed or applied within a 3-D CGI context.

Undeniably the practice of 3-D CGI concerns space. Space is implied within 3-D CGI's title, its 'self-evident' quality. This research has argued that 3-D CGI is not only concerned with space but that space can be regarded as the media specific quality for 3-D CGI. A unique characteristic of 3-D CGI practice. Moreover, I suggest that the concept of space within 3-D CGI might not be limited to Cartesian models of representation, that a richness and expanded vocabulary for 3-D CGI lies beyond rigid interpretations of how space might be represented via perspectival routes, accessed by seeking alternative methods for working within this spatial digital process.

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Kurt Kren, *Baume Im Herbst* (Trees in Autumn) (1960)

Ulf Langheinrich, *Movement series* (2010)

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Michel Ocelot, *Les Contes de la Nuit* (2011)

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William Raban, *Skyfilm* (1970)

David O'Reilly, *Black Lake* (2010)

Rafaël Rozendaal *Happy Mondays* (2012)

Paul Sharits, *Ray Gun Virus* (1966)