

T O W A R D · A · P O S T - D I G I T A L
P R A C T I C E · O F · A R C H I T E C T U R A L
R E P R E S E N T A T I O N : A N
A N I M A T E D · R E - E N G A G E M E N T · O F
A R C H I T E C T U R E , V I S U A L · E F F E C T S
A N D · T H E · M O V I N G · I M A G E ·
· M A T H A N R A J · R A T I N A M ·

Doctor of Philosophy
School of Architecture and Design
RMIT University
2012

Toward a Post-Digital Practice of Architectural Representation:

*An Animated Re-Engagement of Architecture,
Visual Effects and the Moving Image.*

A thesis submitted in fulfilment of the requirements
for the degree of Doctor of Philosophy

Mathanraj Ratinam
B. Arch.

School of Architecture and Design
College of Design and Social Context Portfolio
RMIT University
August 2012

DECLARATION

Declaration

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

Mathanraj Ratinam
10th August 2012

ACKNOWLEDGEMENTS

For Lisa and our two cheeky monkeys.

Acknowledgments

The immediate and short list of people to thank also happen to be the people this PhD is for: my wife Lisa who only a couple of years earlier completed her own doctorate despite encountering some of life's greatest challenges and our two wonderful young sons who were born after I began pursuing this PhD and on more than one occasion had passages of it read to them at bedtime. Had they not been so forgiving I would never have crossed the line.

The longer list of people I'd like to thank includes those in other time zones who were directly involved in shaping the depth and flow of this study. Hélène Frichot who generously and patiently counseled me through the research and helped me to narrow down my many nomadic thoughts. Brent Allpress who's questioning set many of my thoughts in motion in the first place. Laurene Vaughan who with the eyes of a cryptographer could always see how a PhD was coming together and when it was whole. Martyn Hook who encouraged me to find the best voice for the work, and Charles Anderson, Inger Mewburn, Miodrag Mitrasinovic and Terry Rosenberg for the wonderful conversations that revealed inspiring new ways of unraveling my ideas.

Then there were the people who made the film possible, from the actors Katie Scherer and John Pelham, David Fano and Georg Mahnke for their technical support and critical friendship, my brother Nishan Ratinam for composing and producing the musical score for the animation, and of course Paul, Marc and David of Lewis Tsuramaki Lewis for the architectural proposition, visual language and critique. Finally there were people who contributed to the refinement and finalizing of this work in a manner I still have trouble fully accounting for but nonetheless fully appreciate. Penny Modra and Mel Campbell who made for a smoother reading with their editing of the text, Stuart Geddes who with his delicate eye gave this publication so much life through his thoughtful and sensitive approach to its design, and Jacqueline Cooksey for her assistance in preparing the document for print.

A PhD can seem like a lonely pursuit but everyone above made it feel wonderfully collaborative and collegial and to all of them I owe thanks and remain grateful.

Contents

- III Declaration
- V Acknowledgments
- 1 Abstract
- 5 Introduction

Chapter One – Scope and Structure

- 11 Scope and Aim
- 12 Exegesis Structure
- 14 Outline of Chapters
- 15 Research Methodology
- 16 Project-Based Research and Practitioner-Led Investigations

Chapter Two – Project One: Digital Quadratura

- 21 The Architecture of Animation
- 22 Digital Panoramas and Photogrammetry
- 23 Visual Effects Techniques and Perspective
- 25 Digital Modelmaking
- 26 Constructing a Panoramic Image
- 30 Allowing for Movement
- 32 Falling into the Image
- 34 Still Frames from *Digital Quadratura*

Chapter Three – A History of Visual Effects

- 37 Compositing and its Beginning
- 41 Significant Examples from Film as Precedents for Architecture
- 44 Perspective: A Visual Effect
- 52 Contemporary Perspective Machines and Techniques
- 54 The Slippery Slope of Truth Surrounding Perspective
- 56 Divergence
- 58 Narrating Perspective
- 60 Manipulating Perspective
- 62 Other Architectural Visionaries Who Mediated Perspectives
- 65 Framing Devices
- 66 A Practitioner's Perspective

Chapter Four – A Review of the Architectural Flythrough

- 69 Research Background
- 69 On Representation
- 71 Architecture and the Moving Image
- 76 A Description of a Flythrough

Chapter Four (Continued)

- 76 The Trouble with a Flythrough
- 77 The Flythrough, Architectural Representation and Drawing
- 81 Photorealism and Verisimilitude
- 83 Objective/Subjective
- 83 Embodiment
- 86 Closing – on Architectural Representation
- 88 The Flythrough and Animation
- 88 Drawn to Animation
- 89 Narrative and Liveliness
- 92 Closing – on Animation
- 94 The Flythrough and the Cinematic
- 95 Here's the Plan
- 98 Bird's point of view
- 100 Architecture Unedited
- 101 Closing – on the Cinematic
- 103 In Isolation

Chapter Five – Project Two: Park Tower

- 107 A Broader Context
- 110 Assessing the Transition
- 111 Outlining the Intention
- 112 The Planning
- 116 A New Practice
- 121 The Outcome
- 122 Construction of Greenscreen Studio
- 124 Storyboard Frames
- 132 Still Frames from *Park Tower*

Chapter Six – Discussion and Conclusion

- 139 Interstitial Practices
- 141 Intervening Between Projects
- 146 Addressing the Initial Concerns
- 146 Looking Back
- 147 Limits and Expansions
- 148 A Summary of Discoveries
- 150 From Here On
- 151 Conclusion

- 154 Bibliography
- 158 Filmography

TOWARD · A
POST-DIGITAL · PRACTICE
OF · ARCHITECTURAL
REPRESENTATION:
AN · ANIMATED · RE-ENGAGEMENT
OF · ARCHITECTURE,
VISUAL · EFFECTS
AND · THE · MOVING · IMAGE.

Abstract

This research is about the ways in which architects communicate architecture. It sits within a larger context enquiring into the role of representation in architecture and more specifically concerns itself with contemporary practices of architectural representation and their relationship to certain fields of the moving image, namely animation, visual effects, and cinema.

For over a decade there has been a great deal of interest in the creation of architectural forms from digital processes, or what is commonly referred to as generative architecture. Though this has undergone extensive experimentation and critique in academia with some highly inventive outcomes that are emerging in the professional sphere of architecture, there has been significantly less attention paid to the way architects digitally represent architecture, generative or otherwise. Amid the abundance of digitally rendered images and animations of late, which have provided new opportunities for illustrating and disseminating architectural ideas, there are some concerning trends. They include: the narrowing of aesthetic outcomes through the current digital methods, leading to greater homogeneity and limiting the communicative potential of the outcomes; the complex, inappropriate and redundant techniques employed to develop imagery and animations; the privileging of a geometric description over the poetic qualities of architecture; and, perhaps unintentionally yet importantly, the re-characterising of representation as primarily an explicative practice as distinct from the equally reflective, reflexive and contemplative practice it once was. Exploring and addressing these concerns is the interest of this research.

This research examines through theoretical writings the current practices of digital representation and their results, and through two projects proposes more appropriate methodologies that would enhance the outcomes. The first of the two projects reconsiders the existing digital modelling and rendering conventions. These conventions largely emulate physical model making even though they don't intend to produce an outcome that is tangible. The approach I propose looks instead to a historical example of perspective construction developed by Andrea Pozzo, along with contemporary developments in cinematic visual effects as precedents in putting forward a new digital technique more aligned with established practices of architectural perspectival representation. The approach is not merely to couple cinematic visual effects with the long-established tradition of architectural drawing as a fashionable counter, but rather to recognise their historic overlap; there was a time before the medium of film when visual effects sat clearly within the domain of architecture and painting. Returning to the birth of Renaissance perspective, which is largely credited to Filippo Brunelleschi, we find ourselves not only at a point where architectural representation began to flourish but also, as I argue, at the birth of visual effects. Today we see the overlapping of visual effects practices in film and architectural representation once again; their disciplinary boundaries are merging as architectural offices model, render

and animate their proposals employing the same software that visual effects studios use to create effects for films, and architects look to filmmaking as another means of exploring and communicating their aspirations. Yet the practice of perspectivism in film, animation and painting has been and is different from that of architecture. Between the two historically important approaches of generating perspectival imagery – the use of perspective apparatuses for film and painting and linear perspective for architecture – lies an important clue as to what undercuts digital representation in architecture today, particularly that which is in the form of moving images. A historical review reveals that the capacity of linear perspective was limited to describing geometry, a regime which notable figures of architectural representation such as Andrea Pozzo (1642–1709), Giovanni Piranesi (1720–1778), Hugh Ferriss (1889–1962), and even Filippo Brunelleschi (1377–1446) in his time, attempted to fracture and overcome. Their efforts ultimately led to practices and outcomes that looked beyond geometry to the ephemeral, sensorial and even moral value of representations in their making and viewing.

These concerns of the object-oriented nature of linear perspective are brought into a more immediate history in a discussion about the architectural ‘flythrough’, which occupies a significant portion of this research. This recent yet ubiquitous addition to the gamut of representational techniques calls into question its own legitimacy. To determine what it might contribute to architecture I compare it to qualities of the three practices the flythrough claims to straddle: architectural representation, animation and cinema. Its weakness, however, is more revealing and significant than its benefits, as its most recognisable traits largely demonstrate the shortcomings of digital representation more broadly. Yet given the great potential of animation, and considering the shared interests of architectural representation, animation and cinema – which are poorly represented in the flythrough – the area of animated representations of architecture provides the most fertile territory to begin demonstrating a more considered approach to how digital representation can outgrow the flythrough and move on to being as evocative as historically notable examples of architectural representation.

The second project in this PhD, an animation of a speculative building by Lewis Tsurumaki Lewis, stems from the earlier discoveries and discussions, demonstrating a new theoretical and practical framework through which architectural animations could be approached. Aside from tackling the self-generated concerns of the PhD, it considers problems further afield by reflecting upon notable architects whose practices are heavily invested in digital representational techniques to develop their architectural forms, but who do not appear to be nearly as concerned about how they might digitally represent those forms.

In tackling the initial set of concerns and others discovered along the way I have approached this research not as a historian of architectural representation or film, nor as a theorist, but as a maker of images and animations first. As a Research by Project model of PhD, this exegesis views all the interests explored, including the historical and theoretical work, through the lens of a practitioner. Drawing upon aggregated knowledge that is internal and tacit as well as external, such as the contemporary and historical work of others as important precedents, I have always hoped to develop and propose new

ways of practicing representation to critically strengthen practitioners and allow the practice of architectural representation to mature into a necessary and long-overdue period of post-digital representation.

TOWARD · A
POST-DIGITAL · PRACTICE
OF · ARCHITECTURAL
REPRESENTATION:
AN · ANIMATED · RE-ENGAGEMENT
OF · ARCHITECTURE,
VISUAL · EFFECTS
AND · THE · MOVING · IMAGE.

It began with a hunch.

Introduction

This body of research stems from an earlier set of concerns and interests I had about architectural representation, particularly digital representation, during my years of undergraduate study in architecture. At the time I was working with a number of architects illustrating designs through images and animations. All the while there was something about digital representation and its outcome that seemed unresolved yet I could never pinpoint what that was or how it could be addressed, and ultimately this left me frustrated and unsatisfied with the way I had been practising. In the following years my professional practice drifted into filmmaking and as I began directing television commercials and animations my film practice acted as a counter to my architecture practice. More interestingly, the practice of filmmaking began to illuminate some of the problems of digital representation in architecture and I sensed that I was coming to realise what it was that had troubled me earlier.

My original concerns about digital representation began with a conversation around a digitally rendered image that I was involved in making for an architectural office. The 'artist's impression' of a large-scale office building was an entirely digital construction, compositing together the sky (digitally painted), the streetscape (photographed and digitally manipulated) and the building (3D modelled and rendered). The trees, which were not from the site of the proposed building but from a library of photographic assets, became the focus of the conversation when, towards the end of the production as we began layering the image with vegetation, the architects had asked us to strategically line the façade with trees. There needed to be enough to hide some parts of the building with which they weren't entirely happy, but not too many as to appear self-conscious. For me, this conversation led to questions about the role of the image I was making as I saw three very different readings occurring. The architects felt that it was an opportunity to mask their faults, perhaps in the belief that renderings and artistic impressions should never be considered entirely accurate even if the result was to appear as a photorealistic image. The client, however, would expect to witness not just the trees but the entire scene as a promise of the completed project, and I as the maker of the image saw the outcome as a critique of the architects' design; the image should encourage the architects to return to the drawing board to make the necessary amendments to the scheme. The three very different intentions of the image - deceptive (the architects manipulating the image to cover their flaws), explicative (by visualising the design perspectively from two-dimensional architectural drawings for the client) and reflexive (as I considered the image a critiquing device rather than simply a marketing tool) - also spoke to the timing of the image. The architects saw the artist's impression as the outcome of all their past work, I saw it as existing in the present and as part of an ongoing design process,

and the client considered it a window to the future. The conflict of interests surrounding this image was the first time I had really questioned the purpose of what I was making.

Since that image I have become confronted by other questions and issues about digitally rendered images and animations of architecture. One question in particular is about the representative capacity of photorealistic renderings, especially as we now see this homogenous aesthetic becoming the standard for many architects. Another issue is the vast majority of digitally rendered images that emphasise material and geometric order over the symbolic and poetic aspirations of architecture; and it seems that such digitally rendered images are almost always created at the end of the design process. A larger concern is about the changing state of architectural representation – that such images and techniques have come to re-characterise representation as primarily an explicative practice rather than the equally contemplative and meditative practice it once was in the pre-digital period.

Where I had once thought that ideas could be explored and described more deliberately and articulately when represented digitally, I began to feel that architecture's potential to communicate its significance was being stifled. The continually increasing body of anaesthetising images and animations in architecture suggests that a review of architects' image-making practices is necessary and urgent.

The concerns of this PhD are not limited to digitally rendered still images. In fact the issues become more pressing when architectural representations take the form of moving images – particularly as animations – as it is no longer a single frame that needs to be addressed but an entire sequence through a building. The subject of animation as it relates to architecture is in fact at the core of this research, not only as a central topic but also as the mode of practice and primary outcome for the body of work that will be presented here. Of all the methods of representation available today by which architects are able to represent their designs and ideas, animation occupies a unique role and history. If we were to divide all the individual traditional practices of representation into two categories – those that can be practised before the building exists and those that are made only after the building is built – the techniques most often used to conceive and develop a building (drawings, models, et cetera) would sit in the former and those used to record and re-present a building after it has been created (such as photography and film) would sit in the latter. Generally, those that have a mimetic pictorial quality and are works of moving image are part of the latter, except animation. Unlike other forms of the moving image (such as documentary and fictional films), animation can be also employed before the building exists, because it is more graphic than photographic. Categorised in this manner and used in the stages between the conception of an architectural idea and its realisation as built work, an animation is able to take on roles traditionally reserved for drawings and models. These roles should not be considered merely as utilitarian and to aid the construction of the eventual building, but more widely appreciated as being tied to the process of architectural ideation, as one of agency that is very much part of the contemplative performance of an architect at work. Such representations develop a back and forth conversation between the architect and

communicative and design intentions, we are seeing a convergence of practices. Yet we should be aware that the convergence of architectural representation, animation and visual effects is neither a mere coincidence that has only come about through software, nor a very recent occurrence. As I will reiterate throughout this research, there have been moments when the histories and concerns of these fields crossed paths in the past and it should come as no surprise that they have merged again – particularly now through the opportunities of a digital practice, which has made more fluid the transition from one field to another, blurring and expanding old disciplinary boundaries.

There is little doubt that digital architectural representation has benefited from its use of animation techniques and software; however the current practices, conversations and outcomes of architectural animation are much narrower in scope and dominated by what is commonly referred to as the architectural flythrough. Characterised by a continuous and unedited roaming camera to recreate the view of an occupant, this impoverished form of animation is a result of a problematic digital practice that has never truly critiqued the contribution of a flythrough to architecture or its merits as an animation. Made mostly by graduates of the digital era of architecture in professional practice and taught by recent graduates to current students in academia, it continues to be practised to demonstrate technical wizardry and a more ‘advanced’ way of presenting architecture by departing from its traditionally still history. But, given the overwhelming number of software packages that a graduate of architecture is now expected to comfortably manage, it is of little surprise that the flythrough has continued without review as most of the effort has focused on students becoming technically proficient rather than critically assessing the outcomes. An unintended consequence is that the software, more so than its operator, often dictates the aesthetic qualities of digital representations, effectively demonstrating that architects are less aware of why they are representing the way they are. In light of this, my research will not only focus on the architectural flythrough but also discuss the scope of architectural animation more widely. Ultimately I will propose new strategies of working – strategies more aligned with the disciplinary nature of architecture and the historical ambitions of architectural representation.

Filmmaking can be a liberating experience as it allows for so much complexity to be embedded even within a single frame of footage. This is achieved through good directing, performance, cinematography and many other aspects of filmmaking including digital visual effects, which allow one to create moments that would otherwise be unachievable by the camera alone. Film, among other things, is a medium of representation and I see it as an ever-evolving language discovering new ways of communicating myriad complex and contemporary ideas. The representational possibilities of film have no doubt flourished over the past two decades due to the expansion of digital techniques – particularly in the area of visual effects, where significant developments have enabled increasingly evocative image creation, intensifying underlying narratives. At the same time the same software is being used to model forms and render images and animations in architecture; but, where visual effects has employed the software and procedures to

create more imaginative spaces and emotionally important moments for cinema, architecture seems to have steered a path toward making literal and prosaic depictions of architectural designs.

We need to keep in mind that the relationship between visual effects and architecture is more intertwined and significant than a conversation about software. During the Renaissance, before the medium of film existed, visual effects sat clearly within the domain of architecture and painting, and today the contemporary practice of visual effects in film still remains largely rooted in the discoveries of that period and its image-making processes. This is an important relationship as it sheds light on how the current concerns of digital representation in architecture can be tackled. Practitioners could expand their communicative potential from verisimilitude to include the non-geometrical aspects of their architectural ideas if they were made aware of the historical and contemporary relationships between architectural representation and the practices of visual effects and animation.

Overall, this is how I have approached the research. It is motivated by what I will argue are overlapping ambitions in architecture, animation and visual effects to represent ideas spatially, evocatively, narratively and emotionally. Most practitioners are unaware of the quiet dialogue between these three fields but through the writings that illustrate their relationship and projects that demonstrate an expanded practice of architectural animation, this research intends to re-establish some of the former interests of architectural representation that began to fade away as it transitioned into a digital practice. A post-digital practice reconnects the digital period of architectural representation with its non-digital past in order to move on from dichotomizing architectural representation in such terms and to (re)focus on the core richness, value and consequences of new and possible representational practices in architecture. One such intended consequence is that as a project-based PhD the research strives to create a more reflective practitioner, which I would argue is intrinsically linked to the representational practices of filmmaking and architecture alike. That is, a strongly established and deeply considered representational practice allows an architect and filmmaker to better understand him or herself just as much as what is being presented.

CHAPTER · ONE
SCOPE · AND
STRUCTURE

Scope and Aim

Perhaps it is easier to describe the aim and scope of this research by explaining what it isn't. There has been a great deal of exploration of digital processes and techniques of animation that have led to new architectural forms. This work, promoted by such practitioners as Greg Lynn and Lars Spuybroek, might be best described as generative architecture.

But my research is not about that. There is also the technical study of available software and technology to help create representations in and of architecture. Yet this research is not about that either. Nor does it take an art history approach to historically reviewing architectural representation and its meaning.

The larger intention of this research is to enquire into the role of representation in architecture and thus it will reach out to and touch upon all the aforementioned areas. Within that, the specific aim of this research is to offer new approaches to digitally representing architectural ideas and propositions through the moving image enlightened by visual effects techniques, animation, cinema, and their historic links to and overlapping interests in the practices of architectural representation. Unlike the previously mentioned areas of research, which are largely about the generative, explicative and historical roles of representation, the focus of this research is the reflective and contemplative role of representation. That is, in adopting and reappropriating visual effects, animatic and cinematic techniques of representation to communicate architectural propositions, how might we reconsider architectural proposals, reveal more of their meaning and discover a more profound understanding of their intention? As my interest lies in the communication of architecture rather than the generating of architecture, this research is about the representation of architecture, not representation for architecture. Furthermore, in relating the fields of the moving image and architecture, this research is about practising with the medium of film in architecture, not investigating the use of architecture in films. Though this research at times converses with many of the established practices of representation in architecture (orthographic drawings, perspective drawings, models, architectural photography, collage et cetera – digital and non-digital) it is focused upon the creation and review of digitally produced images and animations in perspective view; or, in other words, exploring pictorial impressions of how the eye and the camera see the world.

The ambitions of the research are twofold, as reflected by the two projects that have been pursued. The first of these is to propose a more technically efficient process of creating images and animations than what is widely practised today. This will be done by reviewing the conventional method of making digital imagery and its outcome in order to put forward an alternative approach that would achieve the same ends (and at times better results) via a simplified procedure. The second, propelled by the outcome of the first, is to understand the role of animation in architecture and to propose how one might be able to go about embedding more meaningful ideas into the moving image through

a more considered approach of involving narrative. The approach aligns with the traditions and nature of animation and cinema and their established importance in order to raise the understanding of an architectural proposal. In very simple terms, the emphasis of the first project is to be technically reductive and the aim of the second is to be narratively enriching.

Exegesis Structure

The research is packaged in a chronological manner with the projects and research being explained largely in the order they were undertaken. This is to reveal how the tone and ideas behind the research developed from the first project to the second. Project 1, which addresses the technical aspirations of the research, is followed by a series of discussions extending from its approach and outcome. These discussions provide the groundwork for the various areas and practices of representation and their communicative value in both architecture and film – asking how things are represented and for whom. They suggest new ways of understanding representational theorists, terms, directors and ideas surrounding the broad topic of representation, which all



together initiate and inform Project 2. This second project focuses on two key aspects of animation – the narrative and the production process – to discover how these can be used to uncover and illustrate a wider set of experiences and understandings of an architectural proposal.

Since the outcome of Project 1 is an animation compositing 3D generated content, digital photography and live footage, the discussion following it begins with a selective history of visual effects focusing on compositing. Cited are particular examples throughout the history and contemporary practice of compositing applicable to the specific interests of this research. Ultimately this conversation leads to a period before the invention of cinema, the Renaissance, when architectural representation flourished and when visual effects resided within the study of architecture and painting following the invention of Renaissance perspective. This period marks an important point for architecture and visual effects (as we understand them today), as the consequences of those initial discoveries are manifest in both fields, even in today's digital environment. More important is the subject of perspective, which has continually mediated the sustained relationship between architecture and visual effects. Its study encompasses other noteworthy matters such as representational practices in architecture and painting, the techniques and instruments that were developed to generate perspectival imagery, and notable figures who recognised and pushed its limits. This journey – back to the Renaissance and returning to today – functions to establish the initial historical connection between architecture and visual effects and, along the way, marks other moments in history when the techniques and intentions of the two practices crossed again. From here a larger conversation begins, less historical and more theoretical, originating mainly from the outcome of the first project about the relationship between animation and architectural representation. In re-viewing the animation from Project 1, not for its technical merits but for its representational merits, a number of concerns arise which are also found in the majority of architectural animations that have come to take the form of a 'flythrough'. This initiates a lengthy discussion which dissects and compares the flythrough to animation, architectural representation and the nature of the cinematic – all the areas the flythrough claims to straddle – in order to determine its value. Here a number of positions are established about the flythrough, its relevance to architecture, and the way architectural animations should be approached. This discussion leads to Project 2, which aims to put into practice many of these opinions and ideas established in the discussions since the first project. Project 2 also looks beyond the internal concerns of the research, tackling other problems about digital representation that occur among today's notable architects who are heavily invested in digital representational techniques. As Project 1 is related to a historical practice of representation, Project 2 explores the role of animations and their ability to offer a more meaningful account of an architectural idea by communicating aspects of a project that are difficult to present through the traditional methods of architectural representation. These two projects, which bookend the historical and theoretical discussion about digital architectural representation, animation, visual effects and, to a lesser extent, cinema, also present a shift from a technical interest (Project 1) to a theoretical interest (Project 2). In closing, both projects are reviewed

in a discussion comparing their outcomes and leading to a broader conversation of what might be carried out beyond this body of work.

Outline of Chapters

Following the introduction, Chapter 1 outlines the ambition and structure of this research. Chapter 2 documents Project 1, which proposes an alternative methodology to modelling and rendering images and animations where the practice and the outcome operate entirely in perspective. While it is a digital process it also references the work of Andrea Pozzo and his quadratura technique of the 17th century. Chapter 3 describes the historical relationship between architecture and visual effects back to investigations of perspective during the Renaissance through to examples of visual effects that are pertinent to architectural representation and this research. Focusing largely on the early demonstrations of Filippo Brunelleschi, it examines a crucial point in history that marked not only the birth of Renaissance perspective but also the beginnings of compositing and visual effects. This relationship is unfolded further through a discussion focusing on the historical practices of making perspectival representations and the techniques that were used. By contrasting the two different practices of representation within architecture and painting, the discussion brings to light the various outcomes they privileged, most notably the distinctions between representing geometry and representing narratives. The discussion returns us to contemporary practices of image-making and how such historical influences still reside in today's practice of architectural representation, filmmaking and animation.

Chapter 4 is an essay about the architectural flythrough. It arises from the animation of Project 1 (described in Chapter 2) and the historical coverage from chapter 3 to focus on a more immediate history and develop a theoretical position that establishes relationships between architecture and the moving image. Examining and critiquing the role of the architectural flythrough, Chapter 4 describes how it is, in character (unlike the established forms of architectural representation), an impoverished form of animation, and a misrepresentation of what it means to be cinematic. Yet, the flythrough ultimately reveals itself as a symptom of the much larger problems of digital representation in architecture. A number of the issues that make up these larger problems are addressed with a broader set of ideas put into practice in the second project, described in Chapter 5. Project 2 is an animation that proposes and demonstrates a new approach to representing architecture in an animated way. It highlights the unique qualities that animation as a practice can contribute to architecture, which I argue remain elusive within the well-established architectural practices of drawing, image-making and the model. The specific outcome in this case is a short fictional animation based on a speculative project designed by Lewis Tsurumaki Lewis architects for the 2004 Venice Architecture Biennale, titled *Park Tower*. Chapter 6 is a comparative discussion

and conclusion. It concentrates mostly on the two projects – discussing which new ideas and issues are raised through their relationship, what they achieve together and how they address the initial concerns that provoked this body of research. The conversation also weaves together all the previously mentioned historical references, demonstrating a common aspect among them that further supports the discoveries of this research. A third element of this discussion is a reflection on the conduct of the practitioner-centric mode of research. As this is a body of research undertaken by project, this chapter looks back to consider the role of the practitioner both in terms of what he or she is able to expose and how the research serves him or her. The conclusion reflects on the findings by looking forward and considering the ongoing research that may be cast in light of the discoveries made in this PhD. Accompanying the written document is a DVD containing the animations of both projects and supporting material that documents the production of each project.

Research Methodology

In order to address the aforementioned concerns as well as make a contribution of new knowledge to the field of architectural representation, this research attempts to resolve contemporary problems of digital representation in architecture by way of the two projects that I will present. These two works are the project-based components of the research and each take on a large-scale existing problem in the professional practice and academic teaching of architectural representation today. The projects are also supported and developed by theoretical and historical writings that are crucial in developing from the first project to the second.

Turning to history was important to help negotiate contemporary concerns about digital representation in architecture for several reasons. Often historical examples of work are more helpful than recent examples, as the passage of time has allowed for a better understanding of the issues they raise and the consequences that followed. These issues of the past are also recurring and therefore become important precedents for the concerns we face today, which are often a repeat of past problems now taking place within a digital context. The varied selection of references is in keeping with the nature of my practice and of practitioner-led research generally, for two reasons. First, the notable examples of work that I reference are results produced by practitioners. As a practitioner myself, I have focused on the work of historical and contemporary practitioners, paying close attention to their techniques and outcomes. Second, in the nature of a practitioner, I look to others and their work not only to support and argue my position but also to influence and inspire my own practice. I can't always explain why a certain moment in a film or a particular painting has etched itself into my mind; but carrying them with me I have found myself continually referring to them, and their importance continues to grow. As they have become a part of my practice I feel their influence needs to be mentioned and explored more thoroughly within this body of research

to determine their full value. Working with a diverse set of influences is not something that is unique to my practice but something I would argue is part of every practitioner's work in his or her own way.

As a practitioner pursuing a project-based PhD, analysing, reviewing and writing about projects has led me to new projects and more writing; inevitably an autobiographical method of working needs to be disclosed and at the same time remain scholarly and rigorous. This is only complicated further as each project intends to be inventive and original in very complementary ways, as illustrated in the table below.

PROJECT 1 DIGITAL QUADRATURA	PROJECT 2 PARK TOWER
<p>Aim: To propose a new method of constructing digital site models for architectural renderings and animations.</p> <p>Domain: Contemporary representation in a historical context.</p> <p>Objective: To overcome current cumbersome practices by looking back to the pre-digital period of architectural representation.</p> <p>Outcome: Technical and object-oriented; focusing on a simplified process of modelling for still renderings and animation.</p>	<p>Aim: To propose a creative process that introduces a narrative-centric approach to architectural animations.</p> <p>Domain: Contemporary representation in a multi-disciplinary and trans-disciplinary context.</p> <p>Objective: To overcome current concerns surrounding the architectural flythrough by looking across to the contemporary practices of animation and visual effects.</p> <p>Outcome: Character-driven and subjective storytelling; focusing on narrative.</p>

The particular course the research takes – in navigating theoretical ideas, historical figures and their outcomes, and the projects developed as part of the research – has its reasons. First, it best reflects the specific concerns of the research, which is about practice, and highlights how all the other aspects of the research are tied to the practical nature of the projects. Second, it suits the way that I prefer to work, as a practitioner, in order to make the most of what is being discovered along the way. Lastly, it is a path that chronologically demonstrates how history and theory come to influence the development of the projects. In this regard the specific historical and theoretical references that are discussed are only those that have either sprung up from the projects or influenced the development and shaping of the projects.

Project-Based Research and Practitioner-Led Investigations

My work has always begun with an enthusiasm for image-making. I have always sought to discover new ways of creating images and animations and am 'self-taught' in many respects. But resolving these smaller problems raises larger questions about the meaning and value of images, leading to a more critical approach. That is how I have found myself pursuing this project-based doctoral research.

The form of a project-based model of research was always more appropriate for the questions I was asking. These questions were best resolved through the making of work and they would also demonstrate the applied nature of my concerns and theory. A project-based model is also more suited to how I prefer to work, which has always been to stumble upon a problem, enquire, test and address it through the making of new work rather than operating in a strictly written mode. So the interests that are pursued in the research did not begin from a blank slate but rather have emerged from a much longer lineage of projects before this PhD, which were often outcomes of questions surrounding even earlier projects. The pattern recurs in this research, as Project 2 stems from Project 1 while trying to examine broader concerns.

I have at times found myself asking why some aspects of this work would warrant the title of research, let alone doctoral-level research, when there are people who often resolve similar technical concerns in a professional setting without referring to it as 'research' but simply as a part of a daily practice. What is it that separates this body of work from all the work that had been done before pursuing a doctorate? I have discovered that this exploration is, in fact, quite different in many ways from 'everyday' practice. The problems I have chosen to resolve are no longer strictly my concerns, as I have begun to enquire about the larger practice of representation in architecture. This, in turn, leads to another difference which is that this research intends to be disseminated and make a new contribution to the field. Quite often in a professional environment, which is competitive by nature, such knowledge (otherwise known as intellectual property) is not freely shared. For this reason the work is best removed from the professional arena for the sake of the research. Although the research is an effort to change the way image-making – and, more specifically in this case, architectural animation – is carried out professionally, exploring the work within an academic setting means it is unencumbered by the burdens of professional practice (financial, client and time-based restrictions) allowing for a more thorough exploration and therefore casting a wider horizon. These bigger questions then need a larger timeframe, a different intellectual environment and new kinds of resources in order to be explored and resolved. Relocating project-based research into the academic arena allows the work to mediate between the rigours of the academy and the profession.

Though the research is demonstrated most vividly and experientially through the projects, it is also most meaningfully grounded and unpacked through the writing. Here it directly converses with many other voices in the theoretical field of architectural representation, animation, visual effects and cinema, marking perhaps the most significant difference from everyday practice. As the projects take on board the ideas and arguments of many architectural and representational theorists in order to visually create a dialogue between my ideas and theirs, the writing describes the thoughts and debates that can't be revealed in the animated outcomes alone. It therefore spans widely beyond the specificity of the projects, each of which could be seen as quite a unique example of many possible variations.

A few articles arising from this research have already been circulated in journals and presented at conferences,¹ which have been important avenues for sharing the knowledge and receiving feedback at a critical and refereed

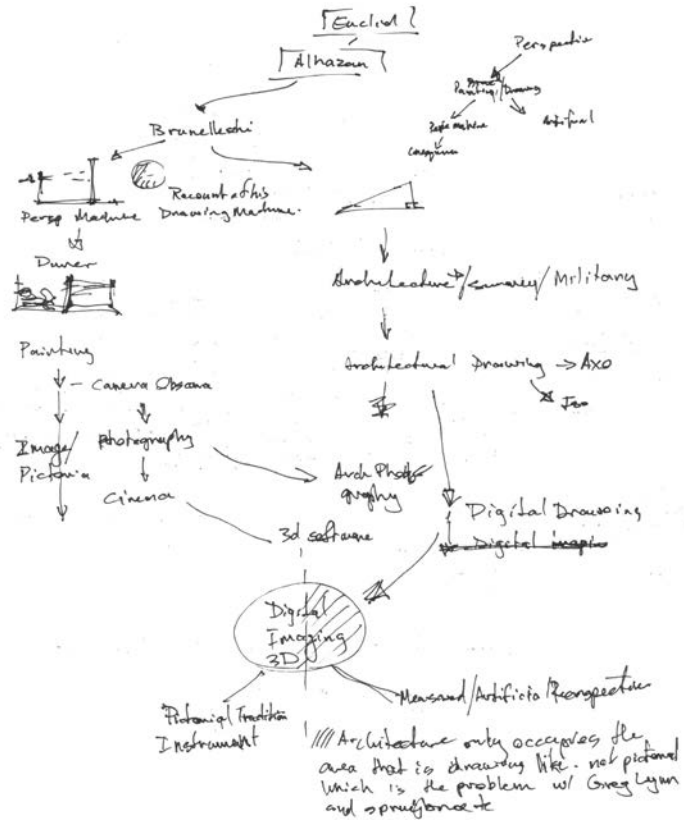
¹ M Ratinam, 'Falling into the Image', *ARQ: Architectural Research Quarterly*, Volume 9, no. 3-4, 2005, pp. 237-244.

M Ratinam, 'A Digital Renaissance: Reconnecting Architectural Representation and Cinematic Visual Effects' in M Frascari, J Hale and B Starkley (eds), *From Models to Drawings*, Routledge, London, 2007, pp. 146-158.

M Ratinam, 'A Broken Engagement: A Review of the Architectural Fly-through', paper presented at *Design Cinema Conference*, Istanbul University, Turkey, 2008.

M Ratinam, 'Architecture Unedited', paper presented at *Chu Hai Archi-cultural Symposium – Film, Architecture, and City*, Hong Kong, 2010.

level. The outcomes and discoveries of the research now also ground my professional practice and teaching. This shift, therefore, from smaller personal curiosities to much larger concerns pursued as doctoral research about architectural representation and the moving image has ultimately redesigned my own critical practice and ways of learning and teaching.



While project-based research is well suited and constructive to my own personal practice and subject matter it is also important to describe why practitioner-led research is valuable to non-practitioners or even to the practitioners who don't engage specifically with my concerns. The overarching reason is that it allows for different kinds of disclosures from the style of research conducted by non-practitioners. It's to do with the intimate relationship between the maker and what is made, and the opportunity this provides to describe and act on what occurs in the making. Practitioners, of course, have a tacit awareness of how things are made - partly through experience but also through sensitivity for the subject matter. These insights offer a new way of both recognising and investigating the problems of practice; this research is about the practice of digital representation and why representations are made the way they are. By shedding light on some of the mysteries behind the making, it aims to establish new knowledge with which non-practitioners can work.

CHAPTER·TWO
PROJECT·ONE
DIGITAL
QUADRATURA

“When work on certain artistic problems has advanced so far that further work in the same direction, proceeding from the same premises, appears unlikely to bear fruit, the result is often a great recoil, or perhaps better, a reversal of direction. Such reversals, which are often associated with a transfer of artistic ‘leadership’ to a new country or new genre, create the possibility of erecting a new edifice out of the rubble of the old; they do this precisely by abandoning what has already been achieved, that is, by turning back to apparently more ‘primitive’ modes of representation. These reversals lay the groundwork for a creative reengagement with older problems, precisely by establishing a distance from those problems.”

Erwin Panofsky, *Perspective as a Symbolic Form*¹

¹ E Panofsky, *Perspective as a Symbolic Form*, Zone Books, New York 1996, pp. 47.

The Architecture of Animation

The relationship between film and architecture has been frequently remarked upon generally, yet much of the discussion refers to the literal depiction of architecture within films. In these cases, the role of the architecture has largely involved the use of significant architectural works (particularly modernist homes) for staging scenes, set designs that are strongly influenced by an architectural period

or movement, or specific architects and their work as subjects of architectural documentaries. Moving beyond the many literal connections between the two fields, writers such as Juhani Pallasmaa² and Norman Klein³ have discussed the ability of various filmmaking structures to convey an understanding of space and demonstrate ephemeral qualities important to both cinema and architecture. Pallasmaa and Klein converse largely through representation, its poetics and its cultural significance in the two disciplines, locating many of their thoughts not only in the overlap between architecture and film but also in the moments when qualities from one discipline are able to transcend and even enlighten the other.

Aided by digital means we have more recently seen a merging of the disciplines. Architectural practitioners such as Greg Lynn⁴ and Lars Spuybroek⁵ have explored and promoted techniques of filmmaking and animation that generate architectural forms. But aside from these and similar generative methods, are there other relationships between the moving image and architecture? Could animation play another role in aiding the architectural process?

In the specific study recounted here, the aim is to investigate contemporary modes and techniques of digital representation, with a particular interest in those being employed for visual effects in cinema. The ambition has been to re-appropriate these techniques to help communicate architectural ideas while enquiring of their link to historic practices of architectural representation. More importantly the aim is to consider how a new approach could be used to critique architectural designs as they develop, rather than being employed at the end of a design process to communicate the outcome or, as formerly mentioned, being used to generate architectural forms.

² J Pallasmaa, *The Architecture of the Image: Existential Space in Cinema*, Rakennustieto Oy, Helsinki, 2001, pp. 7-10.

³ N Klein, *The Vatican to Vegas: A History of Special Effects*, The New Press, New York, 2004, pp. 10-12.

⁴ G Lynn, ‘Animate Form’, retrieved 15 January 2006, <www.glfm.com>.

⁵ L Spuybroek, ‘NOX: Machining Architecture’, retrieved 15 January 2006, <www.noxarch.com>.

Digital Panoramas and Photogrammetry

To begin, two of these visual effects techniques need to be briefly unpacked and explained before their involvement in the project and their relevance to architectural representation are considered.

First, the most commonly understood and experienced visual effects are digital panoramas. These panoramas are made by digitally stitching together a series of photographic images of a scene that can be viewed through freely available software known as ‘players’. Within the player there are a number of mapping methods used to project the panorama on what could be described as a room interior within which the viewer is located and is able to rotate or look around. The mapping, for the sake of the analogy, could be thought of as how the panoramic image would be wallpapered to the surface of the room. The projection method (and the shape of the room) can be spherical, cubical and cylindrical. However there are no distinguishable differences when viewing a spherical or a cubical projection, as their differences lie more in the production of the panoramas, as will be later explained.

The second technique, photogrammetry, has existed since 1851 as a technique for measuring objects from photographs.⁶ The use of photogrammetry for architecture dates back to 1858 when the architect Albrecht Meydenbauer developed techniques to document buildings for preservation and rebuilding.⁷ In very simple terms the process can be thought of as reversing the well-established technique of constructing linear perspectives, so it would begin instead with a perspective image (the photograph) and work back to a set of measurable orthographic drawings. The photogrammetrical process is discussed more extensively in Chapter 3, under the section “Contemporary Perspective Machines”.

⁶ M Doneus, ‘Introduction to Photogrammetry’, Universität Wien Luftbildarchiv, accessed 10 June 2005, <www.univie.ac.at/Luftbildarchiv/wgv/intro.htm>.

⁷ *ibid.*



Figures 2.1a
Ceiling of Sant'Ignazio, Rome, decorated by
Andrea Pozzo (1684–1685).



Figures 2.1b.
Ceiling of Sant' Ignazio, Rome, decorated by
Andrea Pozzo (1684–1685).

Visual Effects Techniques and Perspective

There is a strong connection between the visual effects techniques of photogrammetry and panoramas – as well as others, including Image Based Rendering⁸ and 3D camera tracking⁹ – and the investigations of Renaissance perspective. What all the aforementioned techniques have in common, as with most techniques in visual effects, is that they are ocular-centric; beginning with, developing through and outputting via perspective. Movie-making works entirely in perspective, as all images are captured through the lens, and for this reason almost all the technologies that have been developed for visual effects are organised around the principles of perspective.

These contemporary techniques are derivative of the investigations and debates of perspective that occurred through the Renaissance. The mathematics at the root of these techniques, in principle, is based on the same trigonometry. Digital methods and software programs that are employed for visual effects in cinema, I would argue, are contemporary digital equivalents of the perspective machines that da Vinci, Brunelleschi and others were experimenting with in their time.¹⁰ In proposing this I also take the position that such artists and architects were, at that time, also creating visual effects. One example of this is the vault of the nave decorated by Andrea Pozzo in Sant' Ignazio, Rome (Figures 2.1a and 2.1b).

To help paint the vault Pozzo developed and used his quadratura technique whereby a candle would be placed in the space at eye level and above it, toward the ceiling, was a grid constructed of string. The light from the candle would cast shadows from the string onto the ceiling, which would act as a guide when transferring the fresco image to the surface of the architecture.

⁸ I Kerlow, *The Art of 3D Computer Animation and Effects*, John Wiley & Sons, New Jersey, 2004, pp. 167–170.

⁹ *ibid*, p. 377.

¹⁰ The relationship between contemporary techniques of digital visual effects and the mathematics of the Renaissance is discussed in more detail in Chapter 3 under the section titled 'Contemporary Perspective Machines'.

11 F Leeman, *Hidden Images: Games of Perception, Anamorphic Art, Illusion*, Harry N Abrams, Inc, New York, 1976, pp. 51.

12 Alberto Perez-Gomez and Louise Pelletier, *Architectural Representation and the Perspective Hinge*, The MIT Press, Cambridge, Massachusetts, 1997, pp. 203.

13 *ibid*, pp. 58, 203–204.

When the eye of the viewer was located at the privileged position of the candle flame, regardless of the ceiling's physical geometry, the image would fall into alignment. The ceiling would cease to be a painted image and would instead appear as an extension of the physical architecture, dissolving away the ceiling and allowing the architecture to continue toward the sky. The practicality of the technique of using a candle to cast the shadows is debatable as the distances between the surface of the ceiling, the network of strings and the flame of the candle would have created shadows too faint to trace accurately. The doubtful strength of a single candle to illuminate such a large space, as well as the flickering motion of the flame, only draw more attention to the limits of such a technique. Fred Leeman proposes that a line of string would have been used instead to stretch from the position of the candle flame to the ceiling intersecting the grid as a substitute for the rays of light.¹¹ A ray of light, a drawn line and a pulled string have often been substituted for each other in illustrating the workings of perspective. In all these cases the construction is principally the same and for the remainder of the document I will assume that a candle and the shadow it cast was used as it was described by Pozzo in his treatises *Rules and Examples of Perspective Proper for Painters and Architects* (1707) as suggested by Perez-Gomez and Pelletier,¹² rather than Leeman's proposal that a piece of string stood in place of the ray of light.

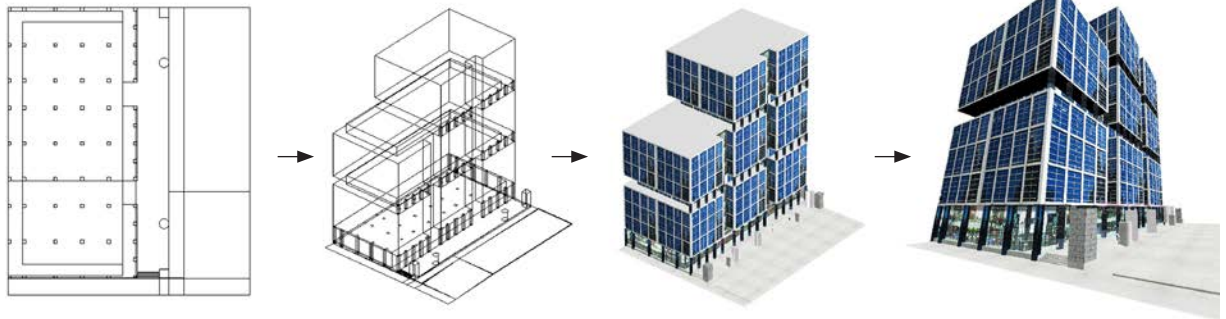
The quadratura method used in Sant'Ignazio assumes two things. First, that the position of the flame and eye is significant to the technique and maintains a fixed ideal position; and second, that as the grid mesh was parallel to the floor and the image is structured with a central vanishing point, the fixed position (of the candle) would need to be in the centre of the room in order to convincingly extend the geometries of the physical architecture into the painting. The quadratura method has a relation to both the viewer and the architecture within which the viewer is present, as its repeated aim was to extend the architecture beyond its physicality.¹³ More specifically in the case of the Sant'Ignazio, it also appears to extend the ideology of the church by merging heaven and architecture through the fresco image.

This practice is still exercised extensively today, not so much in churches and architecture but in theatre and cinema. Referred to as matte paintings in cinema, the camera lens supplants the position of the eye, allowing the physically built set in the immediate foreground to be extended into the painted and digital backdrops. This practice raises an important issue. Before the medium of film, visual effects once used to sit clearly in the domain of architecture. This research is interested in how architecture can reclaim some of the techniques used in contemporary visual effects to better communicate architectural ideas. By re-appropriating the contemporary techniques of visual effects (derived of architectural representation) this research may also begin to test the limits of digital representation for architecture.

Digital Model-Making

The quadratura technique can help shed light on how contemporary representational practices in architecture can be improved. Currently, the technique used to create 3D rendered views of architecture and interiors follows a traditional and empirical process (Figure 2.2). Beginning with a two-dimensional plan, one extrudes and constructs three-dimensional forms. Textures are then

scaled and applied to the surfaces and thereafter a camera is placed within the scene to render a perspective view. This approach to digital modelling comes from the legacy of physical model-making, where the same process is used with cardboard and wood. Yet the ends of a physical model and a digital model, except in the case of digital prototyping, are very different. A physical model has the qualities of tangibility, heft, massing, understanding the play of light and how materials react with each other, some of which are even measurable. But a rendering provides physically flat 3D views, often distorted beyond how we might really see the form, and depicting geometry that is without the influence of gravity. Digital models ask us to imagine ourselves into the pictorial environment of its rendering, whereas physical models come into our world and perform according to our environmental conditions.



This approach creates two problems. First, transferring the process of physical model-making to digital modelling suggests that the digital is a more 'advanced' method for creating models, when we know their roles in architectural representation to be distinctly different. This leads to a larger crisis, as we're seeing today, of digital models replacing physical models in the practice of architecture. The second problem concerns the empirical nature of producing digital models when the final output will be physically flat perspective views printed or displayed on a screen. In relying upon the technique used for creating physical models, the digital model is accurately measured during its construction but its resulting views are not measurable. Both these problems suggest that if the outcomes of a physical and digital model are very different then the process used to create a digital model should be reconsidered.

Figure 2.2.
A conventional process of digitally modelling an architectural form.

In the case of Sant'Ignazio the quadratura technique casts shadows onto a cylindrical vault that contains cuttings for the windows. But, since the form of the ceiling can vary and still produce the same impression when viewed from the ideal position, we can reconsider how the quadratura technique can also be altered to produce the same outcome. Working with the same principles of shadow and light, we can think of the image to be transferred as having been painted onto a glass lantern (with a candle at its centre), which would also cast a shadowed impression onto the surrounding walls. This would do away with the network of string to aid the transferring of the image, eliminating a large step in the process. The painting is essentially a panoramic image running seamlessly around the lantern.

Constructing a Panoramic Image

To practice such an approach today, we can digitally construct the panoramic image of the lantern by beginning, in this case, with a site. The City Square in Melbourne, Australia, has gone through a number of design changes and because of this history it seems to be an appropriate testing ground for this technique and a suitable site for (yet another) new design. Digital photographs of

the square were taken from a fixed position then tiled together to create a spherical panorama (Figure 2.3 and 2.4). Viewing through a player one can pan, tilt and zoom in and out of the panorama. In zooming out as far as the player allows one can distort the image to present what appears to be a 2D elevation view of the neighbouring hotel (Figure 2.5). This is, in fact, a single-point perspective with the vanishing point located at the centre of the image. However, as the vertical and horizontal lines are parallel, it begs the question: if the vertical and horizontal dimensions are in proportion and measurements could be extracted from this image, could it be considered as a rendered orthogonal drawing?

Figure 2.3.
Source images used for stitching together
a panorama.





Figure 2.4.
Preview stitch of panorama.



Figure 2.5.
One-point perspective extracted
from panorama.

The sandy area in front of the hotel is the City Square and in order to be re-thought of as a site for a speculative intervention the existing design needs to be cleared of the eucalyptus trees in the image. In doing so the areas of hotel occluded by the trees need to be painted back into the image. This can be done with greater accuracy by converting the spherical panorama to a cubical panorama, allowing the elements of the image that need to be painted back in to align with the grid of pixels that make up the image (Figure 2.6). This is precisely for the purposes of cloning the repeating features of the image, such as the windows and tiling patterns, over the pixels that were formerly occupied by the trees (Figure 2.7). Even in the cases where the hotel is in perspective the facade can be perspective-corrected by distorting the four corner points, retouching and re-distorting it back into its original perspective form (Figure 2.8). When the editing is complete the image can be converted back to a spherical panorama and imported into a 3D modelling and rendering program.

CHAPTER 2
CONSTRUCTING
A PANORAMIC IMAGE

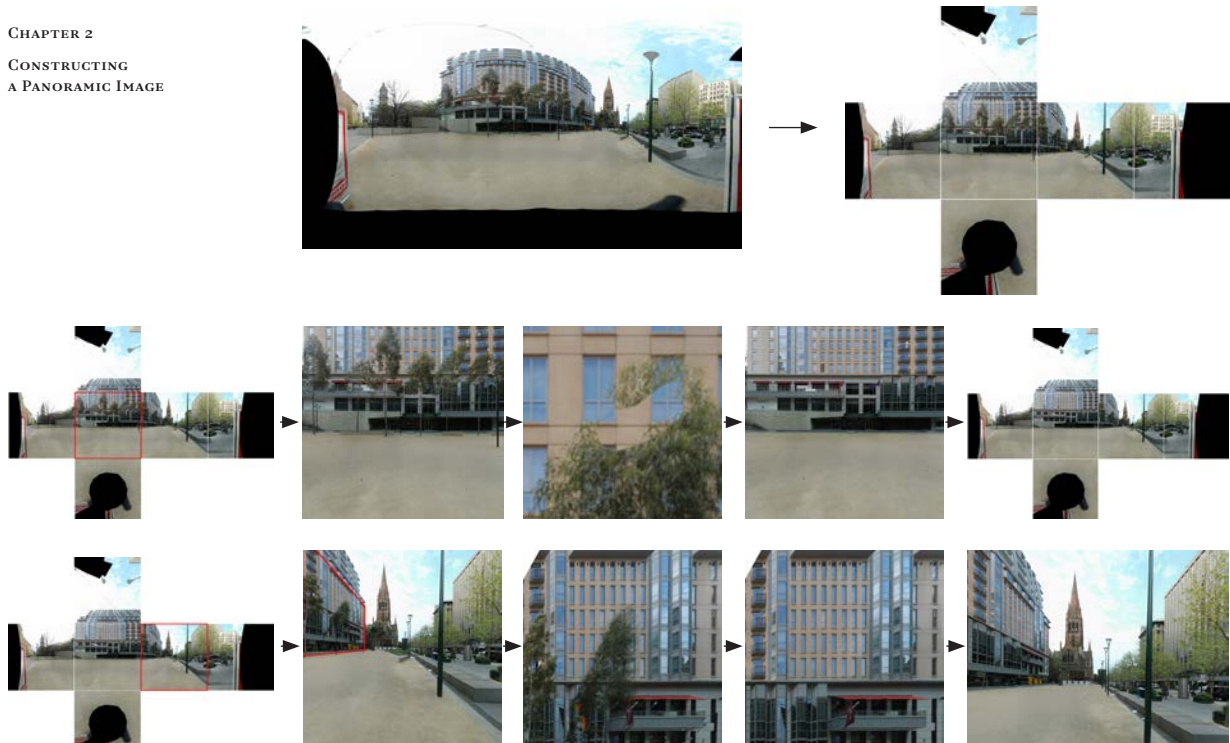


Figure 2.6 (top).
Converting the spherical panorama to a cubical
panorama (both unwrapped).

Figure 2.7 (middle).
Digitally touching up the image to remove the
vegetation.

Figure 2.8 (bottom).
Perspective correcting the façade in order to
remove vegetation then distorting it back into the
original view.

Once imported, the panorama is mapped, or wallpapered, onto the inside of a sphere and a camera is placed precisely at its centre. Essentially this panoramic sphere is a digital recreation of the glass lantern and candle arrangement, with the flame being replaced by the camera (Figure 2.9). From the view of the camera the image is aligned but, more importantly, the lens distortion has been removed from the image. To consider how an architectural proposal might be viewed within this environment, a modest design of an undulating grass surface is created and placed within the sphere to act as the intervention (Figure 2.10). This design is orthogonal and measured – unlike the panorama, which, in the nature of spherical images, is highly distorted. Due to the removal of the lens distortion, the panorama and the 3D generated design align in three-point perspective (Figure 2.11). Generally photography emulates the eye and lines that are straight appear to bow, creating a lens ‘distortion’; 3D modelling software presents straight lines as straight – so removing the lens distortion allows the lines to appear straight. This final arrangement is similar to both Sant’Ignazio, through the seamless merging of the physical geometry of the church in the foreground and *trompe l’oeil* on the ceiling, and set designs for cinema that place a physically built set close to the camera and a painted backdrop (matte painting) beyond it.



Figure 2.9.
Reconverted back to a spherical panorama, it is mapped to the inside of a sphere with a camera at its centre.

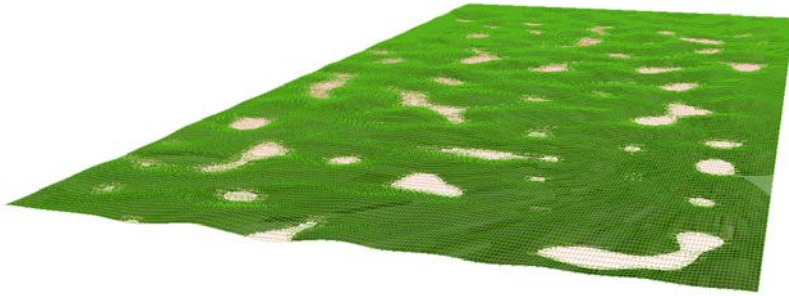


Figure 2.10.
An undulating field of grass. This geometry is measured and modelled digitally in 3D.

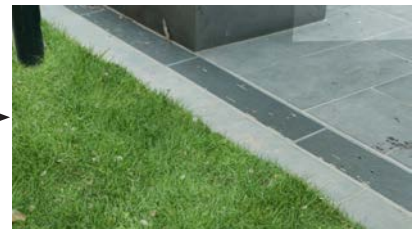


Figure 2.11 (top).
The measured geometry of the grass field and the spherically mapped background cleanly align in three-point perspective.

Figure 2.12 (bottom).
The edge of the geometry relies on an alpha map to emulate blades of grass.

However, this is at best only a digital recreation of what appears in Sant'Ignazio. It is not a recreation of the experience of being within the church. Looking upward at the fresco painting in Sant'Ignazio with the horizon no longer within the peripheral view, one becomes partially unbalanced and the experience becomes dizzying. This dizziness, I would argue, is an essential part of the interaction with the *trompe l'oeil*, inducing the viewer to more easily accept the painted extension and therefore the fantasy it depicts. Such an illusory, ephemeral quality can never be recreated digitally to the same effect. Equally, the digital model presents opportunities that are unavailable in the physical world.

Allowing for Movement

With *trompe l'oeil* examples such as Sant'Ignazio the adventure begins when a viewer enters the space, sees the distorted fresco painting overhead and continues walking until he or she has found the position from which it is intended to be viewed – where the image and interior are aligned. From here, movement in any direction only causes the effect to collapse. But what if one could move into and occupy the space of the image? In the physical environment it would seem that this occupation of the image is impossible, other than through the imagination, yet the effect of occupying the image can be achieved digitally.

What I will refer to as 'billboards' placed in the digital sphere – inserted in place of buildings and geometry found in the panoramic image, and receiving the same projection (or shadow and illumination from the candle, as it were) – can act as proxies for the painted geometry in the image. This, in effect, is crudely modelling, within the interior space of the sphere, what exists in the image that is mapped to the surface of the sphere. This allows the camera to move away from the centre of the sphere, the billboards creating the necessary parallax to imply that the eye is travelling through the image (Figures 2.13 and 2.14). In the case of this project, billboards were created only for the hotel and for the church surrounding City Square, the two main features marking the far edges of the site. More generally, the question of the number of billboards is dependant on the level of detail and the intended trajectory of the camera. The foreseeable limit here is that when the camera reaches the end of a billboard and intends to turn the corner it becomes obvious that the hotel or church are not 3D models but merely painted backdrops. To work around this issue, multiple spherical panoramas could be used and calibrated, setting up the other facades of the buildings, to allow the camera to seamlessly travel throughout this digital *trompe l'oeil* (Figure 2.15). Creating the billboards and mapping the projection onto them shifts the technique into the area of photogrammetry, but rather than using a planar projection as is traditionally the case, this technique uses spherical projection. When this is compared to the *quadratura* technique, both show relationships

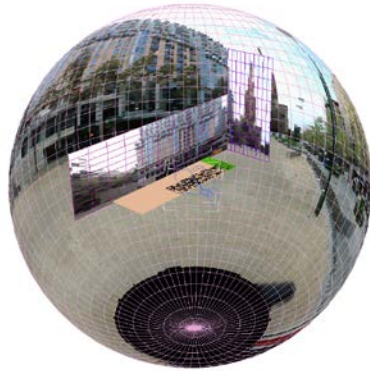


Figure 2.13.
Billboards inserted within the sphere to represent the hotel and church are textured with the same panorama as the background sphere. From the view of the camera at the centre the billboards will appear camouflaged against the background sphere because they share the same mapping coordinates.

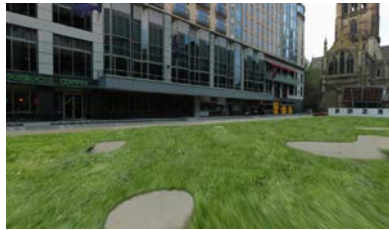


Figure 2.14
Frames from the scene as the camera travels away from the centre of the sphere. The billboards of the hotel and church create the necessary parallax, unlike the background sphere, which would bow and distort.

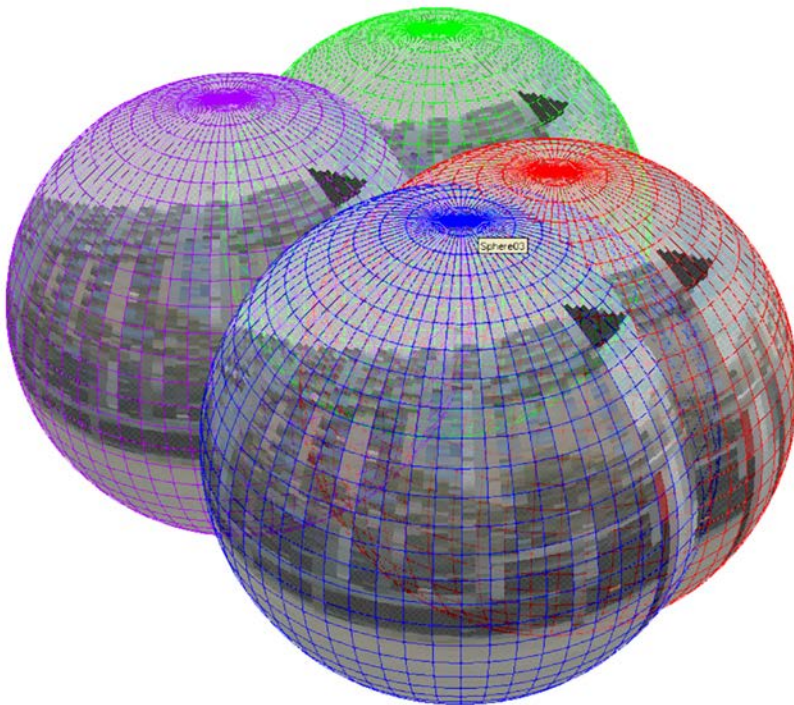


Figure 2.15.
Multiple spheres can be compiled together to create a bigger scene for the camera to travel through.

between image and its geometry. However, as the quadratura technique was used to extend the physical architecture through the illusion created by the painted architecture, the photogrammetrical method described here aims to (re)build the space and geometry within the photographic image itself. Where Pozzo's technique continues the physical geometry into the image, this technique extracts the geometry from the image.

Falling into the Image

What has this achieved and how has it improved the way we digitally model architecture? Technically, the research has generated a method of modelling a site and context without using any measurements, as it was all developed in perspective – beginning with photographs and ending with still and animated representations in perspective. While no measurements were used it can nonetheless be scaled to conform

to a measured architectural proposal and act as a highly accurate setting for a design. The necessary empirical measurements are calculated by the software rather than by the operator because the operator remains working entirely in perspective, and through images rather measurements. This is also a much faster and more efficient method of modelling that might take an experienced digital modeller a few days to complete, rather than a couple of weeks using the approach adopted from physical model-making, as it minimises the modelling process to only what will be seen in the end. At the other end of the process, when still images and animations are rendered, the frames will render more rapidly as the required shading and lighting calculations are already embedded in the original projected image. Both of these time-saving aspects are incredibly important in an commercial setting as they lead to greater productivity.

For the discipline of architecture, this research provides a more experiential and immersive mode of communication and design but, at the same time, an accurate digital site model into which measured architectural propositions can be inserted. In practice this approach has the potential to shift the manner in which architects design and communicate their ideas in two ways. First, as the whole process is developed through perspective, it encourages modelling and critiquing the design through the view rather than by measurements. Second, it allows for designs to be inserted into the sphere in much the same way as they would into a physical site model. This creates opportunities for the design to be evaluated in relation to its context while the design develops, rather than at the end when digital renderings are generally produced because of their time-consuming process. This effectively shifts the role of renderings and representational techniques; they become part of the design process rather than simply communicating its outcome.

Finally, this method does not privilege any architectural form. Far too often anything described as digital is thought of as being party to a particular

type of architecture, namely 'blobs', organic and generative forms. This technique is not about generating architecture through representation or merely providing a means of representing the final design. Its aim is to help critique the architecture in its context as it develops. The technique begins to test the limits of digital representation and the way it engages specifically with architectural practice. It looks forward to speculate on how digital representation can be more suited to architecture while looking back to consider its relation to historical practices of architectural representation. This not only questions the limits of digital representation but also helps debate the topic of perspective and the relationship between two-dimensional images and the three-dimensional form.

In returning to Pallasmaa and Klein and the transcendence of qualities from one discipline to another, this research is not just an appropriation of visual effects techniques for architecture but a reclaiming of representational ideas and processes which had, historically, transcended from architecture to film. There is no doubt that practices of filmmaking and set design both physical and digital have had a great influence upon the way digital modelling and rendering technologies have evolved; and one can argue that today's 3D software is intended for the fields of the moving image (animation, film and gaming) more than for architecture. But as its inheritance is rooted in techniques developed by architects there is a larger opportunity here for architecture to extend itself and build a relationship with the contemporary practices of the moving image. One aspect of architecture that could derive further guidance from the fields of the moving image is the role of narrative – something that seems to have diminished in importance in architectural communication of late as it has transitioned to a digital practice. Recounting this project I have at times mentioned various practices of cinema that have exploited the knowledge of projective geometry. In the following chapter I will delve deeper into these examples by discussing a selected collection of scenes from films and animations, not only to map a lineage of visual effects back to Renaissance perspective but also to discuss how they act as important precedents for the concerns of architecture today. These examples offer new approaches to communicating architecture, not just technically as is the case with this project, but narratively and emotionally as well.

The animation produced for this project can be found on the DVD.

CHAPTER 2

STILL FRAMES FROM
DIGITAL QUADRATURA

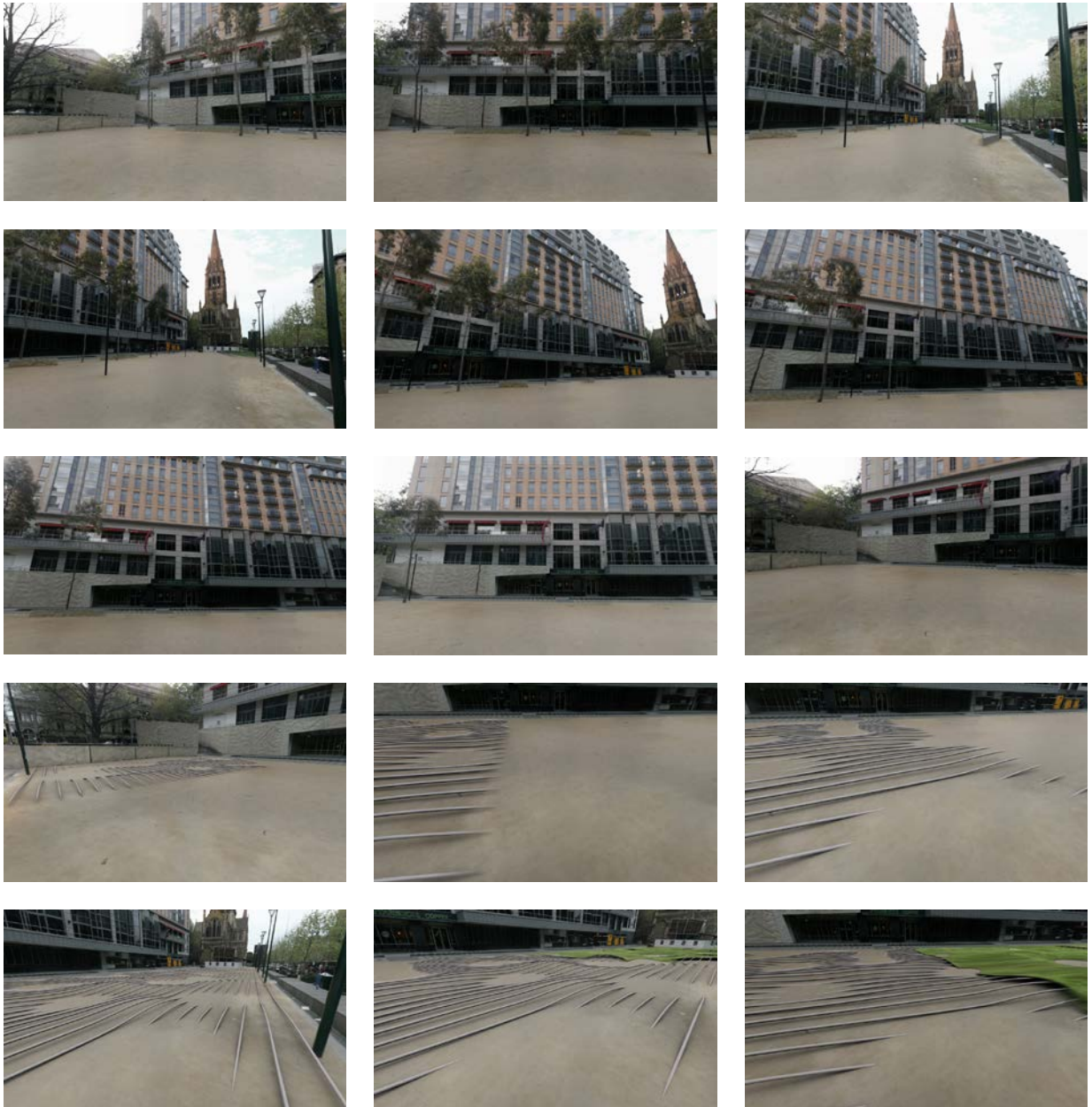
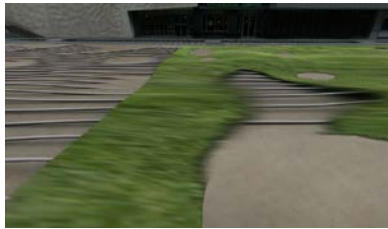
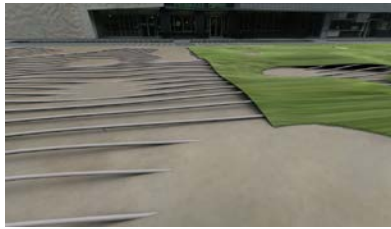


Figure 2.16.
Still frames from Project 1 animation,
Digital Quadratura.



CHAPTER · THREE
A · HISTORY
OF · VISUAL
EFFECTS

Visual effects are illusions, the most elaborate of which distort our spatial understanding and resonate through all our senses. Often invisible, they subversively refigure our perception and consequentially our attitudes towards characters and space. Today they most commonly reside in cinema but before the invention of film, visual effects existed in the domain of architecture and painting. In this chapter I will retrace a selective history of visual effects through key examples and speak mostly of compositing, a key area of visual effects, and how its role has furthered cinematic narratives but can also be traced back to the discoveries of Renaissance perspective. In discussing perspective I have chosen to focus on its demonstrable practices and the various outcomes those practices have led to.

Compositing and its Beginning

In his book *The Art and Science of Digital Compositing* Ron Brinkmann technically defines digital compositing as

the digitally manipulated combination of at least two source images to produce an integrated result.¹

¹ R Brinkmann, *The Art and Science of Digital Compositing* (UK: Academic Press 1999) pp. 2.

This description is understandably open due to its wide application, being forgiving of all its contemporary possibilities. Yet he also highlights the common role of compositing in cinema, which is more conservative in definition and practice. That is, compositing is the bringing together of foreign elements that have been created independently (which may be computer generated, live footage, photographic or painted content) in order to appear as if they were filmed through a single camera at the same moment (Figure 3.1). Compositing, in both cases, can be rethought of as the act of ‘bringing together’ to create an outcome greater than the sum of its parts.

Brinkmann sites Oscar Gustav Rejlander’s photograph *The Two Ways of Life* (1857) as one of the earliest examples of a composited image (Figure 3.2). Rejlander’s photograph depicts a philosopher guiding two young men, one keenly distracted by the unsavoury endeavours of prostitution, idling and drinking while the other less eagerly looks towards the more noble activities of religion, family and hard work. Having only a small studio Rejlander was unable to orchestrate the entire scene to be captured as a single image. The finished photograph was instead constructed of 32 individual negatives with each group of characters photographed separately, accounting for their scale and location in the final composition during their individual shoots (Figure 3.3). While the final image was widely exhibited and received a great deal of recognition it was also considered controversial by fellow photographers for its technique of combination printing. When Rejlander enthusiastically presented his paper at the Photographic Society describing the meaning of each character and the compositing technique he had developed and employed to generate the image he was greeted with a cold reception, mainly by those who had believed that it was a photograph of a single, meticulously choreographed

CHAPTER 3
COMPOSITING AND
ITS BEGINNING

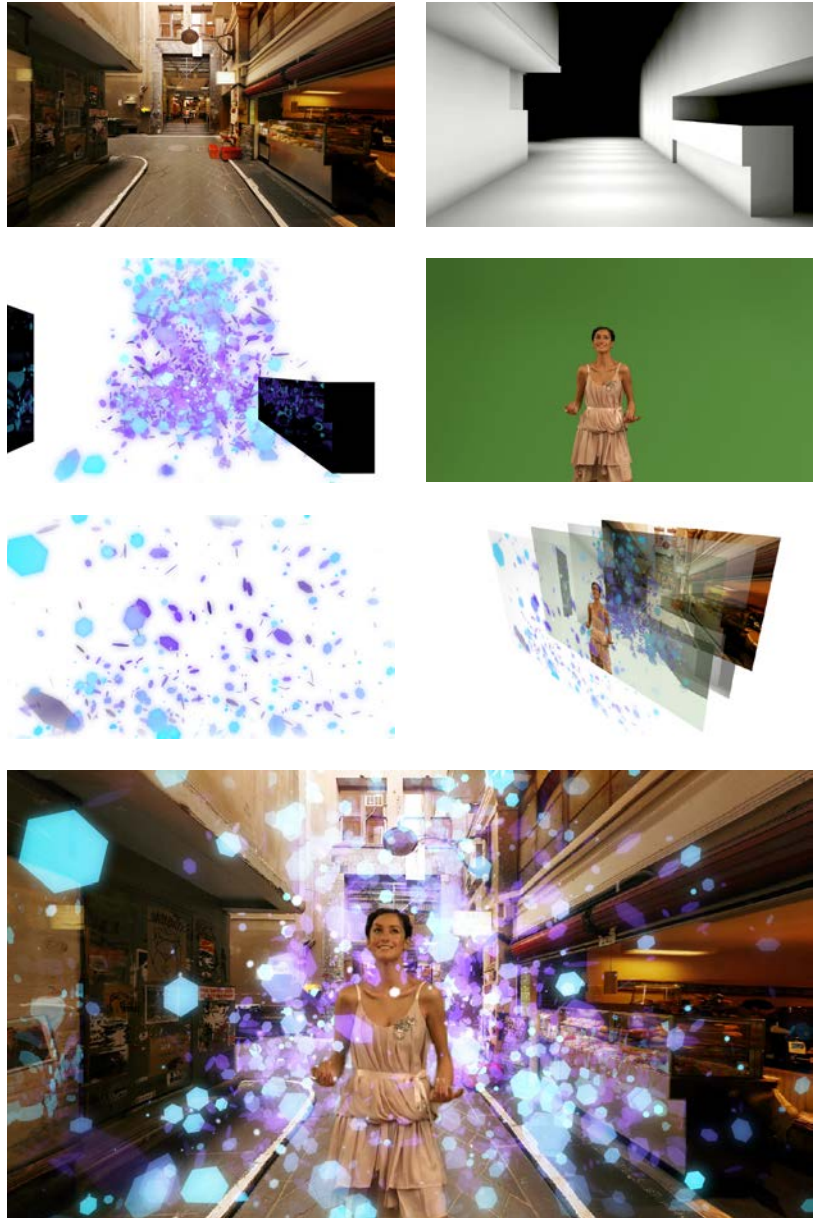


Figure 3.1.

moment. In reviewing Rejlander's presentation his friend and contemporary Henry Peach Robinson wrote:

(He) thereby gave the clever critics the clue they wanted, and enabled the little souls to declare that the picture was only a thing of shreds and patches. It is so much easier to call a picture a patchwork combination than to understand the inner meaning of so superb a work as this masterpiece of Rejlander's!²

² R Leggat, 'Rejlander, Oscar Gustave: A History of Photography', retrieved 4 March 2012, <<http://www.mpritchard.com/photohistory/history/rejlande.htm>>.

Furthermore, the public found the photograph indecent because of the bare



Figure 3.2 (left).

Figure 3.3 (below).



figures contained in the image, even though they were familiar with the naked form in paintings and sculpture. When exhibited in Scotland the left hand side of the photograph was obscured as it was considered immoral.³ Years later, having been deflated by criticism from both fellow photographers and the public, and subjected to poverty, Rejlander became critical of his own practice, saying:

I am tired of photography for the public, particularly composite photographs, for there can be no gain and there is no honour, only cavil and misrepresentation.⁴

Rejlander's use of the word 'misrepresentation' was about the technique of compositing: that a manipulation of the photographic process would lead to a dishonest image. Effectively, he had tied photography to truth. Yet what wasn't so clear was whether the characters and ideas depicted were in themselves misrepresentations. The photographers who were critical of his image were dismissive of its means rather than the ends; the public, on the other hand, seemed only to be unsettled by how faithfully it represented reality. They saw the photograph as too vividly documenting the naked female form and the medium of photography aroused concern because of its mimetic quality, unlike the abstraction or distance created by the mediums of marble and paint. It had seemed that his photo was troubled by controversy from both ends for its adventurous technique and what it depicted, but in either case was never fully appreciated for its intentions, as Robinson had described earlier. The discomfort of critical photographers, curators, the public of the time, and even Rejlander in his later years, suggests that photography was viewed as a scientific and mechanical process of documentation, distinct from art, and an illustrator of truth. Though not speaking of Rejlander's critics specifically, it is worth considering, more recently, Susan Sontag's comments on photography. Sontag argues that the intention to separate the photograph from any influence of its photographer, so as to be considered truthful and objective, is never entirely possible. She wrote,

Despite the presumption of veracity that gives all photographs authority, interest, seductiveness, the work that photographers do is no generic exception to the usually shady commerce between art and truth. Even

3 *ibid.*

4 R Brinkmann, *The Art and Science of Digital Compositing*, Morgan Kaufmann, New York, 1999, pp. 6.

5 S Sontag, *On Photography*, Picador, New York, 2001, pp. 6.

when photographers are most concerned with mirroring reality, they are still haunted by tacit imperatives of taste and conscience.⁵

Ideas of what constituted truth, both of the image's making and how clearly it reflected its subjects, came to burden Rejlander's work rather than creating an awareness of the role that the maker plays. Although he never intended to be deceptive (he did, after all, reveal his methods) other examples and practices of photographic compositing were intentionally dishonest, as described by Bizony:

when photography was still a young art and its secrets were unfamiliar to the public, unscrupulous photographers would shoot portraits at normal exposures, then as soon as their gullible clients were safely out of the studio they would snap a carefully positioned collaborator, making a brief exposure that left only a faint image on the film. After processing, the client would be handed a positive paper print of herself with a ghostly apparition apparently standing behind her. The photographer concocted a mysterious supernatural explanation and doubled his fee accordingly... and after the First World War, many young widows and forlorn mothers and fathers were susceptible to the comforts of ghost photography. The art of special effects was born with an attendant whiff of chicanery and superstition.⁶

6 P Bizony, *Digital Domain: The Leading Edge of Visual Effects*, Billboard Books, New York, pp. 12.

In Bizony's recount of spirit photography (Figure 3.4) he describes this manipulative process with two outcomes. First, predictably, the photographer is interested in profiting monetarily by exploiting technical possibilities; more interestingly, Bizony also alludes to the photographer intervening in the process for a widow, deceptively but perhaps also sympathetically, generating a photograph which would bring her comfort by being fully aware of the emotional significance of photographs. Whilst they were both fraudulent, the second produces a photograph with a psychotherapeutic purpose rather than an image of spectacle. These acts described by Bizony break from the simple objective truth-fiction divide by refocusing from what is photographed and its objectification to the subjective emotional impact they have on the viewer. It marks a development in the role of the photographer as someone who is no longer a technician facilitating the mechanical capturing of a memory and life but as someone who is aware that they can manipulate memory and life, and doctor the image for a greater effect. The widows and others who actively pursued being photographed in this way were not simply interested in a portrait to document their lives but saw the image as a window into an afterlife and a means to connect with it. This was more than a nostalgic effort to refresh a fading memory of a loved one but an image that saw beyond human perception, all made possible by the emotionally vulnerable state of the viewer.

In Bizony's second example, of the consoling photographer, the effect becomes an affect; the technical distortions had wider and more meaningful consequences. By reconfiguring the photograph the most intriguing outcome was not the technical achievement or what was revealed in the image, but what it revealed of the viewer. Having brought to the fore the powerfully subjective element of photography, while continually wrestling with



Figure 3.4.

conceptions of truth, it is hard to reduce the outcomes of these early technical achievements of Rejlander and spirit photographers as mere gimmickry and spectacle when they demonstrated an emotional impact.

Significant Examples from Film as Precedents for Architecture

Within the practices of visual effects in cinema there have been examples that continue to push the importance of compositing for furthering an emotional understanding while still fitting within the broad definition defined by Brinkmann. A scene from *Amélie* (dir. Jean-Pierre Jeunet, 2001) is such an example (Figure 3.5). In this scene Amélie, through a series of clues, has lured Nino, the man she desires, to the café where she works. Noticing Amélie behind him, Nino turns to ask whether it is her in the photograph, one of the clues she had left for him. Her reluctance to answer truthfully describes her emotional state. Conflicted between adoration and shyness and the debilitating intensity of the moment, she falsely denies that it is, walks away and is immediately frustrated at herself by her lack of courage. Nino eventually finishes his coffee and departs, giving up hope of meeting the woman in the photograph. As Amélie watches him leave, having missed this opportunity to finally meet him, her body dissolves to water and plunges to the floor.

The role of any actor is to embody the emotions and affectations of a character in a script. In the closing moment of this scene Jeunet instead chose to use an effect over the actor to describe the complex emotional state of Amélie as she watches Nino leave. Whether it is to be read as anguish or a release of tension after an intense moment, the emotional state of Amélie is poignantly described by water gushing to the floor. The success of this effect, just as it was with the photographs of spirit photographers, is furthered by the role of the audience. As Amélie is abstracted and illustrated as water, it offers an opportunity for the viewers to project their own emotional experiences onto Amélie, putting themselves back into the film. Here the director

CHAPTER 3
SIGNIFICANT
EXAMPLES FROM FILM
AS PRECEDENTS FOR
ARCHITECTURE

guides us through the story not as he understands it but as the viewer may want to, allowing the audience to momentarily claim the scene by creating an interpretive act that induces an empathetic engagement.



Figure 3.5.
Amélie (2001)

Jeunet understands the emotionality of visual effects and uses it in a very spirited manner, which departs from its all too common literal usage in modern cinema. This leads to greater possibilities of filmic grammar by bringing to the surface seemingly invisible human qualities. If we pause to consider how architectural renderings today have become so preoccupied with literally depicting geometry rather than its intended meaning, Jeunet's work becomes a notable reference that suggests a new approach. It also highlights the role of the audience not as a singular passive onlooker, but as varied active participants who need to be connected with so they may better engage with what they see. Jeunet's approach is a precedent for how digital representation may adopt a more sensorial quality and represent digital imagery more poetically.

Decades earlier, in a scene from *Mary Poppins* (dir. Robert Stevenson, 1964), there was again a merging of what was 'fictional' and 'real', literal and non-literal, through compositing (Figure 3.6). Though this arguably occurs at all levels of visual effects (as they are illusions) here it happens perhaps more because of the performance than the various layers of imagery that make up the final scene. The scene combines through compositing a painted background plate, hand-drawn cel animation, and live footage on film of people extracted from a yellow screen (via a sodium vapour process similar to chroma-keying). In most cinematic cases compositing aims to

blend the elements seamlessly, appearing to have been captured as a single take. This requires matching the lighting, colouring and camera movements of each layer to convincingly bring together a unified outcome. In this particular scene, which compiles elements of varying mediums, the composite is not through light and shade but through behaviour, the distortion of the characters rather than the adjustment of separate streams of imagery. The penguins display anthropomorphic qualities, dancing and conversing like humans, and Bert (played by Dick Van Dyke) in a zoomorphic manner lowers his pants and acts like the penguins around him. Their mediating identities of half-man-half-penguin align further through their synchronised movements, making them appear more alike despite being materially different in their appearance. The resulting scene is a perceptively seamless compositing of performance and character instead of image and colour.

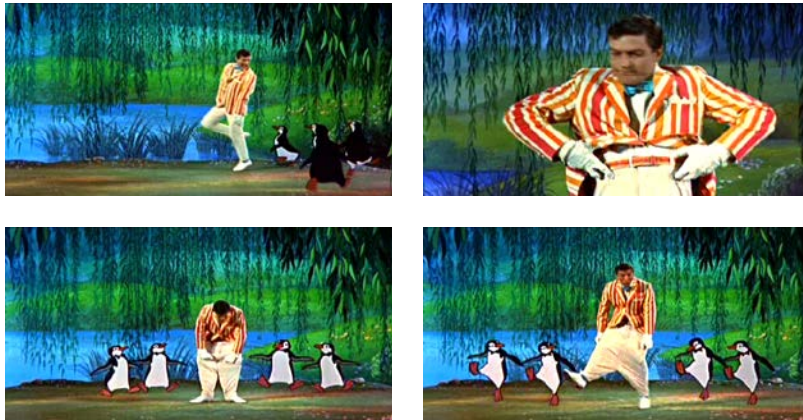


Figure 3.6.
Mary Poppins (1964)

As film is a medium of movement, shifting the focus away from an aesthetically seamless composition towards one of interaction, it exploits opportunities not found in photography. As architecture explores the possibilities of working with the moving image, this example not only suggests that aesthetic differences between the photographic impression of film and the abstracted nature of drawing in architecture may too be merged, which might lead to a better characterisation of architectural propositions, but that such a merging might also be a deliberate attempt to shift the attention toward the narrative of a design and designing, and away from a critique of the image's medium and its visual accuracy. This is about the performative quality of visual effects that might lead to a much more thorough understanding of the architectural intention.

The examples from *Amélie* and *Mary Poppins* highlight how, through performance, we're able to foreground quite complex ideas and emotions, something that today's digital practice of architecture is not yet broadly incorporating. This is particularly important to architectural animations, which are largely rendered photorealistically and through a single meandering camera when they could instead reveal more about a design by carefully creating an alternative (unphotorealistic) aesthetic that more articulately describes its character, then further such a characterisation by carefully editing together a sequence accordingly. Both films demonstrate that to animate

is to go beyond what can be captured via the lens of a photographic process and, through an obvious embellishment, exhibit more about a character's internal thoughts and ambitions. These embellishments and distortions are not follies, or accomplished for the sake of spectacle, but explore how best to engage the viewer and express meaning. They are both visual effects scenes involving animation to construct the poetic and symbolic imagery that brings invisible qualities to the fore. This, I would argue, is so often missing amongst many forms of digital representation in architecture, which have chosen a more prosaic path of describing almost only geometry.

All the aforementioned examples of Rejlander, ghost photographers, *Amélie* and *Mary Poppins* sought to heighten their outcomes through technical effects, and their manipulations were never intended to be as important in themselves as the narratives they served. Their efforts hadn't focused on what appeared in front of the camera or seeming real to the eye as much as inducing an emotion or amplifying the understanding of a character. They had not adhered to the idea that the photographic image is an object of truth, but rather shown that it is precisely by breaking through this limited perception that a more thorough and meaningful representation can be presented.

As the digital practice of architecture exploits the possibilities of the same software and techniques used in visual effects, architects can not only adopt ideas and intentions of image-making but also begin carving out new methods that further describe the elusive and ephemeral qualities of architectural propositions and architectural practice. Rather than thinking of compositing as a bringing together of images from multiple sources (Brinkmann), architectural compositions could also be (re)thought of as a culmination of issues, compiling together layers dedicated to the problem, the ambition and the proposal in one dynamically animated pictorial manner. These composites also need to be considered as parts of a greater act. From Rejlander's *The Two Ways of Life* and the larger narrative that helped build the composition, to spirit photographs and the stories that would have been concocted to explain the apparitions; from the re-characterising of penguins and people by the anthropomorphic and zoomorphic distortions in *Mary Poppins* to depicting emotional characteristics through water. These are moments surrounded by a larger story; not only a means to link between shots for reasons of continuity they are also, through their embellishment, able to momentarily surge the potential of larger narrative.

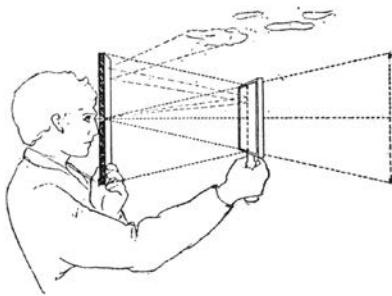
Perspective: A Visual Effect

While looking forward to the new possibilities contemporary visual effects might offer architecture it is also worth looking back through the history of architecture, past the early days of photography and cinema, to when visual effects and architectural representation had a symbiotic relationship during the conception of Renaissance perspective. Though the history of perspective

itself could be traced back even further to Euclid (c300 BC) and his study of geometry and optics and followed through other developments of Vitruvius (25 BC) and Alhazen (1000 AD), I have chosen to focus on the period of the Renaissance and a few of its notable figures for four main reasons. First, for the developments of physical instruments to both understand (and prove) notions of perspective. Second, it marks a point at which there developed almost separable interests of perspective for drawing (architects) and perspective for painting (artists). Third, it was within this period that the ideas surrounding perspective were demonstrable with exercises that were physically performed. Lastly, it marks, as I will argue, the true beginnings of visual effects as they are used in cinema today.

In Manetti's biography (1485) of Filippo Brunelleschi, which is extensively explored by Hubert Damisch in his seminal work *The Origin of Perspective*⁷, there feature two paintings (dating between 1418 and 1425) that Brunelleschi created which would demonstrate linear perspective at work. The first is of the Baptistery in San Giovanni, made as Brunelleschi positioned himself facing the Baptistery from within the doorway of the cathedral located across the plaza (Figure 3.7). Brunelleschi had created on a small panel a painting of the Baptistery with a little hole in the panel at the vanishing point of the image. Facing the painting towards the Baptistery, a viewer would look through the peephole from behind, and between the panel and the actual Baptistery a mirror was held reflecting the painted image back to the viewer peering through the hole. The mirror was then temporarily removed to reveal the true Baptistery and demonstrate the precision of the painted image. Damisch writes,

The truth effect attached to Brunelleschi's experiment was produced in the mirror.⁸



⁷ H Damisch, *The Origin of Perspective*, J Goodman (trans.), MIT Press, Cambridge, Massachusetts, 1995.

⁸ *ibid*, pp. 137.

Figure 3.7.

The mirror in this case demonstrated that an image painted in perspective could accurately capture the geometry of the Baptistery. What is most interesting is that whilst Brunelleschi had painted the building and the foreground, he replaced the area of the painting representing the sky with polished silver. Manetti wrote,

And insofar as he had to show the sky, that is, where the painted walls stamp themselves against the air, he used silver burnished in which a way that natural air and sky were reflected in it, and even clouds that one saw pass by in this silver pushed by the wind, when it was blowing.⁹

⁹ A Manetti, *The Life of Brunelleschi*, C Enggass (trans.), The Pennsylvania State University Press, University Park, Pennsylvania, 1970, cited in Damisch, pp. 89-90.

10 Damisch, pp. 93.

On the second panel, Brunelleschi painted the piazza of the Palazzo della Signoria, its surrounding buildings and the elements in front of it. Unlike the first painting, he had this time cut around the upper edges of the buildings and disposed of the top section from the wooden panel. The painting viewed properly in its original setting (the piazza) would silhouette the surrounding buildings and again adopt the conditions of that day's sky to fill the area from the upper edge of the painting to the viewer's periphery (Figure 3.8). With particularly the first experiment being widely credited as marking the beginning of Renaissance perspective, the two paintings are spoken about as the earliest demonstrations of linear perspective. It is argued by Giorgio Vasari that Brunelleschi had used a ground plan and an elevation of the baptistery to construct the first painting.¹⁰ However it was what Brunelleschi didn't paint that I find more intriguing. Using the polished silver as a surface for mirroring the sky not only marks the beginnings of perspective but was also an early example of live compositing, a visual effect, which has since been used extensively in cinema, 500 years after Brunelleschi's demonstration. Furthermore, as the painting reflected the changing conditions of the sky and the moving clouds 'pushed by the wind' it was in fact a work of moving image and not a static painting, and therefore of even greater cinematic importance.

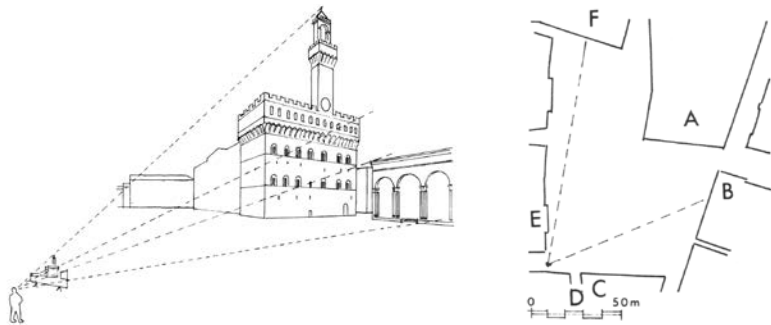


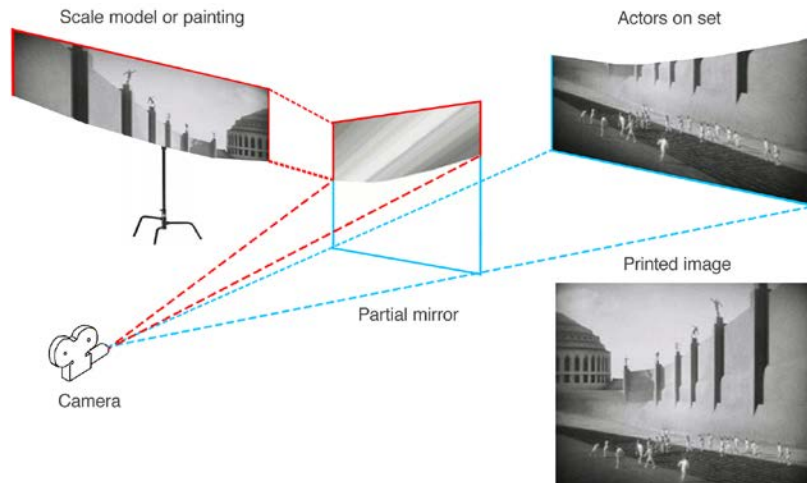
Figure 3.8.
From: H Damisch, *The Origin of Perspective*,
J Goodman (trans.)

11 F Clark, 'Schufftan Process', *Intralinea*,
retrieved 6 January 2009, <<http://www.intralinea.it/intra/ipermedia/magistro/En/Schufftan%20process.html>>.

Both paintings should be recognised as notable precedents to techniques used in cinema, particularly what came to be known as the Schufftan process (Figure 3.9).¹¹ This technique developed by the cinematographer Eugen Schufftan during the making of *Metropolis* (dir. Fritz Lang, 1927) was used for shooting actors against miniature models and was what is known as 'live' or 'in camera' compositing. The technique also uses a mirror, set in front of the camera and rotated 45 degrees to one side, which reflects a miniature model or matte painting (secondary set) back to the camera. The areas of the model or painting that did not need to be seen (these were for the actors) would have the silver from the mirror scraped away. This would leave only the transparent glass in those areas for the camera to shoot through to a partially built, 1:1 scale section of the miniature (primary set) with which the actors would interact. Similar in concept to Brunelleschi's first experiment, the mirroring areas in Schufftan's process are inversely used in the areas that remain static but mirrored close to the camera lens to scale up the miniature model. A variation of the Schufftan process is painting onto glass – dispensing with the mirror and model – which would sit perpendicularly in front of the camera with certain areas of the glass unpainted revealing the primary set in the background. This is of course

limited to paintings, whereas the Schufftan process allows for both paintings and models (Figure 3.10). This example is also more akin to Brunelleschi's second exercise of painting perspective onto a surface and then seeing through the uppermost portion of the panel. Other variations in cinema include rear projection (Figure 3.11), where film footage is projected onto a screen behind the actors and elements in the foreground. It has been used so extensively that James Monaco remarks,

Thousands of Hollywood taxi rides were filmed this way by the aid of rear projection, introduced in 1932...¹²



12 J Monaco, *How to Read a Film*, Oxford University Press, New York, 1981, pp. 107.

Figure 3.9.
Scene from *Metropolis*.

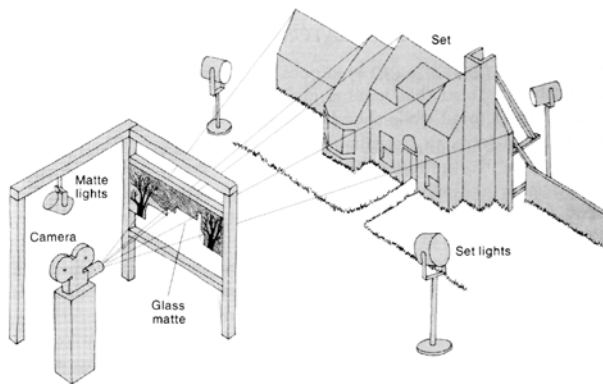


Figure 3.10.
From: J Monaco, *How to Read a Film*

Monaco also describes an alternative projection technique of front projection, which is less frequently found in cinema. Monaco cites *2001: A Space Odyssey* (dir. Stanley Kubrick, 1968) as the film that had perfected the technique, using it in one of its famous opening scenes (Figure 3.12). In front projection, images are projected through a two-way mirror at 45 degrees and the light from the projector casts shadows that are perfectly occluded by the foreground elements and therefore are never seen from the angle of the camera.

These techniques also resemble others used earlier in theatre (Figure 3.13), notably Pepper's Ghost (developed by John Pepper) derived from

Henry Dircks' Dircksian Phantasmagoria technique from the 1860s, which would reflect an actor offstage using a discreetly positioned glass plane onstage, to create the semi-transparent impression of ghostly figures.

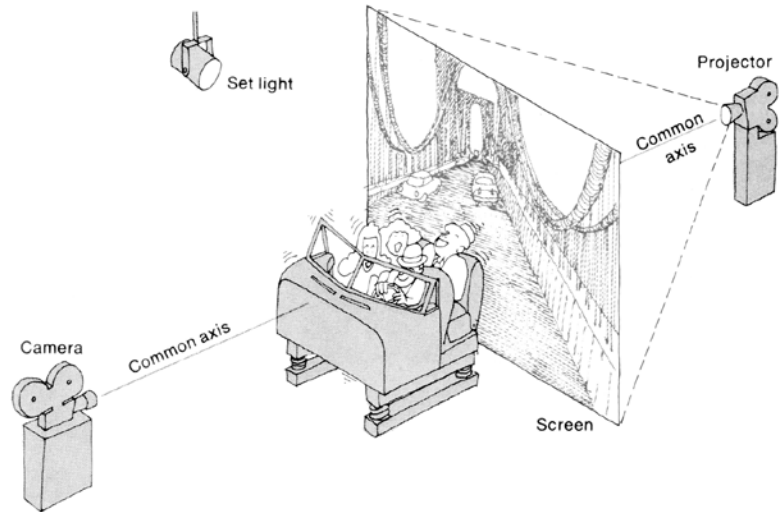


Figure 3.11.
From J Monaco, *How to Read a Film*

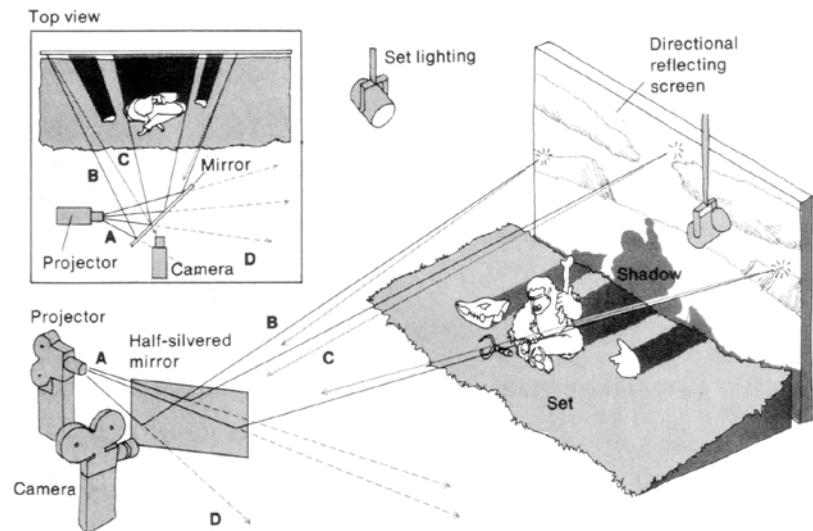


Figure 3.12.
From J Monaco, *How to Read a Film*

Here there is quite an obvious reoccurrence of the same principle of mirroring that coupled well with perspective. However this process of mirroring and the polished silver isn't discussed by Damisch in great depth compared to his extensive investigation of all the other aspects surrounding Brunelleschi's experiment. I believe that he didn't recognise its full value and misunderstood the demonstration. At one point Damisch asks,



Figure 3.12.
2001: A Space Odyssey (1968)
From: J Monaco, *How to Read a Film*

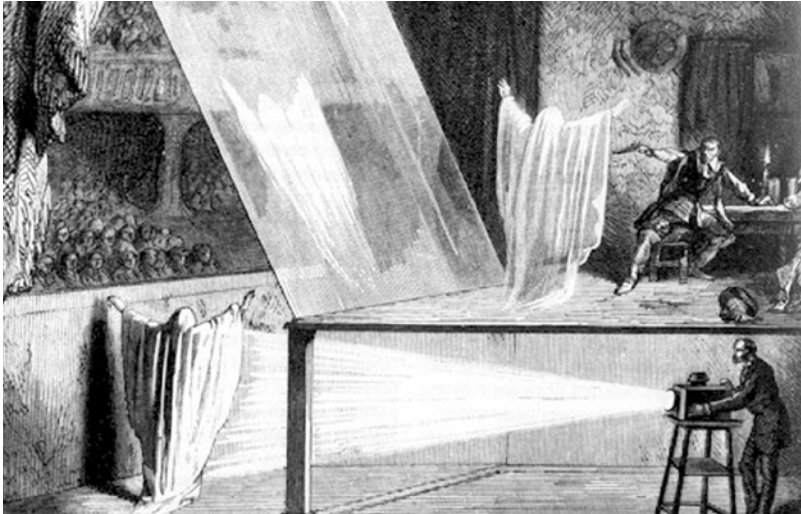


Figure 3.13.

But why the Mirror?... given a construction organised around a single point of view, the flat mirror did nothing but reverse its lateral orientation.

Damisch and, evidently in his continuing commentary, many others could not see the purpose of the mirror when the painting could simply be turned to face the viewer and then pulled away to reveal the actual Baptistery. The mirror seemed an unnecessary addition. He goes on to ask,

If the mirror's only role in the experiment were that of a simple corrective mechanism, as a number of commentators would have it, there would have been nothing particularly revolutionary about it – nothing at least to justify comparing it with Galileo's discovery, as does Parranochi, despite his endorsement of this view. The salient question then becomes that of determining whether the mirror was required during the actual execution, or was only used after the fact, not so much to confirm the accuracy of the perspective construction as to increase its demonstrative impact. This is a problem – that of the method of construction used by Brunelleschi – which Manetti chose to ignore in a way that must be deemed significant, and that left historians plenty of room to exercise their ingenuity.¹³

13 Damisch, pp. 117-118.

These concerns can be quite simply explained. The mirror was used to relay the sky that was being reflected first off the polished silver on the surface of the painting. To simply turn the painting to face the viewer would not reflect the sky as – and I believe this is what has been forgotten – the polished silver would only reflect the interior of the cathedral in whose doorway the viewer or Brunelleschi himself was standing. So the polished silver reflected the sky and the mirror in the other hand reflected it again like a periscope. This elaborate setup was all for reflecting the sky (which wasn't painted), not for demonstrating linear perspective. It had very little relationship to proving linear perspective and in fact it could be argued that the reflected sky was included to make the painting appear more convincing than linear perspective alone. In which case, the entire arrangement had much more to do with compositing than it did with linear perspective, as Brunelleschi had to have planned this from the beginning before he began constructing the image in reverse. The reason, I believe, why Manetti omits this from his recount of the experiment is that when he held the original panel in his hands it would have been obvious enough not to mention. Given this confusion and Damisch's questioning, I can understand why he spends less time commenting on the non-painted aspects of Brunelleschi's demonstration.

This was only the first of a series of apparatuses and experiments that were constructed to prove and understand the workings of perspective. Brunelleschi's demonstrations came to influence Leon-Battista Alberti, Albrecht Dürer and many others who also constructed perspective machines and drawing frames to aid the making of perspectival images and, as with Brunelleschi, those too were used to support their ideas and treatises of perspective. Dürer's and Alberti's perspective machines were frames with a gridded glass plane (Figure 3.14 and Figure 3.15) and an eyepiece for the artist to maintain a fixed viewing position. On the far side of the frame were the subjects and environment that would be captured in the grid and re-plotted to a gridded canvas. The frame in such cases was a plane that would act as a cross section through the visual pyramid with the eye at the apex (the eyepiece). Dürer preferred the term 'visual pyramid' as opposed to a visual cone, perhaps as it was more fitting with the rectangular frame or because of the geometrical and architectural forms that were often captured through it. In these instances the rectangular frame reaffirmed the intentions of the (Euclidian) geometry and the architectural aspirations, a tradition that has been followed through to contemporary architectural photography.¹⁴ Further to this, the frame was also seen as a window frame rather than a picture frame, as described by Panofsky:

Item Perspectiva ist ein lateinisch Wort, bedeußt ein durchsehung"
("Perspectiva is a Latin word which means 'seeing through.'") This is how Dürer sought to explain the concept of perspective.¹⁵

Described as a window there is an indication that the drawing frame itself was in some way part of the architecture it was situated within, as they all had to be sited. Of images depicting drawing frames and perspective machines from the 15th through to the 17th century (Figures 3.14–3.17) the device is almost always positioned orthogonally or parallel to the surrounding architecture

14 One of the 'rules' of architectural photography is to maintain all vertical edges of the building parallel to the edge of the square frame. In many ways, this makes the photograph take on the qualities of one- and two-point perspective drawings. This is discussed further in chapter 4 under the section 'Embodiment'.

15 E Panofsky, *Perspective as a Symbolic Form*, Zone Books, New York, 1991, pp. 27.

and surfaces, reaffirming the device as an architectural feature, a 'window' as Alberti termed it, almost inseparable from the space it was located within. The string, which cut vertically and horizontally across such frames (Figure 3.15), also played a significant role. As in many other images that describe perspective at work, demonstrating rays of light travelling back to the eye, the strings in the drawing frames took on the role of lines in the drawing, again reinstating an architectural quality as they had already traced the formal structure of the building by being parallel to the edges of floors, walls and other features they sought to capture. It would seem that perspective machines had been deliberately constructed according to the nature of their surroundings, arguably sympathising with what they aimed to capture rather than testing the legitimacy of perspective.



Figure 3.14.

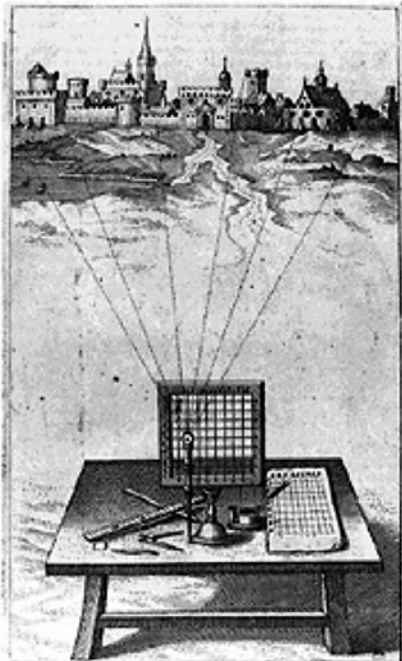


Figure 3.15.

CHAPTER 3
PERSPECTIVE: A
VISUAL EFFECT

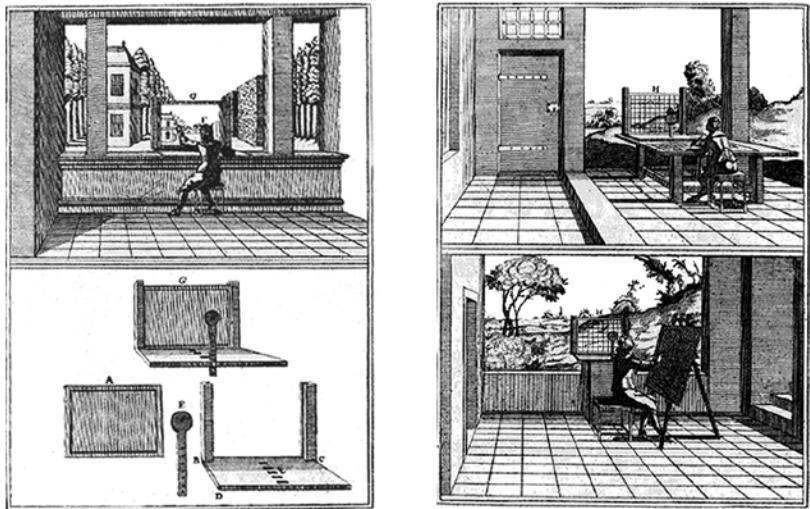


Figure 3.16.

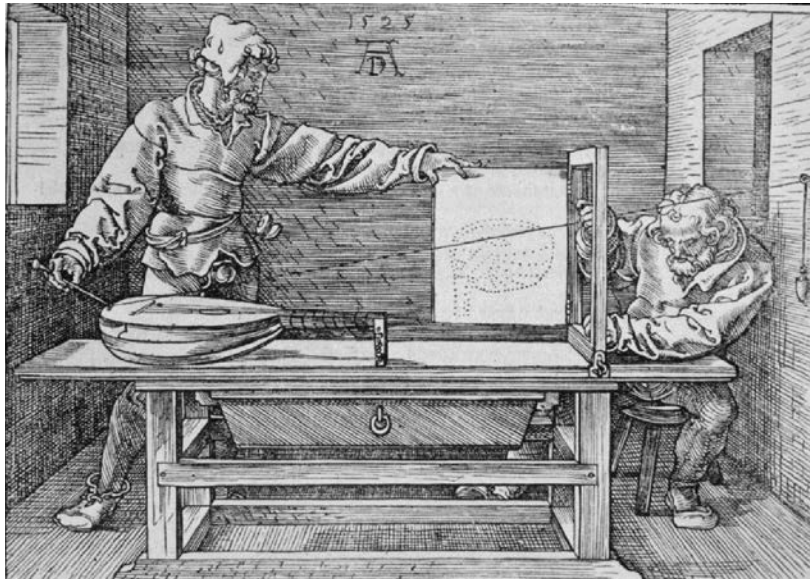


Figure 3.17.

Contemporary Perspective Machines and Techniques

It is difficult to ignore the resemblance between the gridded drawing frames of the Renaissance and the grid of pixels on our monitors today as we work with software to create digital visual effects. Digital compositing is the area of visual effects that completes an image or shot by integrating the content of varying sources, and there are other facets occurring earlier in the pipeline that make up the separate parts ultimately composited together. These specialised areas include, but are not limited to, photogrammetry, image-based modelling and

matchmoving, which all maintain an awareness of the spatiality of images.

Photogrammetry, which has existed since 1851, is a technique for measuring objects and distances from photographs.¹⁶ In simple terms it can be thought of as reverse-engineering the technique used to generate a perspective drawing from measured orthogonal drawings. A photograph is a perspective view and with basic information on the lens used to capture the image, measurements can be extracted through calculus. Digital advances in photogrammetry have led to image-based modelling. As photogrammetry extracts measurements from a single photograph, image-based modelling uses multiple photographs that are cross-referenced to understand all sides of any form or object so that one can digitally recreate the geometry. By locating common points in each of the photographs, such as the corner of a building or the edge of a window, one can position the photographs in digital space relative to the way they were taken. Once the measurements are calibrated a digital 3D model can be derived from the photographs and then the original set of photographs can be projected onto the 3D model to render its texture and describe its materials. If we begin to consider how all this might work across time, that is, working with footage rather than still images, we're able to extract even more information imbedded within the image. Matchmoving (also known as 3D tracking) analyses footage that has been taken from a moving camera. Similar to photogrammetry and image-based modelling, it involves understanding the 'depth' within an image. Across an image sequence it considers the distortion and displacement of colour and luminance in the grid of pixels from one frame to the next to determine where in the scene the camera is positioned at any frame. This results in one of two things: primarily it is used to determine the trajectory of a travelling camera over the sequence, but it can also be used to understand the geometry within the footage to aid the 3D modelling process. In the cases where the camera is moving, the geometry can be considered as static (such as a landscape), or if the camera is stationary, it can be used to track the displacement of points such as markers that are placed on the face of an actor to measure how the muscles contort her face as she performs.¹⁷

What these briefly described techniques have in common is that they work through perspective to determine the spatial and geometrical understanding of images and their content. Through complex mathematics these techniques determine the position of the viewer in relation to the object or scenery being viewed. The ideas and the mathematics at the heart of these digital processes can be traced back to the study of perspective during the Renaissance and the instruments and calculus that were generated from those investigations. In his article titled 'The New Cinematography', Steven Katz reiterates this historical relationship, saying,

Match moving, optics, photogrammetry, and perspective drawing are all part of an area of mathematics called projective geometry. Applied to various spatial problems it can provide solutions for measuring objects at a distance, locating objects in space, and extracting 3D models from photographs. Projective geometry has been in use in motion picture since the silent era: Camera angle projection, the process of extracting a perspective view from architectural plans and elevations, was

¹⁶ M Doneus, 'Introduction to Photogrammetry', Universität Wien Luftbildarchiv, retrieved 10 June 2005, <www.univie.ac.at/Luftbildarchiv/wgv/intro.htm>.

¹⁷ S Katz, 'The New Cinematography', *Millimeter*, November 2001, retrieved 7 September 2008, <http://digitalcontentproducer.com/mag/video_new_cinematography/index.html>.

the standard method used by art directors to visualize specific camera angles and views based on blueprints of a set. Today, computer programs have all but replaced these techniques, but there are still a few working art directors who, with the help of a T-square, triangle, and blueprints, use traditional camera angle projection to preview shots.¹⁸

18 *ibid.*

While Brinkmann refers to the early days of photography as the birth of compositing, I would like to shift the attention from Brinkmann and Bizony's inference that visual effects largely grew from photography. Given all the aforementioned examples predating film, I argue that the Renaissance was the birth period of compositing and visual effects, which arise from the studies of perspective as demonstrated by Brunelleschi. From both of Brunelleschi's experiments and through the many treatises and instruments of perspective by other artists, I take the position that compositing was one of the earliest forms of visual effects to be intentionally constructed during the conception of Renaissance perspective.

The Slippery Slope of Truth Surrounding Perspective

Perspective machines were being constructed at the same time linear perspective was being formulated, providing a uniformed argument whereby the drawing frames would prove the mathematical approach to linear perspective as demonstrably as Brunelleschi's experiments. However there are also enough examples to argue that they privileged different bodies of interests and drifted away from a common agenda.

Linear perspective remains a method of constructing a three-dimensional view derived from a plan (describing the width and length) and an elevation (describing the height) by following a set of 'rules'. The diminution created through a perspective drawing is relative to the position of the viewer and the horizon in relation to the plan and elevation. This methodology behind linear perspective relies upon certain truths: that parallel lines meet at the horizon marking the vanishing point(s) and that all straight lines of the geometry (or plan and elevation) remain straight when depicted in the perspective. In speaking of, but not limited to, one-point perspective, Panofsky describes other beliefs that are of the body that are also problematic:

In order to guarantee a fully rational – that is, infinite, unchanging and homogeneous – space, this “central perspective” makes two tacit but essential assumptions: First, that we see with a single and immobile eye, and second, that the planar cross section of the visual pyramid can pass for an adequate reproduction of our optical image. In fact these two premises are rather bold abstractions from reality, if by “reality” we mean the actual subjective optical impression.¹⁹

19 Panofsky, pp. 29.

Panofsky continues to describe the key difference between linear perspective and what is optically witnessed. This difference is of the projection plane (Figure 3.18). Linear perspective assumes that the projection falls on a flat plane (the canvas) but optically the projection falls on a spherical surface (the retina). The two approaches generate a difference in proportions and a distortion of straight lines. This difference is known as perspectival distortion, with the bowing considered as distorted and the straightened being considered as undistorted, even as the eye (older and natural) bows through its optical functions (Figure 3.19). Perspective here can be divided into two categories: *perspectiva naturalis* (natural perspective), which the eye sees, and *perspectiva artificialis* (artificial perspective), otherwise known as linear perspective, which arises out of mathematical rules to describe geometry.

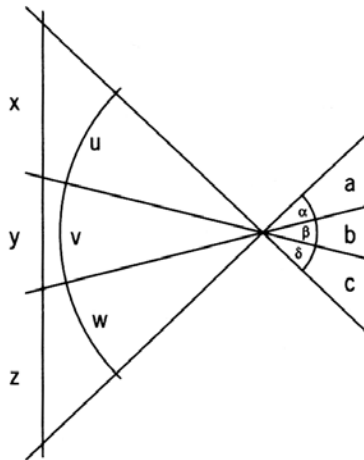


Figure 3.18.
From: E Panofski, *Perspective as a Symbolic Form*

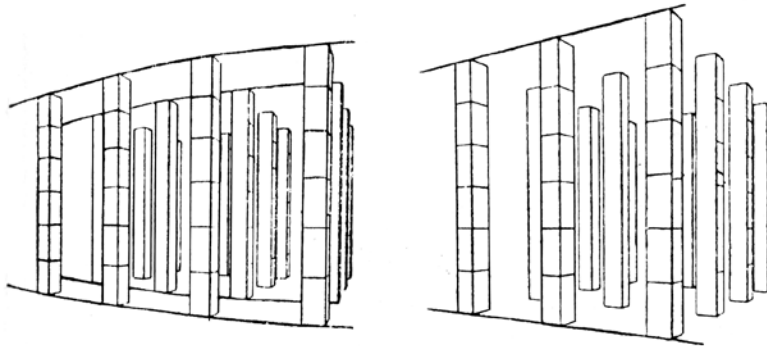


Figure 3.19.
From: E Panofski, *Perspective as a Symbolic Form*

Drawing frames might at first be seen as instruments of *perspectiva naturalis*, as they simply intervene in the cone of vision to assist in capturing what the eye sees, a section through the artist's ocular impression. Though they capture what is viewed through the eyepiece, the deformation occurs when the image is transferred to the canvas via the eye and the mind. As the grid of the frame subtly bends, visually, along with the architectural geometry it captures (as it is an impression falling onto the retina), the artist is neglectful of the minor distortion, believing the lines he or she is viewing are straight.

CHAPTER 3

THE SLIPPERY
SLOPE OF TRUTH
SURROUNDING
PERSPECTIVE

The frame is known to be square and the grid he or she is transferring to on the canvas does not bow, and has in fact been compensated for by aligning to the rectangular edges of the canvas and therefore transfers the lines straightened. The frame again minimises the awareness of such a distortion because it places limits on the artist's visual consciousness, whereas without the frame an artist would clearly recognise the bowing from the extreme edges of his or her peripheral vision. The view is (naturally) bowed by the eye then straightened by the mind, but blinkered and persuaded by the frame. Here we might argue that perspective machines were not used to test the truth of linear perspective but to reinstate it. The frame's purpose was not to truly understand optics, as the outcome would have represented the straight lines as bowed, conscious of what the eye was seeing. It was in fact more to do with justifying linear perspective and to reiterate that all straight lines were being seen as straight even though it was the mind that was compensating for the distortion, under the influence of the frame. This slight deception may or may not have been intentional, but human intervention between the frame and the drawing inadvertently supported what the frames were in part made to prove – *perspectiva artificialis*.

Divergence

Perspective machines and drawing frames were physical instruments that were placed within a space to document a scene and therefore the surrounding architecture or subject had to exist for the device to be put to use. The outcome was a seemingly faithful representation of the view. Linear perspective, on the other hand, by virtue of being a process rather than a physical object, could be used to forecast how a building may appear from plans and elevations alone, without the need for physical surroundings. Perspective machines took on a reflective role while linear perspective took on a predictive role. Here again we can see how linear perspective could be validated by perspective machines by creating a continuity from what was seen and documented to what could be forecast, but the two methods, which reaffirmed each other, also took on very different responsibilities, creating outcomes that weren't shared.

we should remember the limited instrumental application of most perspective apparatuses described in treatises. Albercht Dürer's famous machine (1525), for example, consisting of an eyepiece and a glass panel was mainly intended to demonstrate a rigid method for copying nature by cutting a section literally through the cone of vision.²⁰

Drawing machines, as described by Perez-Gomez and Pelletier, could not reveal such a truth with great accuracy as the lines were drawn with a free hand, without the aid of rulers, compasses or the mathematical rigours used in linear perspective. This allowed for subjectivity by the artist even while

20 A Perez-Gomez & L Pelletier, *Architectural Representation and the Perspective Hinge*, MIT Press, Cambridge, Massachusetts, 1997, pp. 34.

guided by the grid. As a technique its dependence on the artist for accuracy is perhaps why it was more appropriate for painting than architecture. This is illustrated as Perez-Gomez and Pelletier further unfold Brunelleschi's demonstration recounted earlier by speaking more specifically of the panel on which he painted the Baptistery.

Damisch claims that Brunelleschi assumed that the sky simply could not be represented in perspective because it could not be geometrized. For Damisch, this proves that Brunelleschi's interest in perspective stemmed from his architectural concerns rather than from painting.²¹

21 *ibid*, pp. 25.

Artificial (linear) perspective privileged architecture as it was a measured formulation for understanding geometry, yet the truth it revealed was also limited to measurable geometry, namely that which was Euclidian. Ephemeral, without edges or geometry, nor being static, clouds, evidently, were the most difficult of subjects to represent and remained elusive to linear perspective, limiting the technique's potential. Yet as perspective machines were more pictorial (creating images rather than technical drawings) they could assist in capturing and illustrating clouds. This sets up separate roles for perspective machines and linear perspective. Perspective machines, as they were used to capture a view, intervening between canvas and scene, privileged painting by taking on a mimetic role, while linear perspective would come to take on a predictive role privileging architecture. Similarly, today's architectural representation is largely about drawings that exist before the respective buildings they document. The role of perspective machines, which relied upon the natural talents of the artists to draw what is seen, would invite the thoughts and persuasions of the artist, whereas linear perspective required an adherence to its rules. Perspective machines and drawing frames sat more towards, but were not entirely of, *perspectiva naturalis*. Not for resembling optics or ocularity – as it was discussed earlier that they effectively did the opposite – but (I am using the term more liberally) because they would inevitably communicate something personal of the artist. They were subjective instruments under the influence of human intervention, unlike linear perspective, which explained the geometric order without judgement.

To underline this point, we need only return to Dürer's image depicting a drawing frame in use (Figure 3.14). In the highly staged scene is a woman posing for the artist within an architectural setting. The architecture would, in part, accentuate the depth and perspective in the final image while carefully lighting the subject with the window adjacent to her. The placement, framing and lighting is an intentional composition arranged by the artist in a manner similar to modern-day photographers and cinematographers. It is very much 'set up'. The organisation of the scene is as constructed and intentional as the drawing frame and its position, and the surrounding architecture. It would appear that the outcome here would have been a painting focusing on the central body rather than an architectural drawing of the space and geometry.

Narrating Perspective

As linear perspective was limited to measurable geometry, we might ask to what end it was useful to an artist. I refer to both painters and architects as artists, mostly because disciplinary boundaries didn't really exist at the time, though clearly some operated more in one area than the other. I would also propose that linear perspective influenced the divide as we understand it today, as it seems to have been pivotal in its capacity to

address what painters wanted of it and the limits of what could be presented by its structural rules. In the painting *Ideal City* – whose maker or date is not known but is credited to the school of Piero della Francesca of the early 16th century²² – there are three, but I'm speaking specifically of the one located in Urbino (Figure 3.20). One always notices its profound stillness as it so clearly demonstrates the physical form of a city. This raises the question of whether it is more a painting or a rendered architectural drawing. Perez-Gomez and Pelletier explain,

There were, of course, important connections between the painters' experiments and the architects' concerns with creating geometric order in the human domain. The painters' interest in mathematical depth and human events was manifested most clearly in paintings that told a story in an architectural setting. In exceptional cases, such as the well known "ideal city" panels, painters presented the architecture of public spaces without a *storia*, as if they were scenographic backdrops awaiting inhabitation.²³

22 *ibid*, pp. 23.

23 *ibid*, pp. 22.

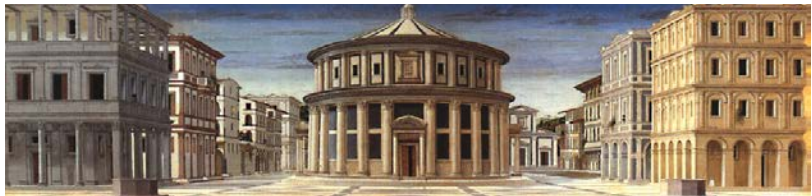


Figure 3.20.

Highly symmetrical and centred, the painting focuses on the geometry but fails to illustrate the social and cultural consequences of the urban space. It is difficult to ignore the absence of people, which makes it appear so static. Framing the city as a single point perspective image, with the vanishing point centred on the panel, speaks of the viewer as one who is also 'aligned' to the symmetrically balanced, geometric order of the city, reinstating its 'ideal' quality as perhaps an attitude or the position of the viewer. These panels are unique in that they counter the common practices of painters, who were different to architects as they mostly concerned themselves with capturing events with people to illustrate the effect and cultural significance of the urban environments. Perez-Gomez and Pelletier's comment highlights the idea that when painters drifted toward an architectural

practice their interests were still to use perspective to present a narrative over geometry. While *Ideal City* demonstrates the conflicting interests of painters as having, in this case, leaned too far towards the objective rigidity of linear perspective and away from a narrative, resulting in this peculiar painting, it also allows us to reflect on the use of drawing frames, which would have been more sympathetic to the painter's needs. As Dürer's image (Figure 3.14) captures an orchestration of both figure and architectural background through the frame to document a (partially erotic) moment, the image demonstrates how the apparatus helps compose and capture the scene. This and other such moments caught through perspective and architectural settings would seem to appeal more to the interests of painters and less to architects, who focused on geometry via linear perspective, as we regularly notice that illustrations of drawing frames at work often depict the artist drawing the human form sitting foregrounded to the architecture. Damisch's claim that Brunelleschi avoided the sky because he was incapable of geometrising it is a notion that could as easily be extended to the human form – arguably just as difficult to geometrise as clouds, if not more so when we consider what the process would mean politically, religiously and ethically. Rarely in paintings do we see people distorted as equally as the architectural settings they occupy – perhaps another reason why linear perspective would not entirely serve the interests of painters as their subjects might have appeared ghastly and inhuman if they were as exaggerated as their surrounding geometry.

Having already mentioned that there weren't disciplinary boundaries, I am obviously not suggesting that painters worked strictly with drawing frames and architects with linear perspective. I instead aim to show that in producing perspectival imagery the different approaches privileged different outcomes and desires. And in privileging certain outcomes we should consider what the ultimate consequences were. It would appear that drawing frames could more fluidly capture the human form, almost as easily they did geometry, as it remained pictorial and subjective. Linear perspective, on the other hand, as a form of technical drawing and objective in nature, struggled to describe anything that couldn't be measured, even if it could be seen. Linear perspective was much more about the rules of the technique and therefore one artist adhering strictly to the process would create the same outcome as another artist, removing their influence. Yet the inaccuracy of perspective machines placed greater emphasis on the artist to illustrate the painting and consequentially greater emphasis on the viewer who would interpret the painting. This leads me to argue that narrating through perspective was better sought through framing devices than the governing rules of linear perspective. This argument includes many other devices since the Renaissance, such as the camera obscura, the camera lucida, the photographic camera, the cinematic camera, and the digital instruments and software we use today.

Manipulating Perspective

Narration brings its own issues and there are a few notable figures who found themselves on both sides of this divide trying to negotiate between narrating ideas, stories, and conditions, and wanting to retain the objectivity of linear perspective. Andrea Pozzo, Piranesi and Hugh Ferriss, among others, all sought to illustrate speculative and imaginary visions, but in order to do so were, in

various ways, forced into manipulating linear perspective's rigidity to foreground their narratives.

The painter Andrea Pozzo, who decorated the ceilings of churches throughout Europe in the late 17th century, and the *quadratura* technique he had developed became important influences on the first project of this research. *Quadratura*, as described earlier in chapter 2, is a method of transferring a fresco image onto a barrel vaulted ceiling in manner whereby the physical architecture continues in the painted image, appearing to extend the space (Figures 3.22–3.23). The treatise describes a technique that begins with an image to be transferred onto the ceiling, often created through linear perspective referencing the measurements of the same physical space. A grid structure made of string is constructed, parallel to the floor, at the top of the interior walls where the barrel vaulted ceiling begins. With the aid of a candle placed in the space approximately at eye height and often centred in plan, the grid would cast shadows onto the barrel-vaulted ceiling which would act as the guide for transferring the image. In order to extend the physical architecture into the fresco painting, the initial image needed to be constructed as a single-point perspective image drawn from the centre of the space, or rather from the same location as the candle. This initial image would contain the existing physical geometry so that, once painted onto the ceiling, it created the illusion that the physicality of the space continued seamlessly upwards.

This technique in many ways resembles Dürer's drawing frame. Pozzo's *quadratura* is a physical instrument of gridded string occupying the space and aligning to the surrounding architecture perpendicularly. It is in fact even less separable from the architecture than Dürer's device, as the grid is attached and suspended from the surrounding walls using them as the frame, and is built specifically to the geometry of the room. Both devices rely on this intervening grid through the visual pyramid to aid what is painted from what is (or will be) seen. There are obvious differences, but most significantly, Dürer's drawing frame captured the image moving toward the eye in the grid and was then replotted to the canvas, while the *quadratura* technique projected the grid, casting the image back onto the surrounding geometry from the fixed viewing position. The *quadratura* technique also involved other steps and relied upon a linear perspective to construct the initial image. In this instance it is as much an apparatus demonstrating the geometrical truth of linear perspective as Brunelleschi's first demonstration. Just as Brunelleschi alternated between the mirror reflecting the painted image and the real Baptistery, Pozzo was able to prove the merits of his technique in

the same moment by extending the physical architecture into the painted scene, validating not only quadratura but also linear perspective as a whole. As Brunelleschi's technique of linear perspective was focused on geometry and the ability of artificial perspective to describe a geometric truth, Dürer's drawing frame, which was set up around a highly composed scene, used the device to transfer a staged moment onto the canvas. Brunelleschi's interest was to create a drawing that was measured and precise, while Dürer's was to paint a picture that captured a moment of a performing body within a scene. Pozzo's technique is even more interesting as it mediated between Brunelleschi and Dürer by combining the practices of both linear perspective and drawing frames. Quadratura was, first, able to predict the appearance of the interior's extension through linear perspective, and then performed the act of re-plotting a view – the drawing of the extension with its grid overlay – to the distorted grid pattern on the ceiling by hand. Effectively, through quadratura, Pozzo was able to exploit the benefits of both techniques.

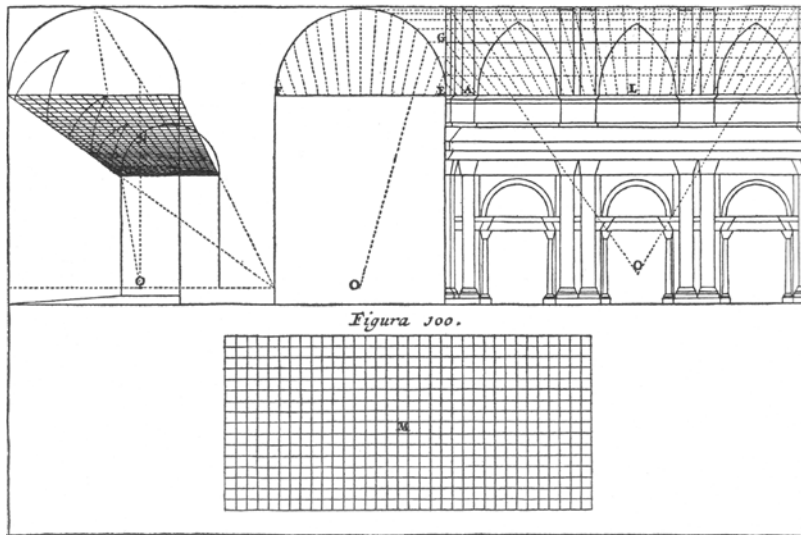


Figure 3.22.



Figure 3.23.

Yet the original drawing derived from linear perspective only contained the geometry. The narrative element depicting people in his process occurs in the final stage after the architectural drawing is projected onto the ceiling through the grid, or at the very earliest, as an overlay after the drawing of the architectural extension is complete. Just as the string is there to help replot by hand and eye an impression derived of linear perspective, so too the geometrical drawing was there to support the narrative. This again reinstates that the 'instrumental' feature of *quadratura*, like that of a drawing frame, was more applicable to figures and narrative than linear perspective. Pozzo as both an artist and mathematician only extends the geometry so far before the scene is decorated by a number of biblical events and characters as it approaches the vanishing point, transitioning from drawing to painting. The characters are staged, all posing in a highly gestured manner, clinging to the architecture. In this portion of the painting the deliberate composition that has been projected onto the physical surface through the grid is again comparable to Dürer's staged event.

It is difficult, then, to separate *quadratura* from its religious promotion. A devout Catholic, Pozzo's intent may have been, by extension, to reinstate his belief by blending its characters with the more immediate and universal factuality witnessed through the use of linear perspective, arranging a co-dependence of a religious and geometrical faith to describe the world. As the arrangement dissolves from the physical architecture of the church to its painted continuation and then on to its religious tale(s), Pozzo overlaps the interest of Brunelleschi through linear perspective, demonstrating its accuracy, and that of Dürer by physically constructing an instrument that would reflect the values of the surrounding architecture onto the human form.

Other Architectural Visionaries Who Mediated Perspectives

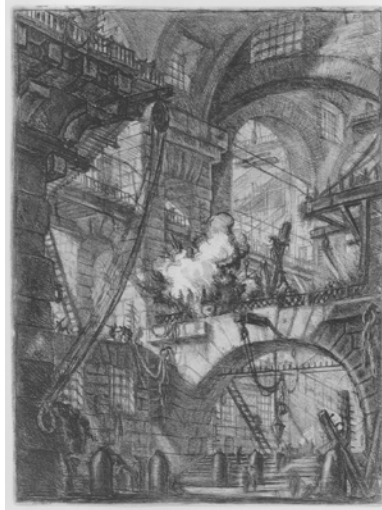
Others also later explored a shift away from the rigours of perspective toward a pictorial understanding of space, notably Giovanni Battista Piranesi (1720–1778) and Hugh Ferriss (1889–1962). Of the more than one thousand etchings that Piranesi produced, the *Carceri* series are perhaps the most widely commented upon (Figures 3.24–3.26). Unlike the majority of his etchings, which took on a more archaeological role, the 16 *Carceri* plates were of fantastical spaces. Less a memorialising of Roman history and its legacy, they were theatrically constructed, dark and incited a sense of fear rather than the optimism of his other work. The value of this series was not in accurately recording the geometrical character of architecture but its psychological impact. Effectively these etchings speak of the viewer's role as much as what is being viewed. The horizon lines in all the views are very low or below the frame, highlighting the authority and imposing nature of the interior. The architectural forms are positioned awkwardly and stagger back into the view, and the light and its sense of hope entering

the interior is the most recessed and suppressed. The composition of all the architectural elements is scattered and chaotic, lacking the sense of balance and rhythm found in Piranesi's other etchings.

What furthers the chaotic nature of these images is their perspectival fallacy. The edges of seemingly co-planar surfaces do not recede to a common vanishing point (Figure 3.27) and this lack of order generates an uncomfortable effect on the eye. The interior walls are also ornamented with symbolic features. Chains, pulleys, fire and smoke and the dark unidentifiable figures silhouetted in a struggling pose all speak of the torturous and repressive nature of the space, further adding to the discomfort. In the cases where there are drafts (Figure 3.26) we can see how the surfaces have been darkened in their final versions to communicate a more disturbing impression and demonstrate a shift in priority from a geometrical description of the interior to its atmosphere. In speaking of Piranesi and Jean-Laurent Legeay (1710–1786), a contemporary of Piranesi who created similarly evocative images of architecture, Perez-Gomez and Pelletier write:

... they developed new ways of fragmenting the linearity of perspective representation that might reveal a depth of human experience now being lost in the systematized rendering of surfaces identified with scientific vision.²⁴

24 *ibid*, pp. 216.



Figures 3.24–3.25.

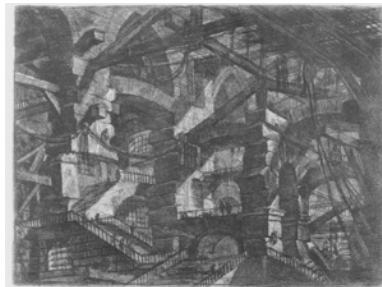
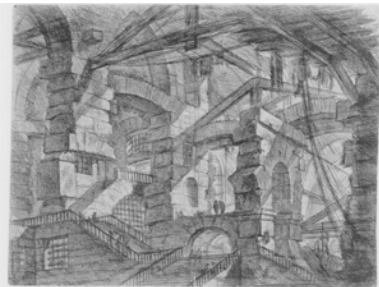


Figure 3.26.

CHAPTER 3
OTHER
ARCHITECTURAL
VISIONARIES
WHO MEDIATED
PERSPECTIVES

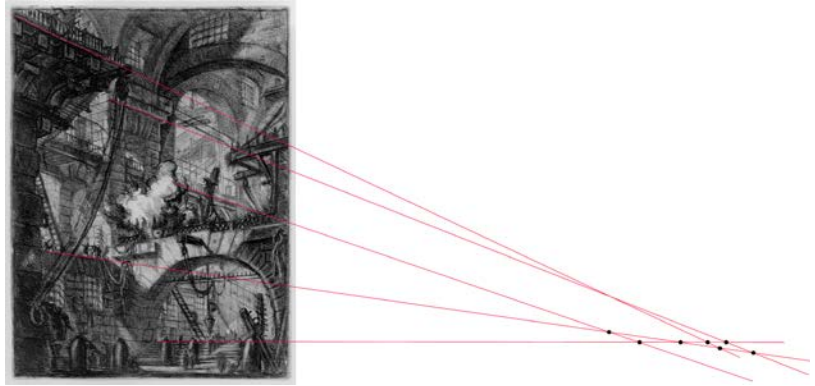


Figure 3.27.

Almost two centuries later, Hugh Ferriss was another such architectural visionary who proactively distorted the linearity of perspective. In an article on the role of architectural renderers he wrote:

... it would appear that he is not so much permitted as actually required to slight incidental facts of his viewpoint in favor of the essential facts of the subject which he is viewing.²⁵

25 I Fraser & R Henmi, *Envisioning Architecture: An Analysis of Drawing*, John Wiley and Sons, New York, 1994, pp. 174.

Like Piranesi's *Carceri* etchings, Ferriss produced a number of renderings with charcoal that played with light and shadow (Figure 3.28). In views that were rendered by night the background remained illuminated by fog. The light came from the street rather than from the sky, which not only gave the work a theatrical quality but also allowed Ferriss to highlight the necessary features of a building by manipulating the light around the form, as the light source was no longer direct but ambient and softly shadowed.

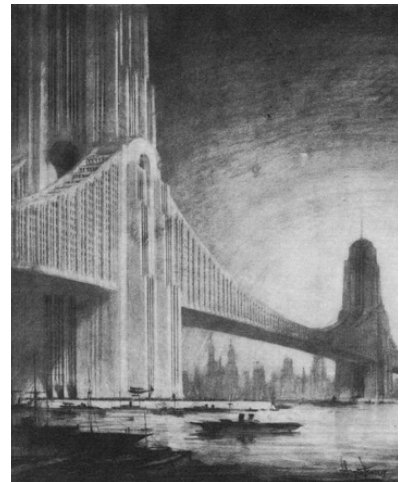
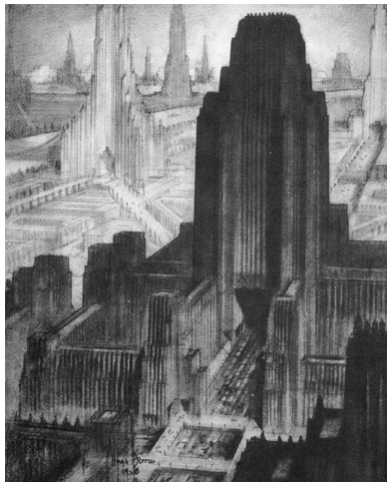
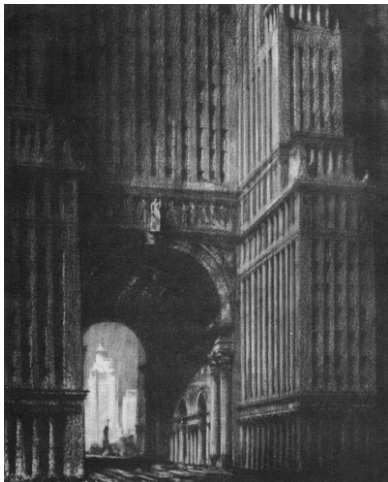


Figure 3.28.

Piranesi and Ferriss both created images that were recognised for their cinematic qualities and together influenced directors such as Sergei Eisenstein, Fritz Lang (*Metropolis*), Steven Spielberg (*Minority Report*) and Ridley Scott (*Blade Runner*) but only after having disrupted the rigid system of linear

perspective to sensorially engage the viewer. Piranesi's etchings with multiple vanishing points could also be thought of, like Brunelleschi's first demonstration, as works of moving image if we (re)consider the misaligned vanishing points not as part of an inaccurate drawing but as representing the shifting position of a moving viewer. It further highlights its cinematic importance by suggesting that the layers and surfaces of the space are continually revealed as one moves through the space. So, to further the comment earlier by Ferris, it is through the fracturing of perspective that both sensorial and cinematic qualities can be brought to the surface.

Framing Devices

Pozzo's *quadratura*, which exploited the 'truth' of linear perspective to construct religious narratives in the images decorating the ceilings of churches, is not too dissimilar to the initial notions of truth surrounding photography and the ways its processes were exploited for spirit photography. Greater than a technically mimetic achievement, the outcome was an image that was intimate and engaging.

To include more broadly the etchings of Piranesi, the composited photography of Rejlander, the charcoal drawings of Ferris and the visual effects of Jeunet, we find that these intentional distortions were no longer interested in a visual truth but were refocusing stories and aspects of the human condition. Having reached the limit of possibilities offered by the methodical approach to perspective, they chose to break away from its rigid confines in order to bring forth poetic qualities, asking what it means to be human.

My interest in retracing the techniques of Renaissance perspective is not so much about linear perspective but rather the framing devices and instruments that were used to capture a view. The perspective machines which had eventually acted as a counter to the ideas of truth still continue to be reinvented today. While software today that works primarily through perspective may be more entwined with the mathematics of linear perspective, there is little to deny that it is used primarily for the purposes of creating visual effects – and I use the term broadly here, beyond cinema. This is more telling of what is important to architects today as they grapple with all the contemporary digital programs and devices at their disposal – most of which, architects have to admit, were primarily created for other disciplines. Brunelleschi's demonstration and Dürer's apparatuses have been very revealing in the roles they have played, not just within the debates surrounding perspective, but more importantly for what they say about the instruments and attitudes at the origin of Renaissance perspective. The visual effects they generated are equally important in a conversation today about the role of digital software in representing all architecture's concerns, not just its form. Given that visual effects in cinema share their history with architecture as well as having demonstrated, through many more examples than those discussed here, that they

have overcome the limits of truthful descriptions of geometry, I would argue that the current climate calls for a re-engagement of architectural representation and visual effects, through a digital practice, to further architecture's communicative ambitions.

In returning to the technique I proposed in the first project, does my position consider digital software more in the nature of a drawing frame or linear perspective? It is of course both, like the way Pozzo converged the two practices, but if interrogated it is perhaps more like a drawing frame, as the software already handles the accuracy of linear perspective and therefore is geometrically true, leaving the creator to make judgments about how it is represented. Ultimately it visually proposes speculative ideas and therefore is not of truth. So the practice needs to become more painterly, narrated, contemplative – to celebrate the role of the creator and be aware of the viewer. I would encourage this because the most notable figures of architectural representation through perspective are those, like Pozzo, Piranesi and Ferris, who shifted away from adhering to the rigid processes of linear perspective in order to explain the world's geometrical order to becoming aware of what it means to make images for a viewer to interpret them.

A Practitioner's Perspective

As a practitioner it is worth reflecting on what this historical discussion means to the developments of my own practice. I wouldn't say this chapter comprises a historical account of perspective, as there are many, such as Perez-Gomez, Pelletier, Damisch and Panofsky, who have investigated the subject far more thoroughly. The aim wasn't to provide a history of perspective but rather to explore how people practised with perspective and made their images. As an image creator in both architecture and film I am interested in how past practices of making images and visual effects might influence my work. What fascinates me further is that there are precedents for my practice in overlapping film and architecture. In this regard the ideas discussed here are entirely to do with how they relate to my practice and projects, rather than creating connections between theorists. It is not an effort to create a new argument from the milieu of thoughts surrounding perspective, but to link some of those pieces of knowledge and tie them back to the work I have generated and the ways, I believe, practitioners generally operate in regard to precedents when they create new work. To work with framing devices (cameras, computers and software) means that I am always confronted with the question of what it means to make images and to ask about their readability, reliability and limits. In doing so I have discovered that there has always been an underlying intention to subvert their perceived truths, not merely for the sake of subversion, but to bring to light that which is invisible in order to create a larger narrative. It is the restriction of the frame that forces me to consider what is beyond it and try to present what seemingly can't be captured.

Of the work that has affected me there are two practices of the past which are the most obviously influential. First is Pozzo's quadratura, in which capturing the existing and projecting the speculative were coupled together in one elegant and practical technique. This was very important as a precedent to my first project, which in the same manner sought to document the existing site and as part of the same process envision new possibilities for the site. The second is Brunelleschi's demonstrations that were an important conceptual stage in visual effects for architecture (via perspective) and cinema (via compositing). What is most insightful is not that which is common to my current practice but the new insights that have been gained, primarily that the visual effects practices of the past in architecture, painting, photography and cinema all led to narratives and that framing devices that re-presented the world were of a sensorial purpose.

As this research foregrounds the projects and practice, I am more interested in practices of the past as influence on my current image-making practice than writing a limited historical argument. As such I write more about practitioners and practices than about other historical writers, but refer to them for support. This should not be misunderstood as a way to excuse any shortcomings or arguments that one might find disagreeable, or even to set the two forms of making and writing about work in opposition to each other. It is to say – in much the same manner as I have argued that the two practices of perspective influenced one another while creating different outcomes – that observing the influence of history on my image-making practice allows me to offer new insights back to the community that operates through literature. One such case was my earlier conversation regarding Damisch's questions and what I offer to his curiosities about why Brunelleschi had used a mirror with his first experiment. This, I believe, is the kind of unique contribution a maker of visual effects can offer to the community of writers about its practices.

CHAPTER · FOUR
A · REVIEW
OF · THE
ARCHITECTURAL
FLYTHROUGH

Research Background

Project 1 created two outcomes. The first was a new technique for generating perspective imagery, a contemporary process resembling that of Andrea Pozzo's quadratura of the late 17th century. As discussed in chapter 3, this newly developed technique led to an investigation of other historical practices of perspective drawing in architecture and painting, and image-making in photography and cinema, all

of which sat within a larger sphere of visual effects practices. As the investigation brought to the fore the importance of narratives it also raised questions about the second outcome of Project 1, which was the animation that the technique had produced.

This discussion, instigated by that animation, is about architecture as it relates to the moving image on a much larger scale. It is not about how architecture has been used in cinema and animation but how film and animation have been used in architecture. More specifically it is not about architects making references to cinema and animation for a discourse on architecture but about how they, in ever increasing numbers, are practising animation and filmmaking. What does it mean when architects make works of moving image, when the practice of architectural representation has traditionally been still? The discussion will focus on the architectural flythrough, for it is not only one of the dominant forms of the moving image practised in architecture – if not the most dominant – but also in many ways it characterises the animated outcome of Project 1 – an unedited observation from a single camera wandering through an architectural proposal. This is an effort to (re)develop the technical and directorial approach to creating architectural animations so that architects may create more compelling works that are better aligned to the practices of architectural representation, animation and cinema.

On Representation

The term 'representation' shifts in its specificity and meaning from one discipline to another so it is important to define the way I have chosen to refer to it, which is in agreement with a number of representational theorists of architecture such as Robin Evans and Marco Frascari. Architecture has a unique understanding of the term representation and its distinct importance from other art and design disciplines is

eloquently highlighted by Evans in his article 'Translations from Drawing to Building'. He writes,

Bringing with me the conviction that architecture and the visual arts were closely allied, I was soon struck by what seemed at the time the

peculiar disadvantage under which architects labour, never working directly with the object of their thought, always working at it through some intervening medium, almost always the drawing, while painters and sculptors, who might spend some time on preliminary sketches and maquettes, all ended up working on the thing itself which, naturally, absorbed most of their attention and effort. I still cannot understand, in retrospect, why the implications of this simple observation had never been brought home to me before.¹

1 R Evans, 'Translation from Drawing to Building and Other Essays', Architectural Association Publications, London, 1986, pp. 156.

His simple yet important reflection illustrates the unique relationship between architecture and the way it represents its ideas, as a result of the divorced nature by which architects operate with the outcome. At a minimum architects are able to capture in a drawing the geometry and composition of an architectural proposition, but the best drawings also operate on a secondary level, encapsulating other things important to architecture by alluding to aspects of a building that are often invisible and intangible. It is an important act that drawings are able to represent these elusive qualities that are ultimately experienced in the eventual building and its spaces, so they may 'translate' through the drawing to the completed building the aspirations imagined by the architect. As such, representation is not merely an effort to begin bringing to the fore what is obvious, but to begin making the invisible visible and suggest all that the architecture may offer. So it is not simply what is seen but what is to be understood, nor what is merely constructed but what is to be experienced. In speaking of the 'definition of architectural vision' that led to the 2005 Architectural Humanities Research Association conference on architectural representation, Frascari writes:

The real architectural drawing does not result from a vision of the absent, but instead provokes one. Rather than resulting from the gaze aimed at it, the drawing summons insight by allowing the invisible to saturate the visible, but without any attempt or claim of reducing the invisible to the visible lines of the drawing... It teaches the gaze to proceed beyond the visible image into an infinity whereby something new of the invisible is encountered. Thus the true 'drawing-gaze' never rests or settles on the drawing itself, but instead rebounds upon the visible into a gaze of the infinite.²

2 M Frascari, 'Models and Drawings - the invisible nature of architecture', in *From Models to Drawings*, M Frascari, J Hale & B Starkley (eds), Routledge, London, 2007, pp. 7.

The architectural drawing is never severed from the imagination; rather the drawing's intention is to provoke it. Though Evans and Frascari speak specifically of architectural drawings because these have taken on the most fundamental role in architecture, their argument should quite rightly be extended to all modes of architectural representation including architectural models, collages and diagrams. Each of these various modes is enriched through its endeavour to offer more than what is immediately presented, communicating the intangible and capturing the ephemeral. This is the unique underlying agenda that needs to be continued as new representational techniques are developed or adopted for architecture; and it's through this lens and understanding of the term 'representation' that we should evaluate and critique the effectiveness of any contemporary (digital) technique of architectural representation.

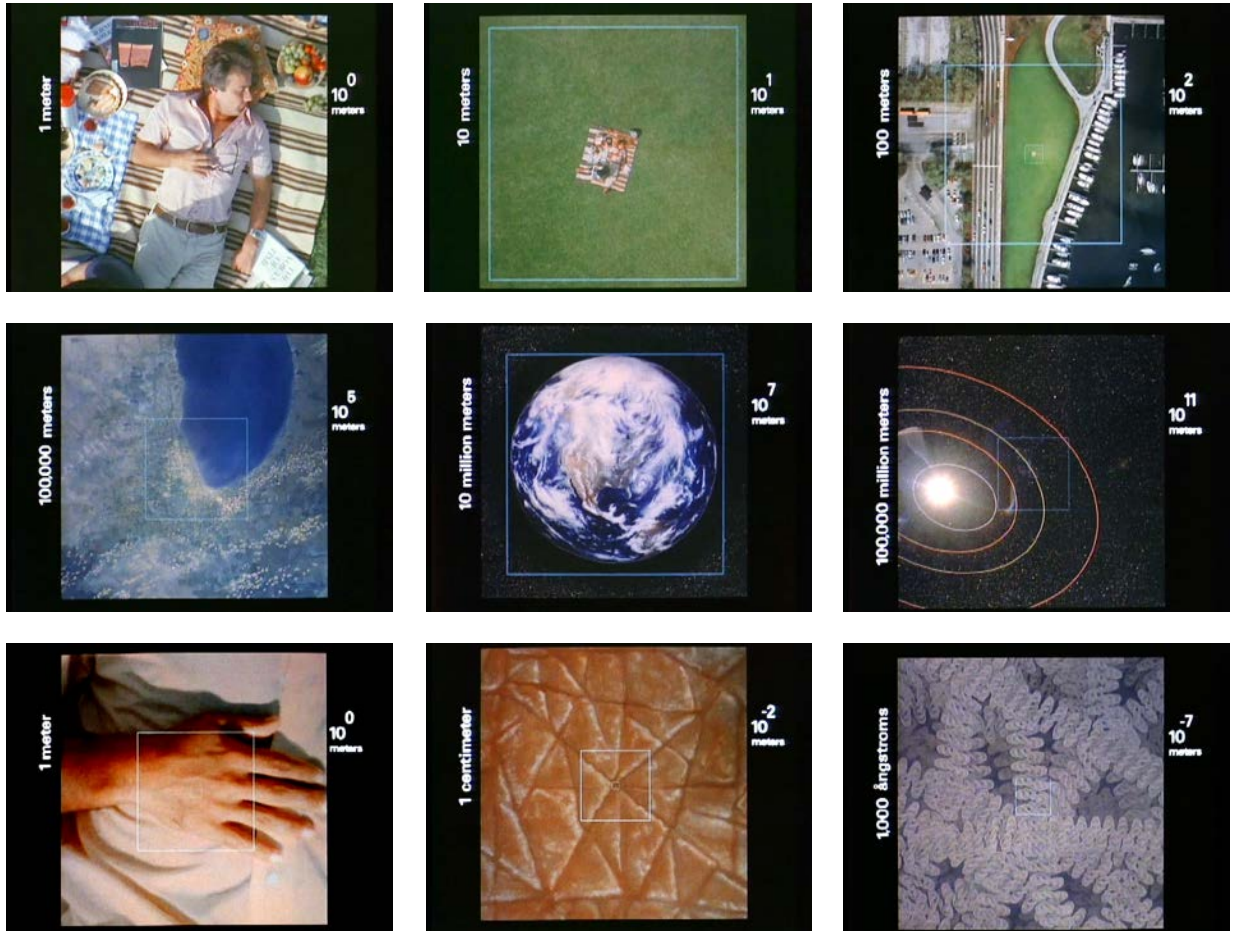


Figure 4.1.
Powers of Ten (1977)

Architecture and the Moving Image

The newest area of representation in architecture to be widely adopted involves the moving image. Here I speak specifically of animation and film but also, more broadly, work online and onscreen in various forms. This cross-disciplinary fascination between architecture and film is neither recent nor marginal, as architects' interest in film can be traced back historically through a few notable figures who made films which were tightly interwoven with their design practice.

One example is Charles and Ray Eames who, within their multi-disciplinary art and design practice of graphic design, furniture design, interior design and exhibition design, also practised architecture and filmmaking. One of the most notable short films they wrote and directed was *Powers of Ten* (1977). Though it is considered by many to be a scientific film it is also a designerly film. Scale, the core subject, is explored beginning with the human body

(Figure 4.1). A couple is having a picnic on the east coast of North America. The camera pulls back to a universal image (of the most that was understood at the time of its making) and then accelerates back in to the man on the picnic blanket, penetrating his hand and travelling so far as to describe the molecular makeup of his body. This continuous camera path dissolves back and forth through film footage (the beginning scenes), photography (accounting for the majority of the travelling camera), and diagrams (such as the lines outlining the orbits of the planets and the scale markers indicated by blue squares) all while physicist Philip Morrison narrates the journey. Morrison's voiceover adds a narrative quality to the film with a discussion of relative objects and conditions familiar to all of us (racing cars, jets, the weather, et cetera) as we travel along the trajectory of the camera. When the camera retracts to its outer-most point Morrison comments,

As we approach the limit of our vision we pause to start back home. This lonely scene, the galaxies like dust, is what most of space looks like. This emptiness is normal; the richness of our own neighbourhood is the exception.³

3 Powers of Ten, Charles Eames and Ray Eames (dir.), 1977.

The film appears as a very measured and objective explanation of the relative nature of the universe but if we interrogate the process used to make the film we might be led to believe that its intention was quite different. Discussing the film in a presentation at the Pervasive Animation symposium at the Tate Modern in 2007, Beatriz Colomina, having seen the plates that were used to make the film, explains that,

the stills are not simply photographs... but are also painted artist's impressions, and the photographs themselves, which I finally saw, are completely covered with paint.⁴

4 'Pervasive Animation', Tate Modern, 2007, retrieved 22 April 2009, <http://www.tate.org.uk/onlineevents/webcasts/pervasive_animation_across_disciplines/default.jsp>.

There are the more obvious modifications to the image, such as the diagrams overlaid on the photographs, like the lines which illustrate the orbit of the planets around the sun or the blue squares which indicate the distance. These act as scale markers – each increasing or decreasing by a factor of ten from the previous square. Clearly these do not physically exist but on a few occasions they are not even accurate. When the view pulls back and the earth is entirely seen, a blue frame sits tightly around the earth, falsely indicating that its diameter is approximately 10,000 kilometres (Figure 4.2) or less when it is in fact larger, 12,756 kilometres. What makes this more noticeable is that later when the camera zooms back in the blue frame is enlarged further around the earth, inconsistent with the earlier view and suggesting that the earth is significantly less than 10,000 kilometres in diameter (Figure 4.3) when it is of course considerably more (Figure 4.4). The diameter of the earth is not the only occasion when there is an inaccurate measurement. Earlier, as the camera pulls back, there is a blue square indicating 100 by 100 metres and this is also false, as it's outlining an area approximately 150 by 150 metres (Figure 4.5). This discrepancy is quite significant and curious considering that the film is about the fundamental notion of scale. The trajectory of the camera is also in question as it appears to be retracting along a straight path.

It pulls back with Chicago centred on the earth but is later centred on a location that appears further toward the North Pole when the earth is presented among other planets in orbit. Even while accounting for earth's axial tilt, the path of the camera curves and winds as it dissolves from one photograph to another. But more interestingly, around the middle of the film as the camera has almost retracted to its furthest point, the footage shifts from 2D to 3D, complicating the understanding of scale (Figure 4.6). While the film is a composite of imagery from different media, the majority of the film is represented orthographically, as if to show a continually widening and narrowing view of a single image; but there are several seconds of stars and galaxies moving parallaxically and we are made to understand that we are physically moving through three-dimensional space. In this perspectival period of the film, the scaling device of the blue frames continues to be used – but how or where can they accurately sit within the three-dimensional view?

Figure 4.2 (left).
Zooming out

Figure 4.3 (middle).
Zooming in

Figure 4.4 (right).
Diameter of the earth is 12,756 kilometres, true 10,000km box indicated in red.

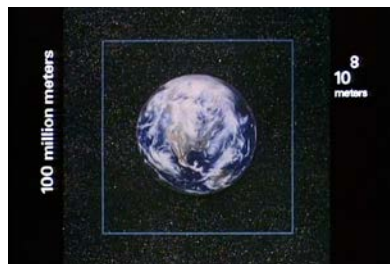


Figure 4.5.
Frame from the film depicting 100m x 100m box over Chicago in 1977 overlaid on aerial image of Chicago in 2010 (background image courtesy of Google)

100m x 100m box as indicated in the film (blue) compared to the true measure of a 100m x 100m box (red). Blue box of 100m x 100m from the film is approximately 150m x 150m.

Just as, described in the previous chapter, Rejlander's *The Two Ways of Life* had distorted a spatial truth by compositing together a series of images and Piranesi's *Carceri* etchings had distorted the geometrical truth by subverting the rigidity of linear perspective, the Eameses too had broken away from notions of pictorial truth. All these artists seemed more concerned ultimately with what the representation would provoke in the imagination of the viewer. Most profoundly, the verbal narrative that stitches together all the stages and imagery during the film's shift between scales reinstates this humanising aspect. The film begins and ends by illustrating and discussing what we are commonly aware of through our daily experiences, with a closing remark commenting on human knowledge.

As a single proton fills our scene, we've reached the edge of our present understanding.⁵

5 Powers of Ten.

What all these inconsistencies – many which are quite obvious – indicate is that the film was not intending to adhere to a geometrical and spatial truth through images. Instead these aspects – the distorted measurements, the artist's impressions and doctored photographs, the movement that curves while appearing straight, the mixing of mediums from film to paintings, and the dialogue that humanises the imagery – all serve the purpose of the larger narrative about scale and its relationship to the body (Figures 4.7a and 4.7b). Without such distortions the film's narrative would not have been sculpted so smoothly and would more likely appear as an explicative, object-orientated diagram of space. This film is to be understood more subjectively than objectively; it is a film about the idea of scale rather than a truthful depiction of it. It aims to experience scale rather than explain it, and this is demonstrated most clearly with the film beginning and ending with the human body, which is not only the fundamental basis for understanding scale (particularly in architecture) but also makes the viewer become aware of his or her existence in the world.

Figure 4.6 (left).

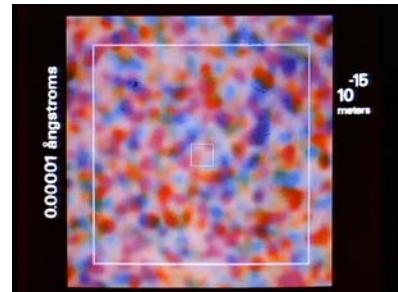
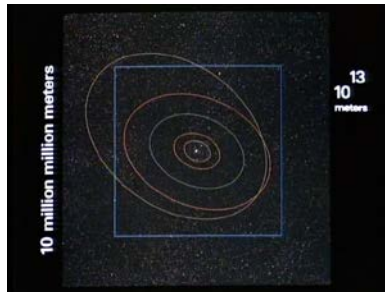


Figure 4.7a and 4.7b (middle and right).

This is not to argue that there is a problem of misrepresentation, as even the most objectively constructed pictorial representations are never without at least some sliver of subjectivity and manipulation. The intention is to highlight that the techniques and distortions used in making the film are yet another instance when images require manipulation for a greater narrative or idea. In a case such as this film, which needed a series of visual effects to distort and construct the continuous flow of imagery, we see once again that compositing helps contextualise our existence in the world.

The filmic works of architects such as the Eameses and another, Superstudio, pioneered a new and rare representational practice of working with the moving image in architecture. While filmmaking in architecture was a rare practice during their time, considering the skills and expense of shooting when compared to drawing, it was well suited to the interests of these two particular offices. The Eameses, having created more than 85 short films spanning animation, live action, documentary, fiction, experimental and commercial work, seemed as comfortable making films as they were designing. Superstudio, having developed a sophisticated image-making practice to vividly communicate their utopian ideas, seemed more interested in focusing their efforts towards a practice of representation than one of building. Their ambitious projects were speculative in nature and quite simply unrealisable in built form, yet they were well served by the possibilities of film to help elaborate their ideas, opinions, and critical approach to design. For the greater part of the last century, the contribution by many architects to the conversation of architecture and cinema happened very much through theory as a way of re-understanding architecture, but they continued to operate in architecture as architects. The Eameses and Superstudio are notable for having also practised as filmmakers.

We have, since the mid-1990s, seen a shift whereby architects are more liberally practising as filmmakers to further explore their architectural ideas and communicate their propositions. This is an important transition from theory about architecture and film to a practice of film and architecture that has broadened architectural filmmaking from what was previously explored by the Eameses and Superstudio. The expansion and uptake has occurred for two reasons. First, and most importantly, it occurred as a result of the shift to a digital practice in both architecture and film. It was both an issue of access to and the affordability of new technology, allowing for greater experimentation. Second, working digitally allowed content created in, or captured through, one software package to be brought across to another. By generating an idea in a paint program and exporting it to a CAD program, then rendering that in another program, the architectural idea was being translated and re-visioned through various tools, many of which were intended for other disciplines (photography, engineering, animation, et cetera). This interoperability meant drawing was no longer a strictly two-dimensional act, as drawings became images and images became animations with such convenience that there was little critical thought as to the significance of the shift they were undergoing. The possibility to animate lies at one of these transitional junctures once the architectural form is modelled and ready to be rendered. Most rendering packages architects commonly use to light, texture and render their digitally modelled forms were created for animators, and therefore have led architects toward a very easy transition into the moving image. Though it seems that a more experimental – and subjective – approach to architectural representation might have flourished given all the new opportunities, without the critical discourse about the state of digital representation that was very much needed at the time, the evidence is that a more conservative path was taken. This in part explains how architects, when engaging with the moving image, have come to produce the all-too-common, object-oriented architectural ‘flythrough’.

A Description of a Flythrough

There is no strict definition of flythroughs, but there are general traits that allow us to identify them. The architectural flythrough, also known as a 'walkthrough', has grown quickly in both the academic and professional environments of architecture. Architects, or those architecturally trained, commonly make it at the end of the design stage when a proposal needs to be shared with an audience. Those

who make or employ a flythrough see it as interpreting architectural drawings into a more legible three-dimensional form for an audience that includes those unable to decipher the coded nature of architectural drawings. It is a simulation of the building viewed through a continuously floating camera recreating the point-of-view of an occupant; sometimes, however, it take a bird's-eye view. Circling the building externally then finding its way in and flying effortlessly about the interior, through stairways and along corridors, its title comes from its swift and effortless voyage through an architectural proposal.

The assumption in most walkthroughs is that the animation will be a fairly accurate approximation of the finished building or site from the point of view of an observer. The height of the camera for a walkthrough gives the viewer a visual cue as to his or her relationship to the scale of the model. ... Just as in filming home movies, a camera is used to establish the point of view and the path of the observer moving in a walkthrough.⁶

6 C Cory, W Meador & W Ross, '3D Computer Animated Walkthroughs for Architecture, Engineering, and Construction Applications', paper given at International Conference Graphicon, Nizhny Novgorod, Russia, 2001.

While they take a human occupant's point of view, flythroughs generally are without human characters or only occasionally populated with generic people, who are often cardboard cutouts scattered through the building as scaling devices. This raises another irony about the static nature of a flythrough: the building and even the environment are often still and it is only the camera that roams about a frozen scene in an unedited manner. This single unedited format describes the continuity from one space to another, demonstrating the building has been resolved as well as offering a digital prediction of what may be witnessed when the proposal is completed.

The Trouble with a Flythrough

The closer one inspects a flythrough the more questions it raises about its making and usefulness. Whose or what kind of a view is both that of a bird and a person? In what ways are the architectural ideas communicated through the audio, and how is that weaved and synchronised with what is visually occurring at the time? And is the one-shot-tells-all approach really about describing a fully resolved building by an uninterrupted

view, or does it reveal the lack of filmmaking skills on the part of the architect?

In its very short history, compared to other representational techniques both digital and non-digital, the ever-growing and undisciplined practice of the flythrough raises a number of concerns about what it actually contributes to and communicates of architecture. While its presence has exploded as a new mode of architectural representation it has managed to evade a more critical review of its intent. As its use has become more common and relied-upon, the contribution of a flythrough to architecture remains confusing and at times simplistic for the amount of effort exerted in its making. Or rather, is perhaps a reflection of the effort required.

In measuring the merit of the flythrough I want to compare it to the practices of architectural representation, then animation and finally cinema – all the practices it often claims to straddle. I want to focus on only the key aspects of each discipline and craft, measuring their similarities but most often their differences to the flythrough. My efforts are to isolate it in order to better understand its identity, its lineage and its constitution. Ultimately this investigation will help provide a sense of where the contemporary practice of architectural representation is headed and in particular what we might expect in the future of architecture's engagement with the moving image.

The Flythrough, Architectural Representation and Drawing

Robin Evans provides deeper insight into the effectiveness of a drawing in relation to the architectural outcome and his commentary offers a starting point to begin comparing the drawing and the flythrough and the architectural intentions they represent. Pointing to the work of James Turrell, Evans highlights his well-known installations and speaks about their architectural drawings. The installations were small but indeterminable interior spaces viewed through an unframed rectangular opening in a wall. They were so evenly and carefully lit by a single colour hiding the (curved) edges that they would confuse the eye as to the depth of each space. Reaching out into these spaces your eyes seem to be deceiving you, as you expect your hand to return some feeling of a surface or an edge but it senses nothing. The effect is created by fluorescent tubes that illuminate the space. These are often hidden on the back of the wall, through which the viewer peers into the space.

The mainstay of Turrell's work through the late 1960s and the 1970s was the artificially lit room. Most architectural of these were a series of empty spaces which, if drawn up within current architectural conventions, could only be construed as indicative of witless simplicity. Their effect as installations can nonetheless be completely overwhelming.⁷

⁷ Evans, pp. 158.

Evans describes the separation between a drawing and its outcome, suggesting that the experiential effect of spaces can be difficult to embed within

CHAPTER 4

THE FLYTHROUGH,
ARCHITECTURAL
REPRESENTATION AND
DRAWING

8 Evans, pp. 159.

drawings. He goes on to say,

The drawing has intrinsic limitations of reference. Not all things architectural (and Turrell's rooms are surely architectural) can be arrived at through a drawing.⁸

In contrasting the drawing and the outcome, Evans establishes that the intended experience of the installation, having been imagined by Turrell, could not be adequately mediated through a drawing. Turrell's drawing of "witless simplicity" would most likely show a continuous line that would run along the perimeter of the interior, curving at the corners, with the minimal detailing to describe the fluorescent lights that illuminate the interior. It would illustrate a cycloramic interior that blends floor, walls and ceiling into one continuous surface. Whether the drawing is a plan or a section, the more it attempts to reflect the minimal and indistinguishable nature of the space the simpler it becomes, reducing itself to only its most necessary lines to indicate the shape of the room.

Marco Frascari's comment, speaking more generally about architectural drawings, adds an interesting twist to those of Evans, as he writes:

By reading and drawing 'architectural imaging' line-by-line, architects read and draw 'between the lines' to foster architectural imagination. For architects, that which is between the lines is in reality earlier – more archaic and genuine – than the lines themselves; for that which is shown invisibly is that which appears most powerfully and most directly in architecture. Architecture is not represented directly; rather, it is that which lies between the lines that appears most directly as it is able to manifest itself, reveal itself, give itself, exhibit itself, arise and materialize. That which occurs in this invisible realm is not 'somewhere else', it is 'in' the drawing itself; the architecture that is able to be discerned in-between is not elsewhere.⁹

9 Frascari, pp. 2.

The comments by Frascari should not be considered as contrary to those of Evans when Evans speaks of the line and Frascari of the space in between the lines. It could instead be understood that it is this reductive process of simplifying the line work of a drawing that makes way for the presence of what lies between the lines. So, while Evans argues that the experiences of Turrell's installations cannot be contained in the lines of the drawing, Frascari in many ways agrees as he advocates that such an experience exists in the space between the lines. Turrell's work is a strong example of the restraint of a drawing clearly working in its favour as it reflects the nature of the outcome – for it is the void that makes itself known in his rooms. What is suggested more widely of all architectural drawings is that where there is an absence of drawing on a sheet of paper, the potential of the architecture is revealed. Two-dimensional drawings such as a plan or a section abstract the essence of an architectural outcome, and the lines have a dual function of delineating edges for the eventual structure as well as existing on the paper surface to serve the voids that offer an imagining of the outcome. This is the translation and generative quality of architectural representation at work.

These comments speak more widely about the conventions of architectural drawings and their ability to cast an outcome. Unfortunately, they are unimaginative when drawings take their conservative form: as a set of clear instructions to be read and exercised, having been collapsed back onto a two-dimensional plane and annotated with specific orders to be followed. Evans and Frascari might then argue that over-documenting a drawing does not reveal a clearer impression of the outcome; rather, it complicates our understanding and clouds the imagination, as the drawing is less interpretive. Continuing, Frascari argues that the current state of digital representation is facing just such a large problem, having forgotten about the invisible nature of drawings and instead focusing only on what the lines literally indicate.

Mimicking only the make-up of traditional architectural drawings, most digital representations are limited only to the communication of conscious intent, since within the realm of conventional computer graphics there are two imperative aspirations: on the one hand, the aim is to produce 'photo-realistic' images that do not aim to emulate the human phenomenology of perception, but rather that of the photographic camera. On the other hand, the conceit is to describe future-built artifacts with a precision and accuracy that no-one within the existing building trades could possibly achieve during construction.¹⁰

10 *ibid.*

Considering for a moment a relationship of the two points made by Frascari, we quickly recognise the deceptive qualities of photo-realistic renderings. An architect who suggests a building will be realised as faithfully as a digital rendering fails to recognise the collaborative nature of producing a building, having completed the impression of the building well ahead of the input of the craftsmen who build the work: builders, painters, et cetera. This suggests, falsely, that the building is entirely the result of the architect's doing, ignoring the many problems that are creatively negotiated through the craftsmanship of a trusted builder when a project begins construction. In the period between the completion of drawings and the completion of a building arise many unforeseen shifts and manipulations that are all part of building in the physical world and give rise to a necessary maturing from drawing to building. A photorealistic rendering not only ignores the translation at work between drawing and building but also provides little tolerance for the necessary manipulations that occur as the architectural intent passes through many hands. This is a process that a non-photorealistic rendering would allow for. More importantly, what is predicted of the outcome through a photorealistic rendering is limited to the geometric order, and what is lost is the emptiness (the space between the lines), which may offer some sense of an experience. In all cases such photorealistic renderings lead to a lack of interpretive possibilities.

The flythrough has chosen to follow the same path of photorealistic renderings by extending the image to a sequence of frames, digitally emulating the literal aspects of architecture, reducing buildings to what is tangible and viewable to a single, disembodied eye. It objectifies the architecture rather than concerning itself with the bodily experience of the space, and it abandons the roles of all other human senses and natural acts of curiosity and

CHAPTER 4

THE FLYTHROUGH,
ARCHITECTURAL
REPRESENTATION AND
DRAWING11 Interview with Inger Mewburn,
Melbourne, 14 October 2004

wonder. Verisimilitude alone in architectural renderings and flythroughs raises many concerns, not only for what little they reveal about how architects engage with others who are essential to the process of making buildings, but also about how architects conceive their ideas.

The restrained qualities of a physical drawing, ink onto a textured surface, keep the imagination active – contrasting with the literalness of a flythrough, which tries to recreate the optical functions of the eye. Considering Frascari's earlier statement that photorealism has little to do with human perception and more to do with the camera, the ocular-centric nature of a flythrough and its continuing endeavour to appear more realistic is an effort to trick the eye into making the building more believable. While it strives to resemble the mechanical process of a photographic camera it fails to reflect the thoughtful role of a photographer, considering that contemporary photography today is far from photorealistic, having severed itself from the burdens of truth. Photorealistic renderings and flythroughs are, as Inger Mewburn puts it, "life-like yet lifeless".¹¹

Returning to Evans's comparisons of Turrell's work and its respective drawings, Evans's critique is of orthogonal drawings while Frascari engages a much wider range of representational techniques including perspectival representation. But a key turning point that occurs in the midst of these modes of representation has gone unmentioned: the shift from drawing to image. This discussion of literalness and abstraction cannot take place without recognising the historical shift toward a more image-based (digital) practice in architecture. This is not just with the introduction of new image forms but also the conversion of certain representational techniques, once considered as drawings, that have now become practices of image-making. This conversion commonly occurs as the representation shifts from being orthogonal to perspectival. While a non-digital practice generated orthographic and perspective representations that were all considered as drawings, architects practising digitally (as illustrated by the flythrough) are seeing the properties of their work change from drawing to image as they move from orthogonal to perspective forms of representation, since those perspective images are now invariably derived from a digital 3D model. This shift from what was previously delineated to something that is now more pictorial may well be influenced by the transition from the hand-drawn line to the manipulation of pixels on a screen. The discussion of Turrell's work is of architectural spaces being abstracted back to a two-dimensional plane as drawings, and Frascari's comments on photorealism highlight the shift from drawing to image as digital techniques only loosely imitate traditional representation practices. However, the shift from drawing to image does not simply or automatically reflect a change from the interpretive to literal, as there are always examples to the contrary. The problem stems from the lack of a thorough discourse about digital representation that, as a result, has contributed heavily to reappropriating architectural representation at large as a primarily object-orientated and explicative practice.

Photorealism and Verisimilitude

There is no legitimate need for photorealistic renderings in architecture but plenty of evidence to rally against them, as a non-realistic rendering could reintroduce the interruptive element so important to architectural representation, of which Frascari spoke. Photorealistic renderings, just as flythroughs, appear to suffer greatly from the burdens of cleanliness and precision. Weighed down by the need to accurately recreate materials and lighting conditions to imply a refined completeness, the approach leads only to a uniform aesthetic outcome. Over the last quarter century, many well-known architects have developed sophisticated representational practices to a uniquely stylised and recognisable personal aesthetic, such as Daniel Libeskind's drawings and Zaha Hadid's paintings. The material and aesthetic outcomes have been intricately interwoven into their architectural practices, reflecting and informing their built work and architectural agendas. However, we are now in a period of representational practice that is steered toward creating a homogenous photorealistic appearance that seems to be casting its net over a continually widening population of architects, regardless of how much their architectural ambitions might differ. As flythroughs continue, this newly established photorealistic tradition coupled with a predictable one-shot camera path then, as Neil Spiller notes,

To animate is often to dilute the difference between one architect and another.¹²

In his essay, 'Towards an Animated Architecture Against Architectural Animation', Spiller also speaks of the architect's hand and personal touch as playing an important role in the making of representation, not merely for the sake of craft or to create a unique artefact, but because it also shows that the drawing, and therefore design, is not yet fully resolved. Drawings such as these make the viewer aware that the architecture remains 'alive' and continues to grow. Such representations are embedded with a natural tolerance to let not only those who view them take part but also, as Frascari has mentioned, those who work in the building trade to refine the architecture as they work directly with the building at a 1:1 scale. The unrefined drawing is not in error but is a request for further participation by its viewer, the maker of the representation and the builder of the eventual building. Though the photorealistic flythrough presents the building as complete, it would be a design's incompleteness that the viewer engages with most profoundly, seeking to comprehend what is being presented. Photorealism, which is often attributed to cameras moving and still, is part of the representational technique employed after a building has been realised, whereas the photorealistic imagery occurring in the conceptual stages before the building exists should not need to present the building as if it has been built.

¹² N Spiller, 'Towards an Animated Architecture Against Architectural Animation', *Architectural Design*, vol. 71, no. 2, 2001, pp. 85.

In her article 'Petrification and the Architectural Flythrough' Sarah Treadwell critiques the flythrough with a comparative reading of an essay by Hélène Cixous on drawing. Leading from Cixous's thoughts that errors in drawings are inevitable as the act of drawing is a venture into the unknown, Treadwell states:

It is impossible, as yet, to imagine the flythrough as a drawing of trial and error. There is little faltering and few hesitations in the view that the observer receives.¹³

13 S Treadwell, 'Petrification and the Architectural Flythrough', *Drawing Together: Convergent Practices in Architectural Education*, Proceedings of the Association of Architectural Schools of Australasia (AASA) Conference, University of Queensland, Brisbane, 2005, pp. 4.

The clean appearance of surfaces and the smooth camera paths of a flythrough are characteristics of a digital production and, in opposition to a non-digital practice, require even more work to roughen their edges and appear sketchy. The economical approach to a representational practice, producing works of less detail while appearing more clean and refined, leads often to an equally economical understanding of the work. Frascari states:

The digital production of models and drawings is faster and more precise, but can often result in relatively meaningless documents if they are considered from the point of analogical 'thinking within architecture'. The new electronic imaging prevents imagining, and the resulting representations promote acts of merely logical 'thinking about architecture' rather than bringing architects, contractors, clients and critics to think within architecture.¹⁴

14 Frascari, pp. 2.

This isn't to say that the problem never existed before digital representation – as it clearly did – but Frascari's comment recognises the enormous trend toward the economical, logical, object-orientated approach to architecture that has resulted from digital production. The greatest evidence of this is found within representational techniques that only exist because of a digital practice such as the flythrough, as Treadwell states:

... flythroughs appear to avoid the nature of the media with which they are fashioned (open ended, combinatory and expansive) and instead pursue a version of reality in which all is object orientated.¹⁵

15 Treadwell, pp. 3.

In a chapter titled 'Birds (From Above)' in her book *Architecture, Animal, Human: The Asymmetrical Condition*, Catherine Ingraham discusses liveliness and representation, among other things. She writes that:

To be an object, by definition, means to have extinguished the subjectivity that is a defining attribute of life.¹⁶

16 C Ingraham, *Architecture, Animal, Human: The Asymmetrical Condition*, Routledge, New York, 2006, pp. 164.

To remove subjectivity in a digital practice is to disengage the representation from the body and discourage any sense that the idea it was to embody might continue to develop.

Objective/ Subjective

The relationship between subjectivity and objectivity has been an ongoing issue within the history of architectural representation, particularly of late, as architects work digitally. The digital practice of architectural representation has expanded to include parametric modelling, digital fabrication and prototyping, digitally generative processes and all the forms of the moving image. What has occurred in this transition to a digital practice is

that representations have also become more object-oriented, focusing on the architectural form and materiality above its poetic and symbolic nature.

The practice of architectural representation seems to have also carefully negotiated a relationship between the representation and the living body, swaying from privileging one to privileging the other through different techniques - from drawings to models to photographs - as these combine to more completely describe the architectural proposition. But more recently the body has been removed from architectural representation. This has occurred in various ways. The hand of the architect who makes the work (which, even as Evans described, never makes physical contact with the building) is now also further removed from the drawing as it is mediated by the computer. There also remains the continuing curiosity of why people are still rarely found within the representational practice of architectural photography, renderings and flythroughs. Surely this would be one of the aspects made easier through a digital practice. The greatest failure of digital representation in architecture, which has focused so intently on what is being represented, is that it has forgotten about the relationship between the representation and the viewer. How does the representation not only connect with its viewers and their concerns and interests but also, more profoundly, make them aware of their own concerns and interests?

Embodiment

The removal of the body from perspective forms of architectural drawings and imagery might have its roots at the birth of the practical approach to constructing perspective images during the Renaissance, beginning with Brunelleschi's famous experiment. As Brunelleschi had such difficulty depicting the moving clouds, eventually using reflective surfaces (the polished silver and the mirror) to capture them on the image plane, could we

suppose, as the panel no longer exists, that he might have avoided the moving people in front of and around the Baptistery since they too were neither Euclidean nor static? Other demonstrations, such as the well-known image

of Durer's frame (Figure 3.14), that were drawn in perspective and part of treatises explaining linear perspective at work, never show the outcomes of the processes but so often depict the body being drawn. As investigations and notions of perspective developed further in architecture, the body seems to have become less likely rather than more likely to appear in the representation, as bodies would have undergone significant distortion if, geometrically, they were represented as strictly as their architectural surroundings in one-, two- and three-point perspective. This tradition of removing the body has continued through architectural photography, which reflects the attributes of one- and two-point linear perspective where all lines are straightened from the bowing created by the lens and all vertical lines are parallel to the edge of the frame. This effort is to make the architectural photograph appear to mediate between an architectural drawing and a view of the built work. Yet even today architectural photographs are eerily devoid of people, who would surely take more effort to remove than simply be allowed to occupy the image.

As this practice continues through digital renderings and particularly flythroughs, we find that even in the cases where people are depicted, they are treated as secondary to the building rather than having the image and architecture composed around them as we so often saw with Renaissance paintings. They regularly appear frozen mid-movement in flythroughs, and unfitting or at best generic in still renderings, most often performing in a manner that bears little relation to the building or interior space. Occasionally they can be found pointing to features of the building, objectifying it rather than truly interacting with or living in the building, making them appear separate from the architecture. In a flythrough it is all the more strange not to find people in the scene when the view is that of an occupant. As we take a lonely journey through a building our own presence is also ignored: we fail to hear our footsteps sounding the materials underfoot or echoing against the interior surfaces.

Even though it may appear that the current state of a flythrough is built on the traditions of architectural drawing, it appears to contrast with many aspects of Brunelleschi's experiment. His experiment resulted in an animated painting reflecting the fluidity of the sky, its colour, its movement and the accumulation of clouds. Just as the painting was alive, so was the whole experiment – set up as a physical installation, with a mirror held in the hand reflecting the painting to the viewer and removed to reveal the true Baptistery. Even in this semi-static state Brunelleschi's panel described more movement in the scene than most of today's architectural flythroughs do.

Just like Brunelleschi's experiment, the flythrough, which aims to be experiential, not only suffers from the absence of bodies within the image but also fails to account for the body of the viewer and the nature of perception. Ingraham observes that:

... the "flythrough" in contemporary three dimensional modeling, is generally modeled after a bird's imputed view/movement¹⁷

17 *ibid*, pp. 151.

This is certainly true of any flythrough which starts externally and descends into an interior, but it often transitions to take the form of a human, floating though very stiff-necked, always looking ahead, never turning to look sideways

while he or she is walking forward. Treadwell writes,

The movement of flight ought to be an estrangement of bodily condition casting the viewer as hybrid bird/human/angel but instead it tends to produce either boredom or nausea; in its excessive rendering of the known estrangement is avoided¹⁸

18 Treadwell, pp. 5.

So while it may reflect a new form of bird-human movement, it offers us less than what we might experience if it had been animated to closely reflect the human body and perception. Yet this 'lively' form of representation only becomes truly experiential once it noticeably shifts from privileging the measurable to the temporal, something that is commonly discovered within the nature of architectural representation as a building is re-presented in perspective from a formerly orthogonal view. This is a move from the quantitative to the qualitative as any true architectural drawing will do when it shifts from the measurable (visible) reading to an experiential (invisible) experience. Building from Frascari's earlier comment that the architecture lies in the space between the lines, Ingraham suggests that architecture also lies between drawings as the architecture is never fully described through one drawing alone. It takes a series of drawings from multiple views and the eye moves

through a series of framed diagrams interrupted by white gaps. These gaps are, in some respects, representatives of the space of an unconscious poised behind the seeing eye... but the assembly of the whole, as mentioned above, requires an implied – even if notional – bodily movement through it. So, always, in architecture a restless movement works its way in¹⁹

19 Ingraham, pp. 159-164

In this case, as the drawings come to life by quietly setting the body in motion, Treadwell reminds us that such a motion is not like the literal flight of a flythrough that is acting alone and independent. She asks,

Why do animations that actually move, which literally carry a characteristic of the living, start to approach the bodily condition of petrification?²⁰

20 Treadwell, pp. 2.

There is great contrast between a set of still drawings, which induce a bodily movement, and the singular flythrough, which only literally demonstrates movement. In bringing together and literally translating the various drawings into a smooth camera path, the flythrough forgets that true architectural drawings engage the mind rather than just the retina.

Closing — on Architectural Representation

A line or mark made on paper has a consequence that may be as physical as an edge to a wall, as literal as a dimension, or as invisible as a section line. Though the architecture is never seen, only elaborated upon through drawings and models, it remains the final outcome. However, a photorealistic flythrough illustrates the architecture as having been created and suggests that we may now wander through it. It's a form of representation

that doesn't lead to architecture as much as assume that the architecture already exists (without physically existing). Simplifying it to create a likeness of the outcome reduces its role to verisimilitude and no longer involves the viewer as an active participant who may contemplate an experience of the building. The great sacrifice is that its inability to be evocative means that it no longer has any agency and it will have sacrificed more than what it gains by pictorially representing the image like a photograph. Architectural representation is a means to a greater end and not an end in itself, even in the cases of unbuilt work. The agency of the representation, not just what is being represented, is important as it has the potential to provoke imaginings that more closely resemble a physically rich experience. The interpretive gap that sits between the representation and the outcome is crucial, as it reminds us that the evocative nature of architectural representation maintains an awareness of a contemplative viewer, and the loss of that gap is the loss of such agency, resulting in only a direct and literal connection between the representation and the outcome. Short of the physical experience of a building, it is the role of architectural representation, practising with intentional restraint, to maintain this gap and stimulate our senses. Neil Spiller writes,

The specificity of much animation loses out to the more fluid multiple-viewpoint 'snapshot in time' that has an imagined past and an imagined future.²¹

21 Spiller, pp. 85.

Though the flythrough rarely demonstrates clear evidence of an imagined past, or acts as the evidence itself, nor does it show signs of wanting an imagined future, stifling the imagination.

Nader El-Bizri further contributes to the comments of Frascari and Ingraham, suggesting it is not just the invisible that is made visible in the space between the lines, nor is it only the architecture that is presented through the recompiling of fragmentary drawings, but that their collective ambition ultimately leads to events. And it is as an event that the architecture is imagined and considered, not according to its geometry and its materials, but for creating scenarios that take place within, around and, most importantly, because of the architecture.

Even in their conventional forms, architectural drawings or models ('les maquettes', in distinction from the paradigmatic sense of 'models')

as 'exemplars') do in some instances inspire originality and discovery, beyond the expedient descriptive functions or generative operations that they perform in presenting concrete or hypothetical expressions of current or future constructible architectural realities. Moreover, the creative reception and adaptive assimilation of what architectural representations stimulate all reflect the imaginative capabilities of the designer, the critic as well as the contemplating observer. Imaginative associations and variations determine the potential unfolding of inventiveness in reference to the inspirational possibilities locked in time-honoured architectural representations. In this sense, notable architectural drawings and models ('maquettes') do not merely 'render the invisible visible as such', but they furthermore offer pointers and directives to events that carry manifold possibilities of realization, and are thus not reducible in their bearing to solely being geometrical or physical instrument that formerly represent prospective or actual habitable structure.²²

22 N El-Bizri, 'Imagination and Architectural Representations', in *From Models to Drawings*, pp. 35.

By now it is clear that for all the technical sophistication and necessary skills that go into creating a flythrough, its most problematic feature, which isolates it from other techniques of representation, is its core ambition to *fly through* a digital (p)reconstruction to which the drawings that often accompany the flythrough allude. Any resemblance to a drawing is only in the most conventional terms as a quantifiable measure of architecture's geometric order. We should also consider the flythrough effectively as an equally conventional drawing, which measures distance by time rather than by the traditional units of millimetres and inches. Within its single uninterrupted view, the flythrough's trajectory stretches like an extended piece of rope from one doorway across the room to another and continues at a constant pace along featureless sections of a building. We can only assume that it wishes to demonstrate through time the distance from one location to another, as it avoids cutting between shots that would focus on the key points of the building. It is an effort to force a Euclidean reading of space through a moving image and to recast the nature of the moving image as a Euclidean measure of time. It is a single, object-oriented and unedited depiction which forgets that editing in film is as much about the reconstituting of fragments to experience a larger understanding, just as it is with architectural drawings as described by Ingraham. And though the flythrough's measured feature may be a redeeming quality which still crudely links back to conventional architectural drawings, it is of little use in its current state if we agree that the significance of architecture is not reducible to merely its form and materials, only repeating what conventional drawings do but with less effect.

The Flythrough and Animation

In comparing the flythrough to animation it would obviously do a great disservice to both fields (and to this research) to broadly gloss over the entire field of animation. So in this comparison I have chosen to focus on the subject of liveliness in both animation and the flythrough to highlight the greatest difference between the two, while speaking about the underlying shared interests of architectural representation and animation.



Norman McLaren drawing on film (1944)

Drawn to Animation

Just as the architectural drawing suffers widely from a conventional understanding of its purpose, even with more insightful opinions put forward by theorists such as Robin Evans, Marco Frascari and the like, the term animation commonly suffers from an equally reductive definition. As noted in the opening lines of Phillip Kelly Denslow's essay 'What is animation and who needs to know?' the Webster dic-

tionary defines animation as:

- a: a motion picture made by photographing successive positions of inanimate objects (as puppets or mechanical parts),
- b: Animated Cartoon, a motion picture made from a series of drawings

simulating motion by means of slight progressive changes.

A more recent search of the term 'animated' on Webster's online dictionary suggests it has updated its position to:

- a: endowed with life or the qualities of life : alive
- b: full of movement and activity <an *animated* crowd>
- c: full of vigor and spirit : lively <an *animated* discussion>
(anima meaning soul in Latin).²³

23 Merriam-Webster's Online Dictionary, retrieved 20 July, 2008, <<http://www.merriam-webster.com>>

While this is a conservative place to seek a definition for animation, the shift in tone is what's important. The first definition suggests that animation is primarily about motion and the latter that it is about life, which is a little more inspiring and a concept with which most practising animators and scholars of animation studies would agree. The animator Norman McLaren has eloquently described the way these qualities of life reside in an animation and are formed during their making, saying:

Animation is not the art of drawings that move, but the art of movements that are drawn. What happens between each frame is much more important than what exists on each frame. Animation is therefore the art of manipulating the invisible interstices that lie between the frames.²⁴

24 E Carels, 'Animation = A Manipulation of Artforms?', *The Animate! Book*, B Cook & G Thomas (eds), Wallflower Press, London, 2007, pp. 14.

His comment aligns the act of drawing in animation very closely with the act of drawing in architecture as described by Frascari – who was quoted earlier about the nature of architectural representation, saying, "It is that which lies between the lines that appears most directly as it is able to manifest itself, reveal itself, give itself, exhibit itself, arise and materialize" – as well as Ingraham when she describes how the assemblage of multiple drawings allows the architecture to be revealed in the "gaps" between them. But it is perhaps El-Bizri's comment that most closely reflects McLaren's; he argues that what is ultimately described through representation is not (just) a sense of the mass and materiality of architecture, as perhaps privileged by Frascari and Ingraham, but the "events" that occur because of this mass and materiality. El-Bizri speaks of architecture by thinking beyond the building to movement, people, time and – most importantly – the liveliness created by all of these.

Narrative and Liveliness

In a discussion about narrative and liveliness in both architectural representation and animation, I am reminded of a comment by Francois Penz who, in speaking about the introduction of narrative in the early days of cinema, said:

Storytelling came very early to the screen, which is not surprising, since moving images are a time based medium.²⁵

25 F Penz, 'Architectures of Illusion', in *Architectures of Illusion: From Motion Pictures to Navigable Interactive Environments*, M Thomas & F Penz (eds), Intellect Books, Bristol, 2003, pp. 139.

Although Penz is speaking more specifically about cinema, I find two aspects in his comment intriguing, and these can be briefly expanded upon through avenues of equal importance to the techniques of representation in architecture and animation.

The first is time, which of course is fundamentally inherent within *events* and *life* in order for them to occur. Yet there is a second order of time in relation to events and life, which exists in their representation. Presenting the notions of events and life through time would naturally seem to lead to stories and narratives. The second factor, more focused on the physicality of the “screen” in Penz’s comment, is perspective. Films operate in perspective as all their imagery passes through a lens in their capture, and in the context of cinema this is largely to do with the role of the camera. Just as quickly as the moving image came to tell stories as a time-based medium, the potential of perspective as it was being developed in painting and architecture was also employed for narrative in its early days during the Renaissance as part of stage designs in theatre, a tradition continuing today. The perspective drawing, more than any other type of drawing (as opposed to plan, section and axonometric drawings), is commonly linked to a subjective viewpoint and is the most obviously suggestive of events that may occur, as it places the viewer in the space. Given the history of perspective and its relationship to narrative found in theatre, painting and architecture – which all predated cinema – film’s nature of operating in both perspective and time would seem to doubly encourage it to become a storytelling medium.

Given that both time and perspective draw us back to the nature of the camera, and that the camera also takes on the most important role in a flythrough – arguably even above the architecture, as the camera is what moves and actually flies through the building – how and why have flythroughs continually been made without a narrative? Additionally, given the precedence of so many other visual media, how has the flythrough continued without the liveliness offered even through architecture or animation, to which it claims a relationship?

The flythrough’s lack of narrative might in fact result from apprehension about placing too much emphasis on the camera. By its own nature of operating in perspective, the camera is part of the problem as it relates to architecture, for it has always equated the perspective view to seeing through an eye. This is a legacy of the Renaissance and the treatises of perspective which demonstrate that (linear) perspective is a relationship between the eye, the object (or building) and the horizon – a belief not entirely shared by cinema or animation. Just as Frascari commented that photorealistic renderings are more to do with the camera than the nature of perception, the flythrough can be seen as being more to do with the camera than the phenomenological nature of architecture. Furthermore, animation, just like architecture, is not bound to drawings constructed only in perspective to evoke imaginings and narratives (events), and has most often foregone perspective representation and engaged with the flatness of the paper surface – particularly through the work illustrated by hand. Speaking about drawing and narrative in relation to the two-dimensional space they occupy in animated cartoons, Norman Klein writes:

Put simply, character animation is a graphic art medium, not a photographic one. I do not mean graphic in the sense of a Rembrandt etching or a poster; more in the sense of Hogarth or the Sunday funnies. It is graphic narrative. But while it makes the allusion to story, its primary responsibility is to surface, rhythm, and line.

When Felix the Cat uses the horizon as a laundry cord and walks on it, going forward and backward simultaneously into a non-existent distance, the audience is reminded of the flat screen. To paraphrase Resnais, if we ask how far back the castle is in *Felix in Fairyland*, the answer might be: about five feet from the bottom, along the surface of the screen.

The silent cartoon, like all animation, was supposed to defy perspective or plausibility.²⁶

26 N Klein, *Seven Minutes: The Life and Death of the American Animated Cartoon*, Verso, London, 1993, pp. 5.

It is difficult to say that upon reading two-dimensional architectural drawings such as plans and sections if we each see the architecture in perspective in our minds, but animations that forgo perspective remind us that we can just as easily comprehend narratives that are represented 'flatly'. As Klein reminds us, it is in the two-dimensional plane that Felix is most "inventive". Not only do animations operate invisibly, as described by McLaren, but they also negotiate and exploit the flatness of their representations.

While architecture and animation have much in common, the flythrough fails to demonstrate their symbiotic relationship. Though it may be moving and presenting a three-dimensional impression of a building or space, it remains unlike still images and drawings of architecture in terms of evoking imaginings of events, which happens part due to their stillness (as suggested by El-Bizri). And it is unlike animation, for it fails to contain movements or manipulate the invisible qualities that actually suggest life (McLaren) nor does it engage with the two-dimensional and abstract qualities that open up the imagination in both architecture (Fracari) and animation (Klein). The issue of liveliness is problematic for a flythrough, as its attention to movement occurs solely through the camera, which travels about an inanimate, digital, three-dimensional model in an effort to bring it to life, only to draw more attention to the stillness of the building – a problem overcompensated for by the continuously flying camera. This is not to argue that a building instead needs to physically move and dance to give the impression of life but, as El-Bizri has described, a building comes to life through the events it creates. The view therefore should not concentrate on the surfaces of the building but focus on what occurs between them: the scenarios that are intrinsically linked to the building and occur because of it. This is a return, once again, to the notion of the 'in between' as Fracari and McLaren describe it, which of course would be furthered again by the spaces between shots if the flythrough were edited together. This 'in between' is the interpretive gap which inspires the poetic quality, and shifts the imagery away from a reductive objectification of architecture.

While drawings are created to lead to buildings, it is hard to determine whether the practice of a flythrough is made for a building or for itself, as it too often appears to celebrate the opportunities of the technology, irresponsibly

handling the extension offered by a 3D rendering environment that was previously unavailable in the practices of architectural drawing. In architecture the separation between drawing and building ensures that an imaginative act takes place between those two states, yet the flythrough attempts to collapse the two by presenting the actual building through a process that is similar in manner to a measured drawing. The flythrough aims to represent the building with such likeness that it appears to want to create the building before creating a motion-based representation, raising the concern that the building might therefore be created for the flythrough rather than the flythrough for the building. Such an inversion would appear to be contrary to other forms of architectural representation that all lead to an understanding of a yet-unbuilt building. An alternative practice of animation to the flythrough, which would be more aligned with the nature of established forms of representation, might be to create an animation that does not attempt to present the building literally in its entirety but only as fragments and details. Just as architectural drawings do, an animation could allow fragments to be reassembled in the mind while creating the interpretive gaps between views to allow the viewer to construct the space and form of the building, just as it so often happens cinematically and animatically in films and animations.

Closing — on Animation

The communicative ambitions and history of architectural drawings and of animation overlap greatly. Both demonstrate liveliness and abstraction, reveal qualities unrealistically in their imagery yet comprehensively to the eye, and by these and other means bring forth narratives. Yet the flythrough fails to take advantage of the opportunities established by either of these practices, isolating it from both. The distance that separates the

flythrough from the nature of animation is so great that it could be argued that the flythrough is contrary to many aspects of animation.

While animation by definition means *coming to life*, the flythrough rarely even acknowledges the person (or animal) that we, as a viewer, embody. No other figures in the building acknowledge us and our presence fails to be reflected in the flythrough's audio; our bodily movements, such as footsteps or thoughts narrating the journey, are never heard. Along with our own silence is the equally false silence of the architecture, when we know that the atmosphere of a building is in great part due to the sounds we experience inside it: whispers, echoes, creaks, the sounds of its materiality and its hollow voids. At times these can be more vividly telling of a building than its visual impression. These subtle elements are both temporal and spatial, as are other rarely acknowledged atmospheric qualities such as the weather and climate, and the ways in which the architecture responds to the various qualities and shades of light, rain and wind. This is not to draw out a scientific study, such as measuring the luminance and reflectance of light in a space, but more to emotionally

colour the image and signify a mood; to build drama and reflect an architectural tone. Returning to an earlier point, these aspects would be heightened through the possibilities of designing the sounds, as opposed to the all-too-common use of un-thoughtful music, which often is only the most desirable tune of the day. The audio should be composed to specifically and discreetly intensify our awareness of the architecture and reflect the atmosphere rather than using fashionable music that might be overpowering and bear little relation to the specifics of a building. To speak of the climate, atmosphere and environment is also to consider the social contexts surrounding the building: the slowness of certain rural or industrial environments, or the politics of class, race and religion. If they were considered during the design process then they need to be re-presented in a meaningful way in the flythrough. The pursuit of photorealism is unnecessary as drawings in animation (as raised by Klein) are similar to drawings in architecture; they are graphic, not photographic. Considering the histories of animation and architectural representation, both have operated almost entirely without photorealism and in a manner that is removed from literally describing its appearance.

Thus far I have been careful not to refer to the architectural flythrough as an animation. I've kept the two separated not only to avoid any confusion by talking about the flythrough as a subset of animation, but also to argue that they are so significantly different, as highlighted by the points above, that the nature of a flythrough is mostly an inversion of animation. While the flythrough may be technically positioned as an animation there are some overarching reasons why the flythrough remains at best a highly impoverished form of animation. Made more in architecture than in the field of animation, the flythrough demonstrates the misunderstood meaning of animation as primarily to do with motion rather than life (just as it was once similarly misunderstood by Webster's Dictionary). As the flythrough has ventured so far from architectural representation, it is difficult to argue that it has headed toward the craft of animation. It has had within its capacity the opportunity to illustrate the many qualities that are fundamental to animation but has failed to do so, and has therefore failed as animation. Ironically, to correct it might not be to expand what it does but rather to restrain it. It overcompensates in its three-dimensionality when it can afford to break from operating entirely in perspective and exploit the opportunities of graphic (2D) representation. The corkscrew manoeuvres and twirls of the camera make it appear that it wants to prove itself as an animation by continually depicting motion, rather than carefully composing the frame with a non-moving camera that might force the building to come to life and generate curiosity from the viewer. The audio, which contributes to more than half the animation, should be appropriately used to amplify our understanding of the building rather than distract us with music that is merely beautiful to the ear. The pursuit of photorealism needs to be re-evaluated so as to no longer reflect the mechanical working of a camera and instead focus on the nature of drawing to present the invisible qualities of a building by way of abstraction. Time and timing need to be deliberately reinstated from their current inelegant use and instead considered as an opportunity to sophisticatedly handle issues concerning memory, drama and the characterisation of a building. The flythrough needs to restrain itself in all these ways to allow room for the imagination and the senses to swell

from what little it may offer in the frame by shifting the focus, as McLaren, Frascari, Ingraham and other theorists would encourage us, toward what lies in between the frames.

The Flythrough and the Cinematic

There are five common ways to understand the multidimensional relationship between architecture and film with examples that fall into at least one of the following categories. There is the area of *Architecture for Films*, where film sets are designed with strong architectural influences and well documented by writers such as Dietrich Neumann in his book *Film Architecture: Set Designs from Metropolis to Blade Runner*. A well-known example

in this category would be the film *The Fountainhead* (dir. King Vidor, 1949). Alternatively there is the *Architecture of Films*, where significant works of architecture (intended as buildings, not as sets made for cinema) have come to play a part in fictional films, often as the homes of evil villains, as Thom Andersen notes in his award-winning documentary *Los Angeles Plays Itself* (2003). There is the category of *Architectural Films* that includes *Memento* (dir. Christopher Nolan, 2000) and *Timecode* (dir. Mike Figgis, 2000) where there is no deliberate use or depiction of architecture but an exploration of concerns shared by both architecture and film, such as ideas of memory (*Memento*) and time (*Timecode*). There is also the area of *Films of Architecture*, such as documentaries based on architects and their work. These describe existing buildings with their intended purpose rather than recasting them fictionally. One such example is *My Architect* (dir. Nathaniel Kahn, 2003), a biography of the director's father and architect Louis Kahn. Then there is *Films for Architecture*, which includes films about speculative ideas of architecture, describing works of architecture and architects that are yet to be realised. What this last category highlights more than the others is that the disciplines of architecture and film are fundamentally practices of communication and it is through this lens that the discussion about the flythrough and the cinematic moves forth.

To speak of the flythrough and the 'cinematic' opens up an almost immeasurable number of debates and aspects concerning the history of film and its making. There are too many places from which to begin and so many avenues to take in comparing the flythrough to what we understand to be a cinematic unfolding of an idea, plot, character or space. The production process, script, sound design, right down to a discussion of the role and contribution of the colourist, are all influential enough starting points to warrant their own discussions. At a larger scale there are also the issues of genres and which are the most relevant, and whether the discussion should be limited in scope to Western filmmaking practices.

I have chosen not to discuss all the areas and attributes of a flythrough that can be deemed un-cinematic as this would touch upon the greater part of filmmaking and its history. Instead I will begin where the two have merged

by referring to moments in various populist films, mainly from Hollywood, where a flythrough has been employed. The flythrough at its most fundamental level a prolonged, continuous and entirely digitally constructed shot, drifting through an environment, revealing in its spatial order a number of issues about its syntactical nature within cinematic grammar. In examining it I want to compare it to three aspects of filmmaking: how it lays out a plan both visibly and narratively; the issue of subjectivity and its intended 'point of view'; and its divorce from film editing in its one-shot-tells-all approach.

Here's the Plan

Scanning over a number of Hollywood blockbusters released over the last decade reveals that the flythrough can be found at plot points across films of various genres. Films including *Fight Club* (dir. David Fincher, 1999), the 2003 remake of *The Italian Job* (dir. F. Gary Gray), the 2001 remake of *Ocean's Eleven* (dir. Steven Soderbergh) and *Finding Nemo* (dir. Andrew Stanton and Lee Unkrich, 2003) are just a few

containing at least one shot that can be described as a flythrough (Figures 4.9 – 4.12). These shots vary aesthetically: at times they are photorealistically rendered (*Fight Club*), non-photorealistically but pictorially rendered (*Finding Nemo*) or simply, and commonly, made with digital wireframes (*The Italian Job* and *Ocean's Eleven*). Yet all have a common purpose of establishing geography. More specifically, in the cases above they explain the layout of connected



Figure 4.9.
Fight Club (1999)

CHAPTER 4
HERE'S THE PLAN

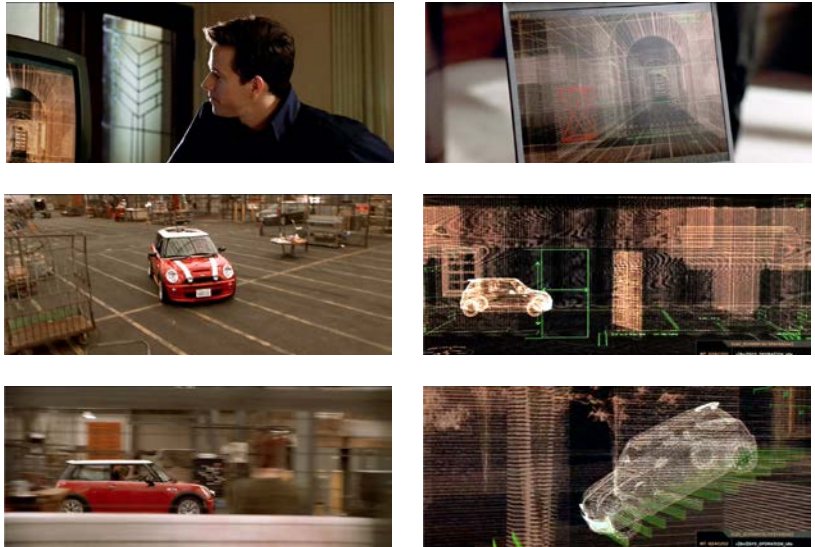


Figure 4.10.
The Italian Job (2003)



Figure 4.11.
Ocean's Eleven (2001)

spaces and relationships between locations. They describe the physicality of the space over its mood and through the continuity of the camera's trajectory they measure from one key point of an interior or landscape to another, demonstrating their relative distance and placement.

The flythroughs in these examples are recreations of 'the plan', and I use this term in both senses – as an operation as well as a sophisticated demonstration of an architectural drawing. It should come as no surprise that in each of these cases there is an intention to strike, or break in or out of an interior, and as such they take an almost militarised approach to describing their

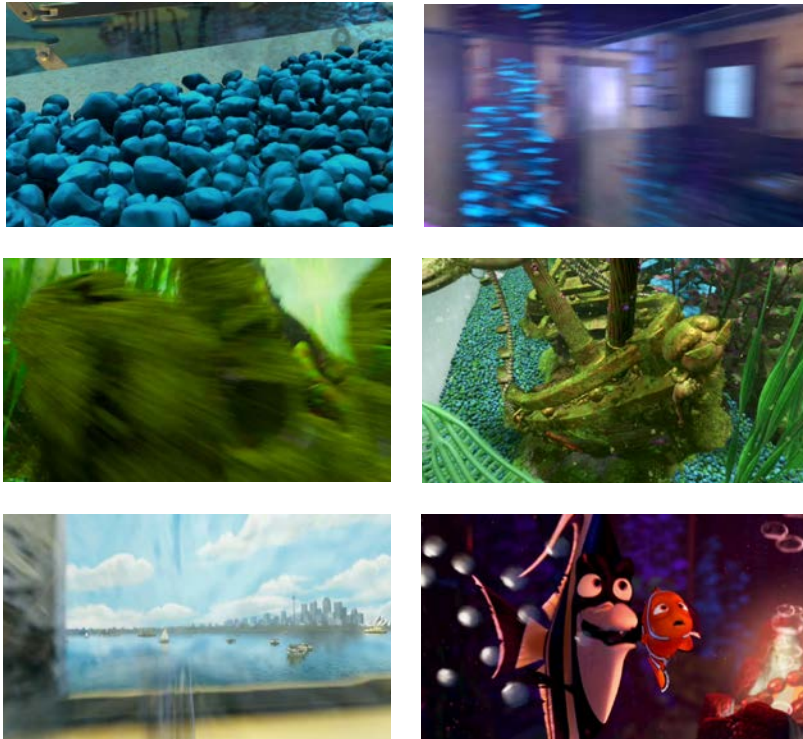


Figure 4.12.
Finding Nemo (2003)

respective spaces: unemotionally, methodically and strategically. The flythrough illustrates how a task such as the getaway, the robbery or the attack will be undertaken, and by objectifying the buildings and spaces in a contained way one is able to view them in an omnipresent manner. In these cases the flythrough stands as a contemporary digital substitute for the 'blueprint' found in the heist films of an older period. More dynamic than the static nature of a floor plan drawing, the flythrough by its movement can maintain the dramatic rhythm and pacing of an edited sequence it falls within and perhaps more clearly describe the layout to a filmgoing public who are unable to read architectural drawings.

Furthermore, it is not a coincidence that the majority of films containing such flythroughs have been made in the last decade, as each of the flythroughs is at least partially if not entirely CGI (computer-generated imagery). The films' production pipelines employ visual effects studios to generate the flythroughs, such as BUF Compagnie who created a number of shots for David Fincher's *Fight Club*. Fincher had previously worked at the visual effects studio Industrial Light and Magic and on the production of the original *Star Wars* trilogy, specifically *Return of the Jedi* (dir. Richard Marquand, 1983). This is worth noting as it brings us to the earliest moment when a flythrough was used in a feature film, a precedent set in 1977 in the closing scenes of *Star Wars* (dir. George Lucas). In the story, the Rebel pilots meet to plan their mission to destroy the Death Star and presented to them (and the audience) is a three-dimensional wireframe view of the Death Star around which the camera circles before flying onto its surface and along the trench which the pilots will eventually travel on their attack (Figure 4.13). The digital effect was created by

CHAPTER 4

HERE'S THE PLAN

27 L. Cuba, 1977, interviewed in *The Star Wars Computer Animation*, video recording, YouTube, retrieved 2 September 2008, <<http://uk.youtube.com/watch?v=yMeSw00n3Ac>>.

Larry Cuba who describes that the effect was initially planned to

match the reality of the other special effects, unfortunately, this reality had not been created at the time my effect was needed.²⁷

The wireframe view as it appears in the film may not have taken its intended aesthetic, but it has nonetheless remained 'a look' for many films – even though filmmakers have since had the ability to achieve a more sophisticated appearance.

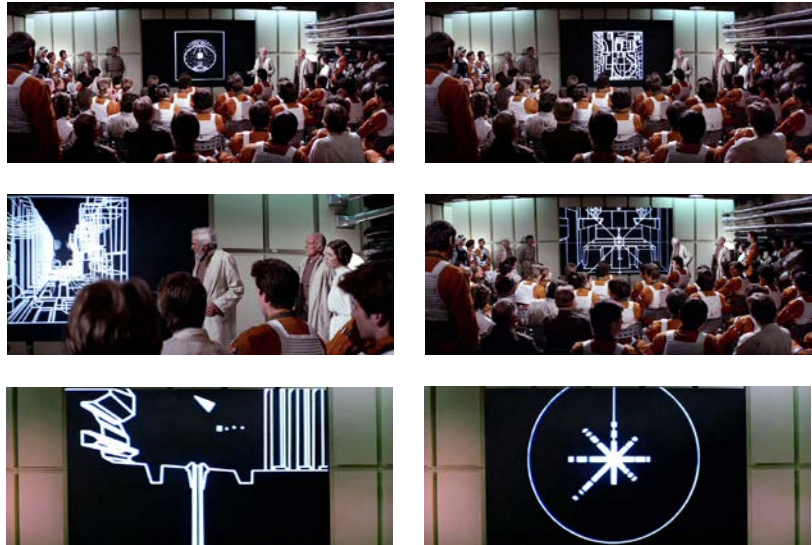


Figure 4.13.
Star Wars (1977)

Bird's Point of View

A more recent example of a fly-through comes from another of Pixar's feature-length animations, *Ratatouille* (dir. Brad Bird and Jan Pinkava, 2007). The shot did not make it into the film but can be found on the DVD as a deleted scene. It begins as an establishing shot with the camera high on a rooftop looking over Paris towards the horizon with the Eiffel Tower in the distance. As the camera floats down it reveals along the way people cooking and eating in their homes through their apartment windows, then it travels onto the street and in through the entry of Gusteau's restaurant, circling the dining area and moving on into the kitchen, intentionally passing by all the key characters, introducing them to the audience, and finally ends by tightly framing the star of the film, Remy (the Rat) peering in through a ceiling window. This all-in-one shot lays out not only the scene and the location of all the elements – the street in relation to the larger city, the restaurant in relation to the street and, in the interior of the

restaurant, the dining area in relation to the kitchen – it also reveals the zones that all the key characters occupy. There are those who work in the kitchen, those who attend to the tables and Remy the outsider, who looks eagerly in through a window. Bird discusses why the shot was withdrawn from the film, commenting that

...it is no character's point of view, it's just a, sort of, god-like shot where you're presented this whole world.²⁸

28 *Ratatouille*, Brad Bird and Jan Pinkava (dir.), Pixar Animation Studios, USA, 2007.



Figure 4.14
Heat (1995)

The idea of seeing but not from any character's view-point is an intriguing issue and one which is discussed deeply by David Bordwell. In an essay discussing the established conventions of cinema Bordwell enquires specifically about the widely used 'over the shoulder' (OTS) and 'reverse' shot setup (Figure 4.14). He asks how it came to be such an established technique of cinematic grammar when it takes alternating vantage points that are unlike natural human vision, jumping back and forth behind one character then the other, and was unprecedented in other representational mediums of characters when it came into effect. He writes,

I can find no plausible parallels in other nineteenth-century media, such as comic strips, paintings, or lantern slides. It wasn't utilized as a stylistic device in the first 15 years or so of filmmaking; that period was dominated by the so-called tableau style, which showed the entire scene in a single shot.²⁹

29 D Bordwell, *Poetics of Cinema*, Routledge, New York, 2008, pp. 58.

Later he asks,

What makes the shot/reverse shot comprehensible?³⁰

30 *ibid.*

Blain Brown, speaking also of cinematic techniques, notes that the early days of film were

31 B Brown, *Cinematography Theory and Practice: Image Making for Cinematographers, Directors, and Videographers*, Focal Press, London, 2002, pp. 2.

straightforward presentations of simple events: a man sneezing, workers leaving the factory, a train pulling into the station. When the filmmakers turned to dramatic presentations, they conceived of them as “filmed plays” – they positioned the camera as if it were a member of the audience seated in the auditorium.³¹

Brown continues to describe that re-presenting theatre through film diminishes the effect, as film would project a flattened view back onto a screen, but is viewed while remaining seated in a similar setting. This not only reinstates the limited viewpoint of the audience but diminishes the three-dimensional quality, as the flattened view would be skewed to various degrees from most seating positions. The introduction of shots broke the action into ‘fragments’ and allowed for new viewing positions, rebuilding not only the three-dimensional environment – as the audience was now able to break away from the fixed view of their seated position – but also, more importantly, allowing the viewer to step in towards and amidst the action, heightening the drama. In reviewing Bordwell’s earlier comment through the theatrical understanding proposed by Brown, we can assume that the OTS is not strictly related to natural vision but is a view that mediates between a point of view and one that demonstrates the three-dimensional placement and setting of all the key characters and elements, which would create the greatest dramatic effect. The drama is not only heightened through a new idealised point of view but is also furthered through the configuration of various (often opposing) views when the shots are edited together.

Architecture Unedited

In Walter Murch’s insightful book *In the Blink of an Eye*, Murch explains his experiences as a film editor. He describes various forms of continuity that an edit can take when compiling a sequence of shots (views) together. Beginning with a somewhat historical account, he illustrates through an example a formerly important editing process, a strategy he calls “three-dimensional continuity”. His example:

In shot A, a man opens a door, walks halfway across the room, and then the film cuts to the next shot, B, picking up at the same halfway point and continuing with him the rest of the way across the room, where he sits down at his desk, or something. For many years, particularly in the early years of sound film, that was the rule. You struggled to preserve continuity of three-dimensional space, and it was seen as a failure of rigor or skill to violate it.³²

32 W Murch, *In the Blink of an Eye: A Perspective on Film Editing*, 2nd edition, Silman-James Press, Los Angeles, 2001, pp. 17.

He continues that three-dimensional continuity is no longer as significant and in fact rates it as the least important form of continuity when ranked against others he would consider when editing.

An ideal cut (for me) is the one that satisfies all the following six criteria at once: 1) it is true to the emotion of the moment; 2) it advances the story; 3) it occurs at the a moment that is rhythmically interesting and “right”; 4) it acknowledges what you might call “eye-trace” – the concern with the location and the movement of the audience’s focus of interest within the frame; 5) it respects the “planarity” – the grammar of three dimensions transposed by photography to two (the question of stage-line, etc); 6) and it respects the three-dimensional continuity of the actual space (where people are in the room and in relation to one another).³³

33 Murch, pp. 18.

Murch goes on to state that emotional continuity is the most important and even applies a percentage value of 51 per cent to it. As he ranks others below it, at the bottom sits three-dimensional continuity at four per cent. Murch’s comments on the shift from the importance of spatial continuity to emotional continuity and how it illustrates film’s progression toward an understanding of space and events that is less to do with geometry and more with human emotions and the viewer. This aligns with Brown’s account of the early days of film as it related to theatre, breaking away from the single wide master shot replicating a theatre setting to the coverage that varied the framing of the action and actors, heightening the sense of drama and revealing more intimately the emotional states of characters.

Considering these comments together we discover a conflict within the architectural flythrough. As Bird describes, the flythrough shot was removed from the film *Ratatouille* because it did not represent any character’s view, and we know that architectural flythroughs are generally framed around the view of an occupant, but to properly establish or become aware of this character we need to cut away to a reverse shot to look back at him or her (or it). This of course would mean editing the sequence, which might seem to break the spatial continuity but, as Brown reminds us, it allows us to construct a three-dimensional understanding by fragmenting the view. Murch also suggests that abiding by the spatial continuity of a scene (as the flythrough does in its unedited form) isn’t nearly as important as understanding the emotional significance of the moment. So for the flythrough to present a point of view but also be unedited works against itself, as the audience will never come to understand the significance of the character. Furthermore, to keep the sequence as a single shot for spatial continuity raises another conflict, as a sense of the character’s surroundings would be better understood through editing, which would also serve, more importantly, the emotional experience.

Closing – on the Cinematic

While the development of film had largely been influenced by theatre, the flythrough is much more of an architectural tradition from within film. Hence replacing the blueprint or the architectural drawing with a flythrough in film does not serve the purposes of drama but rather an unemotional understanding of geography,

geometry and space. The best example to illustrate this separation is the scene from *Star Wars* described earlier, containing what we might call the original flythrough. Aesthetically, the wireframe rendering is a reduction of the landscape of the Death Star back to the essence of an architectural drawing – the line – and performs as a map of the journey rather than the nature of a journey. It is represented as a drawing that is coldly objective, perpendicular and measured to help the troops discuss how they should enter the passageway and attack. Yet later, as the attack takes place, the final scene is shot with numerous cameras and edited to have greatest dramatic effect as the most climactic sequence of the film (Figure 4.15).

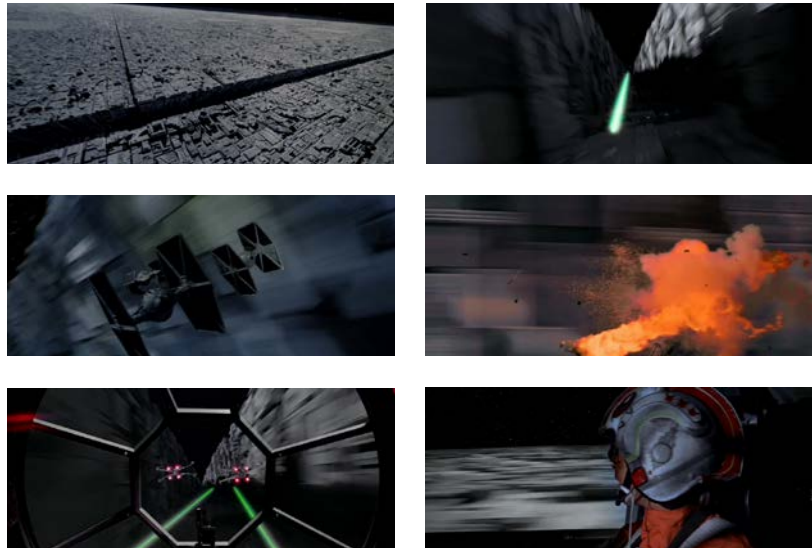


Figure 4.15.
Star Wars (1977)

The flythrough used for foreshadowing is a recurring theme among these films as it's a setup for the action and drama that is to follow. The flythrough and drawings demonstrate the objective but later, inevitably, the execution never goes according to plan, heightening the drama. The use of the flythrough in this manner serves the drama by acting as a counter to the dramatic event that follows, and this separation of the flythrough from the dramatic sequence is a deliberate indication that its value is to explain and not to experience. It is also worth comparing this countering duality in *Star Wars* with aspects from *Powers of Ten* discussed earlier in this chapter. The films were made in the same year, 1977, and beside the obvious subject matter of space and their clear use of visual effects, there are more interesting relationships between them. *Powers of Ten* explains the idea largely using a single camera shot,³⁴ a key characteristic of the flythrough, which is necessary in its particular case to demonstrate the relationship and shift between scales, since scale as a subject matter is very much tied to geometry and drawing. In *Star Wars* the image of the wireframe flythrough intentionally resembles a drawing, but it is only a very small sequence within the larger film. So while in *Star Wars* the flythrough is separated from the dramatic scene later, *Powers of Ten* undergoes a conflict when the two elements are merged together – the objective truth of images that measure the configurations of space and the narrative about scale (Figure 4.16). Resultantly, as described

³⁴ There is an edited sequence at the very beginning to establish the starting point of the journey through scales.

earlier, pictorial truth gives way to the narrative and reiterates the earlier words of Murch. In the closing battle scene of *Star Wars* the continuity of the edit is not, as Murch would suggest, a truthful description of “the three-dimensional continuity of the actual space” but, more importantly, is instead a construction “true to the emotion of the moment”. To put it another way, it is the break in geometrical truth that allows the narrative to be more dramatic. We can conclude that the flythrough is a distinguishable and separable element from the film for solely describing the spatial layout, almost an anti-narrative element made only to heighten the sensorial experience of the narrative. So while flythroughs may make a contribution to a film and can be part of the cinematic process by having a role within a larger narrative, they are not, in isolation, cinematic, as they have no value other than to objectify and demonstrate the spatial order. Perhaps what’s most important here for architecture is that the opportunity to ‘experience’ architecture is being missed by simply ‘explaining’ architecture. Architects need to discover a way to centralise the subjective, human experience and curiosity in their filmic works over the objective explanations of architecture. As the current state of architectural flythroughs deliberately seeks to explain rather than offer the viewer opportunities to wonder and imagine, it is worth considering Murch again, who reminds us:

Suggestion is always more effective than exposition.³⁵

35 Murch, pp. 15.

In Isolation

Reviewing the three comparisons it is apparent that the flythrough, which departs from the established ambitions of architectural representation, is an impoverished form of animation and by itself is un-cinematic. Yet it does contribute something to architecture. What has come to light in pitting the flythrough against other forms of architectural representation, the constitution of animation and conventions and grammar of cinema, is that even when only comparing a thin section of each area, there are a number of overlapping and complementary concerns between architecture, animation and film which, unfortunately, the flythrough fails to represent. The flythrough has reduced the image-making process to retain only the objectifying qualities of an architectural drawing; the poetic aspirations of the three areas still await representation. In speaking about the representational nature of images in cinema and architecture, Juhani Pallasmaa offers some words to guide how we may self-critique our current practices.

There are images that deliberately focus our attention to an object, and entertaining images that hypnotically dull the senses and weaken our sense of self, where as poetic images open up streams of association and affect. Poetic images strengthen our existential sense and sensitize the boundary between ourselves and the world. These are invigorating images that emancipate and charge human imagination. These are images with an ethical potential.³⁶

36 J Pallasmaa, ‘The Lived Image’, in *Design and Cinema: Form Follows Film*, B Uluo lu, A En ici & A Vatansever (eds), Cambridge Scholars Press, Newcastle, 2006, pp. 5.

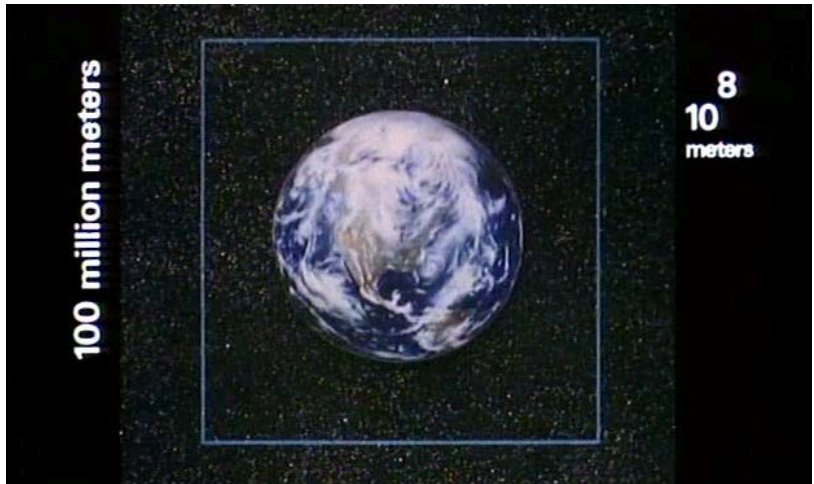
CHAPTER 4
IN ISOLATION

Figure 4.16.

There is something much larger at play and that is what the flythrough reveals about the state of digital practices of representation in architecture. As the flythrough has only come about because of the digital shift in architecture, it highlights itself as an outcome of a poor use of new opportunities. The flythrough is not isolated as some rare example but is emblematic of the larger trend in which a digital practice has re-characterised architectural representation as a primarily explicative process from the equally poetic endeavour it once was. What's lost is the reflective nature of representation, which would

evoke imaginings and consider the viewer as contemplative rather than passive and needing instructions. The great value of a flythrough, therefore, is having made obvious that the digital practice of representation in architecture needs immediate reconsideration so as not to continue in this direction any further. It needs to realign itself to the practices of a pre-digital period not by reverting back to them and abandoning digital techniques, but by considering the aspirations of those practices. A review is needed about the nature of traditional processes and what they offered not just the viewer but the maker as well. We must reconsider how they presented multiple reading and were personally textured and aestheticised, not merely for the sake of craft, but to connect the viewer and its maker who both have the capacity to be sensitive to more than the geometrical and material significance of architecture. There is perhaps no greater place to begin than a rethink of architectural animations, as they have the potential to offer the richest form of engagement and the most fertile terrain to reflect a multitude of concerns – objective and subjective. It is also a prosperous opportunity to reach across to the knowledge and practices of animation and cinema, not only to reconsider the current and past practices of architects but also to develop new, enriched forms of representation. An effort to operate within the overlapping concerns shared by architecture, animation and film would shed new light on how we could, to borrow a term from Pallasmaa, “re-sensitize” (digital) representation in architecture and develop contemporary techniques that would lead to a more critical practice. I would term this architectural practice post-digital representation

**CHAPTER·FIVE
PROJECT·TWO
PARK·TOWER**

The digital technique that was proposed in the first project and its relationship to visual effects was reflected upon in Chapter 3 along a trajectory of historical practices of visual effects in cinema and architecture. The first project's outcome, an animation, was discussed in Chapter 4 enquiring about the role of animation in relation to established practices of architectural representation, as well as the relevance of architectural flythroughs in relation to established practices of animation and cinema. The new insights that have been gained through the last two chapters have led to this second project. This project focuses on the making of an architectural animation that matures from the flythrough. Unburdened by the need to act as evidence, the animation focuses on narrative over geometry. It celebrates the interpretive above its descriptive qualities, and is speculative rather than predictive or in other words, examines what could be as opposed to what will be.

A Broader Context

The concerns of this project extend beyond the internal self-initiated investigations of the PhD to contemporary problems in the professional practice of architecture. Greg Lynn and Zaha Hadid are two notable architectural figures who are highly invested in digital practices of representation, but their outcomes – and I am speaking strictly about their communicative practice, not their

design practice – have demonstrated some problems.

Greg Lynn has established himself as one of the pioneers of an entirely digital practice of architecture and celebrates all the formal possibilities the approach offers, best characterised by the undulating surfaces and organic forms that make up his recognisable body of work (Figure 5.1). One of Lynn's proposals is the Embryological House (Figure 5.2), a speculative housing system in which each house is uniquely versioned under the influence of varying parameters. Lynn writes of the Embryological House,

...many of the variations in any Embryological House come from an adaptation to contingencies of lifestyle, site, climate, construction methods, materials, spatial effects, functional needs and special aesthetic effects.¹

It is troubling that almost none of the factors that control each individual form are ever illustrated in the representations of the outcomes. My concerns here, as with all of Lynn's work, are not to do with the processes used to generate the forms – only their representation, or rather the lack thereof. In the Embryological House project only the house is rendered, never the contextual influences, and when the renderings are digital images they are always against a black background. When the renderings are three-dimensional models, the house sits nested on an unspecified milled landscape adopting the qualities from the material used to create the 3D print, cast or cutting, rather than demonstrating the variable material outcomes that it might

¹ G Lynn, 'Form', 1999, retrieved 15 September 2008, <<http://www.gform.com>>.

adopt as described in the outline. They are presented as they are produced – as raw renderings or digital printouts – and are never furthered by placing them in a pictorial or physical setting among the factors that are claimed to generate their making. Nor are they ever even accompanied by the most generic of features, such as doors or a car parked alongside the house in order to establish its scale. In all cases the house is presented in isolation while claiming to be part of a highly contextualised process.

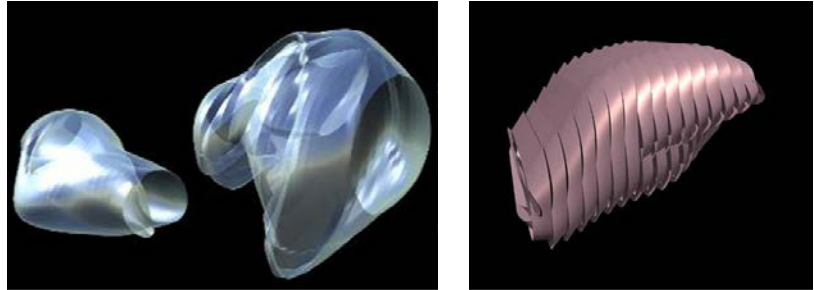


Figure 5.1.

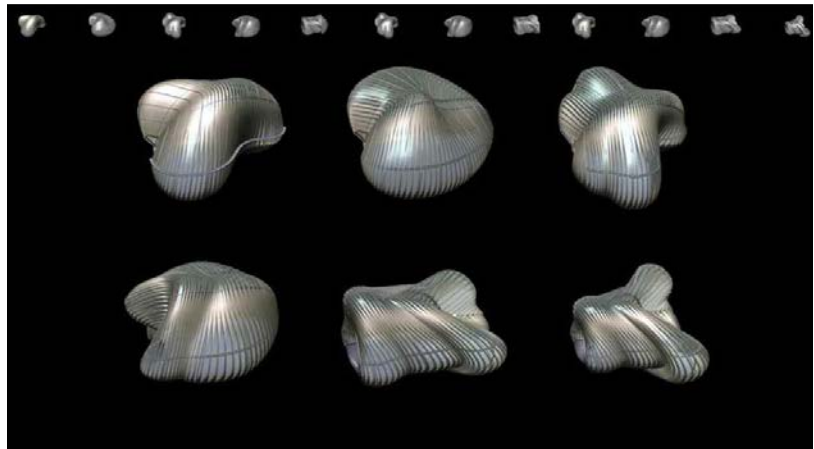


Figure 5.2.

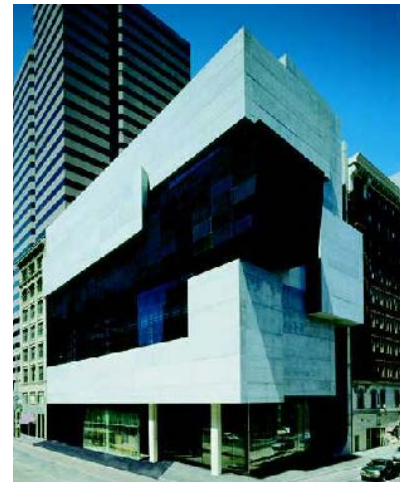
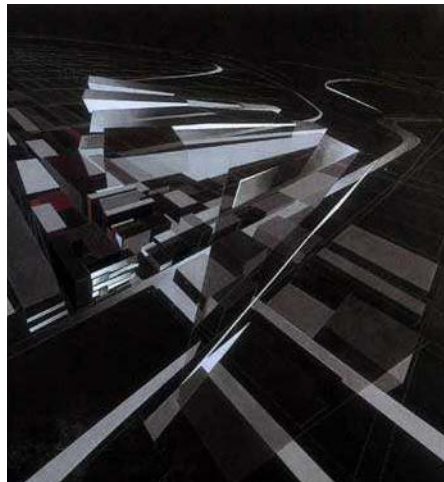
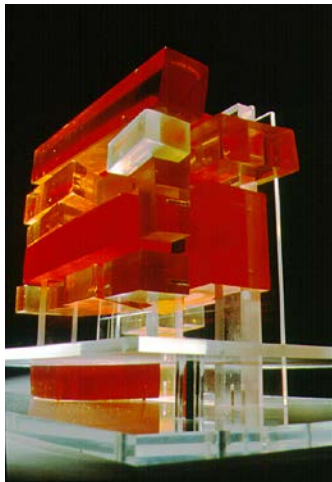
Looking across the larger body of Lynn's work the issue of representation remains quite problematic, especially as his practice is heavily invested in the representational techniques of 3D modelling, rendering, animation, digital printing and prototyping in order to generate the architectural forms. It

appears there has been far more attention paid to the making of architectural forms than representing them, even with all the highly sophisticated representational tools at his disposal.

While Lynn's work has come about from having always operated in an openly digital way, Zaha Hadid's most recent set of projects and built work has been executed using similarly sophisticated software and techniques, though her architectural practice began in a pre-digital period. Like Lynn, Zaha has a uniquely identifiable style, but two key features of her representational practice separate her from Lynn. One is that her earlier designs were represented by large-scale handmade paintings. This approach to envisioning a project contrasts starkly with what is practised today, and it generated a visual difference between what was painted and what was built. These illustrations always appeared speculative, dynamic and new with each viewing. Hadid's representations of the Rosenthal Center for Contemporary Art (RCCA) in Cincinnati, USA (Figures 5.3 and 5.4) present the projects in a manner that is unlike the completed building (Figure 5.5). The representations in this case do not literally depict the architectural form as much as highlighting the design influences. Describing those influences, the office of Zaha Hadid Architects wrote,

Conceptually, the existing plan of the city curves upward making the ground plane and the back wall a continuous surface. This "Urban Carpet" mediates between the city, the lobby as an urban room and the gallery spaces floating above... The Urban Carpet acts as a backbone to the aggregate and interlocking structure of suspended gallery spaces... The effect is to produce a three-dimensional matrix of solids and voids allowing for flexible spatial arrangements within which the narrative of art can unfold...²

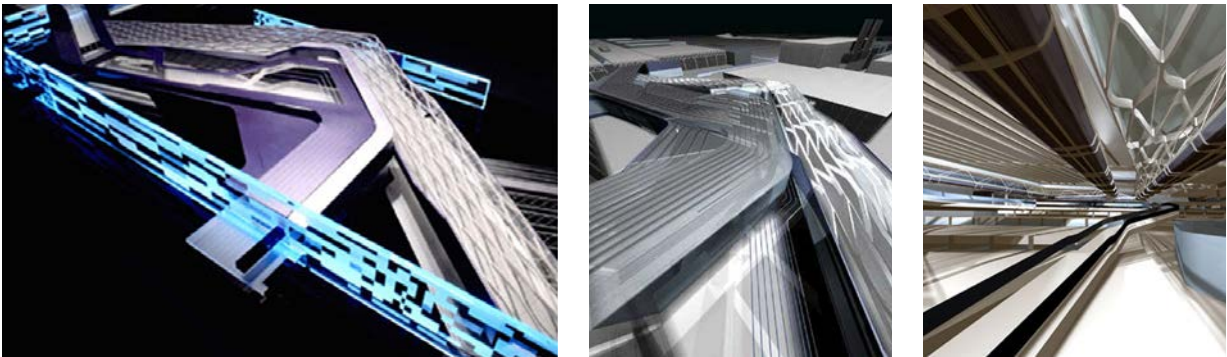
2 A Ruby, P Schumacher, P Noever & Z Hadid, *Zaha Hadid: Architecture*, Hatje Cantz Publishers, Ostfildern, Germany, 2003.



Sitting at the cusp of the transition to a primarily digital practice, the paintings of the RCCA, which at times combine multiple views on the same canvas, dynamically reflect the ideas of downtown Cincinnati being swept up by the floor surface that curves to become a wall, turning the city on its side.

Figures 5.3., 5.4., 5.5.

Since the beginning of this century the number of digitally generated perspectival representations from Hadid's office has been growing and appears to engage with the projects in a very different way to the pre-digital work. More complex in form than the RCCA, the BMW Plant, Central Building in Leipzig, Germany, appears to have been almost entirely designed and represented digitally. There are only a few occasions when the digitally rendered views and fabricated models of the BMW Plant mimic the visual language and style of the RCCA paintings through colour and gradients to shade the surfaces (Figure 5.6). Most often the digital representations, particularly the renderings, lack the separation that the paintings maintained from the outcome and instead look more like the building (Figure 5.7). So having transitioned from a non-digital practice with a strong emphasis on representation to a digital practice which has concentrated more heavily on exploring geometry, Hadid's imagery has also shifted from creating narratives towards describing the geometry, abandoning a very important non-literal quality. As the imagery now attempts to describe the architectural agenda more literally and at times in the most generic ways, suggesting the office's aesthetic is determined more by the software than its representational history, we see the same concerns surrounding the work of Greg Lynn – it is object-oriented and lacking the evocative element that was once part of the earlier, non-digital representational practice (Figure 5.8).



Figures 5.6., 5.7., 5.8.

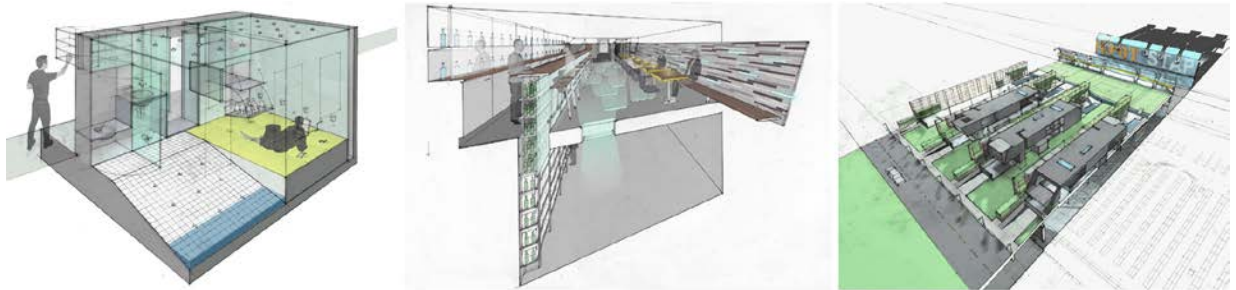
Assessing the Transition

This shift in the role that representations play as they become practised digitally is not isolated to Hadid and affects other architects whose representational practices are intrinsically tied to their architectural agenda. Taking on board these professional concerns as well as those within my research I chose to collaborate with a studio that has been mediating between a digital and non-digital representational practice to propose a new approach to architectural animations.

The office of Lewis Tsurumaki Lewis (LTL) has a very unique technique that it uses to illustrate architectural projects. The company's perspective

representations are a hybrid technique made from a complex layering of 3D digital imagery, hand drawn line-work (that includes all scratches and smudges) and photographic content (Figures 5.09–5.11). I had become very familiar with this technique when I became acquainted with the office as a student in my undergraduate days. Paul Lewis, one of the studio’s directors, recalled that he had developed the technique in such a way that “people couldn’t tell how it was made”.³ While it is evocative, the capacity of the technique has its limits. Since each image involves content drawn by hand, it is obvious that it cannot simply be extended to animation without painstakingly drawing each frame, a task that would be impractical. This problem was very intriguing and raised an important question: how could the visual appearance and tradition created through markings made by the hand become an entirely digital technique so as to allow for animated representations?

3 Interview with Paul Lewis, New York, 25 January 2006.



Figures 5.09., 5.10., 5.11.

Outlining the Intention

The project grew further in its ambitions, attempting to address three primary concerns.

The first was to adopt the historical and theoretical positions that had been developed since the first research project, particularly those that have been argued in the previous chapter discussing the architectural flythrough. The second was to resolve the practical concerns specific to the representational practices of LTL so that the project could overcome its technical limits in transitioning from a semi-digital to an entirely digital process of representation. The third was to develop for other practitioners (beyond the office of Lewis Tsurumaki Lewis) a broader strategy that avoids an unintentional shift in the role of representations when transitioning from non-digital to digital techniques.

What the animation could achieve was then not a single list of goals but rather categories to be addressed, each gathering together various concerns of a similar interest:

Of Architectural Representation and the Practice of Architecture

The outcome of this case study should demonstrate architectural representation as both an act and a process of thought. It should describe how

architects think through and about their ideas as they make their representations. It should recognise that representations exist not merely to communicate the design but are in themselves the practice of design.

Of Architectural Animations

The outcome should explore a unique contribution that animation can make to architecture that currently cannot be made by the established methods of plans, perspectives, and models, et cetera. These aspects should be expressed through the opportunities of being illustrated by a time-based medium. Therefore the outcome should not focus on the geometrical makeup of the design as much as an experience of the design.

Of Lewis Tsurumaki Lewis

At the very least the outcome should serve to exhibit the representational technique of LTL, maintaining the visual language and role of the still imagery throughout the animation, as well as expanding the technique appropriately as it is reapplied over time in the form of an animation. Developing an entirely digital method of LTL's technique should visually reflect the current technique and also be applied in some manner that is in keeping with the values, concerns and personality of the studio.

Of the Cinematic

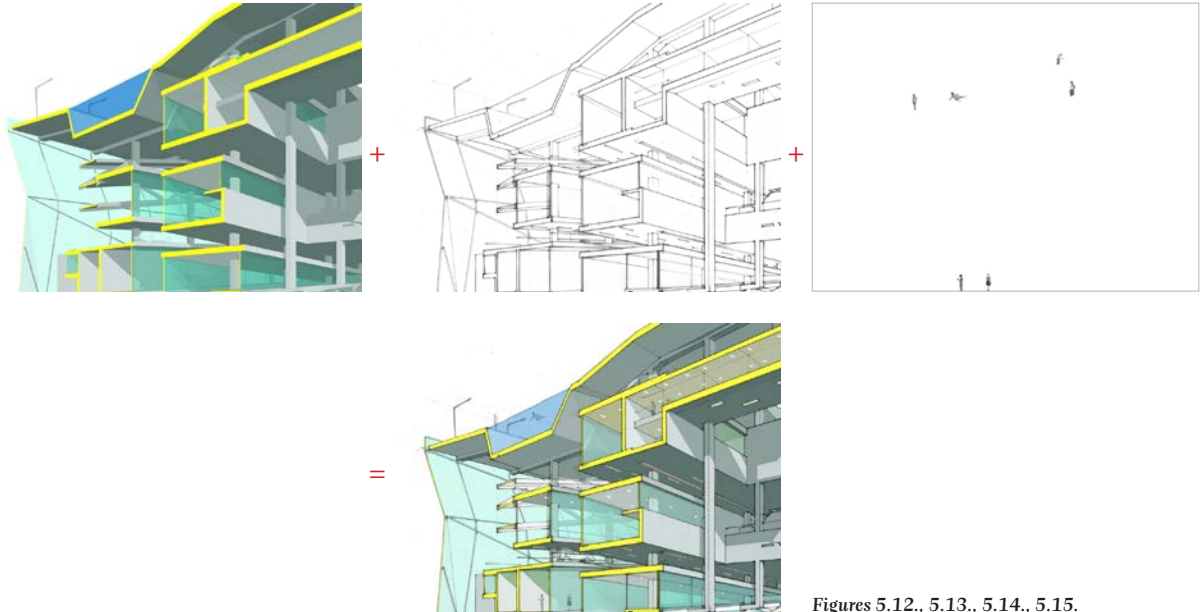
In allowing the audience to experience the design of an LTL project the animation should also use LTL's rendering technique to in some way influence the traditionally filmic areas of editing, cinematography, directing, sound design, et cetera.

There is, however, a caveat worth mentioning: given all the broad intentions of this particular animation I don't believe that any single animation could be expanded to address all the issues outlined in this entire PhD about architectural animations, just as no single film could successfully be all genres at once. Not all the concerns indicated above were weighted equally and so were considered according to the specificity and feasibility of this particular animation.

The Planning

LTL's technique was the first element that needed to be tackled, dismantling the current technique and separating it into all its visible stages. To create a perspective view of a building or an interior LTL's technique begins with a process of digitally modelling the design with enough detail to describe the general massing and form (Figure 5.12). It is then printed out, traced over by hand and annotated with architectural line-work, further resolving the design with finer details (Figure 5.13). In this crucial stage the smudges that are created

by the hand as it moves over the paper surface smearing the pencil marks, the construction lines that extend past an intercepting line, and the nicks and accidental markings that occur during the drawing and tracing process are all retained, illustrating that this was, in part, made by the hand and evidencing the craft of drawing, appearing as a work in progress. Both the rendering and the drawing are then scanned, aligned and overlaid using image editing software. The final drawing is completed with the addition of photographic elements such as cars, furniture, materials surfaces and people, who are often staff members posing specifically to highlight a feature of the building (Figures 5.14–5.15).



Figures 5.12., 5.13., 5.14., 5.15.

It is worth noting the similarity to a historical technique discussed earlier. The quadratura technique used by Andrea Pozzo to decorate the barrel vaulted ceiling of Sant'Ignazio in Rome contained three stages: a technical drawing constructed through linear perspective, a physical setup, which included the tracing of line-work projected by light, and finally the layering of human figures into the image to reflect the purposes and values of the building. LTL follows similar stages of digitally constructing a perspective, transferring through the act of tracing and compositing figures and other elements to demonstrate the building's use. Beyond the resemblance in technique there is, more importantly, an indication here that the outcome in the animation of LTL's work could potentially also lead away from a geometric description to one of narrative, just as we saw with Pozzo's work.

This narrative could be derived from the technique itself as much as the concerns of the project, by establishing an agenda between the three primary layers (stages) in a composited drawing. That the bottom layer in the composite is the 3D rendering could be seen as the general architectural form that has been generated three-dimensionally but needs refinement, while the top layer with all the people could be seen as the end users of the building. The

CHAPTER 5
THE PLANNING

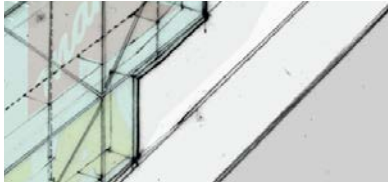


Figure 5.16. Lineweights

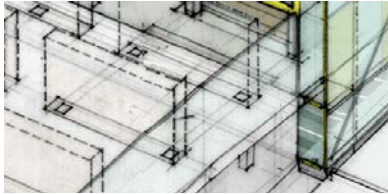


Figure 5.17. Linetypes



Figure 5.18. Guidelines

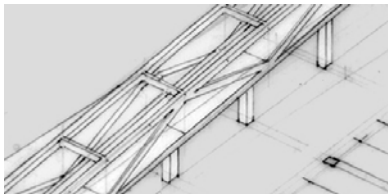


Figure 5.19. Line Colour

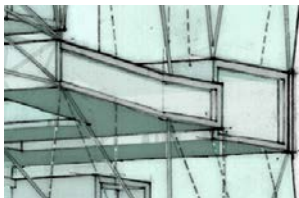


Figure 5.20. Smudges

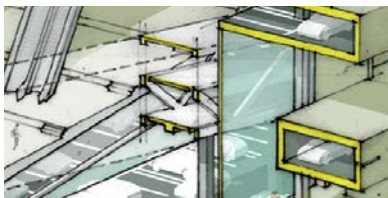


Figure 5.21 Blotches

interest here is how to marry the two; hand drawing in between those layers, therefore, could be considered as a negotiation between the two outer layers, refining the crudeness of the 3D layer with the details necessary to meet the needs of the user on the top layer. Viewed this way, the composite does not simply bring together various forms of imagery from multiple sources with differing material qualities, like others described in Chapter 3, but is also a deliberate construction ordered to create a conversation between them about the process of designing.

Exploring beyond the relationship between the layers to look at the details of a single layer, the drawing layer is clearly the most complex, having been created by hand. The others derive essentially from digital sources and can be straightforwardly employed in a new digital process – the 3D model allows for moving cameras, and the photographic content of people could be recreated by a live-action shoot in front of a greenscreen. The drawing layer is more difficult to describe, as its most defining quality is its sketchiness and inconsistency. Examining this layer quite closely we can break down its notable features further to see how they could be reconstructed digitally which, strangely, is an effort to find consistencies in its inconsistencies. The features of the drawing (layer) are as follows.

Lineweights:

- Inconsistent, heavier towards the ends and patchy throughout.
- They do not fade or thin as they approach the horizon or vanishing point, maintaining their general thickness. So the lines are always represented two-dimensionally rather than three-dimensionally.

Linetypes:

- Thinner when they are behind surfaces rendered as glass or transparent materials.
- Dashed lines are a little unsteady but maintain a consistent ratio of dashes to gaps, generally 2:1.

Guidelines:

- Guidelines are faint.
- They overshoot the ends of the hardlines.

Line Colour:

- Between 30 per cent and 55 per cent black and darker when overlaid with other line-work. This grey appearance is because they are drawn with a clutch pencil (graphite) rather than a pen.

Smudges:

- Occurring mainly along the line-work as the palm of the hand rubs against it.

Blotches:

- Heavy smudges and blurring occurring on concentrated areas of overlapping line-work as the movement of the palm across the drawing is no longer in the direction of the line towards the vanishing point.

All these features need to be both random and controlled at the same time. Their inconsistencies should be replicated not just in the two-dimensional impression of the drawing but also when it is applied in animation, randomised over time adjusting from one frame to the next. Recreating the technique in a controlled manner was not going to occur entirely within a 3D modelling and rendering package. It would be best created in a compositing program following the same compositing structure of LTL's technique but working with carefully rendered sequences of footage and animations rather than still imagery. This is somewhat akin to the *Mary Poppins* example described in Chapter 2, which used images and footage from materially different sources. It is through compositing that the natural sketch-like qualities can be maintained at all levels to create the necessary effect (diagrammed in Figure 5.22).

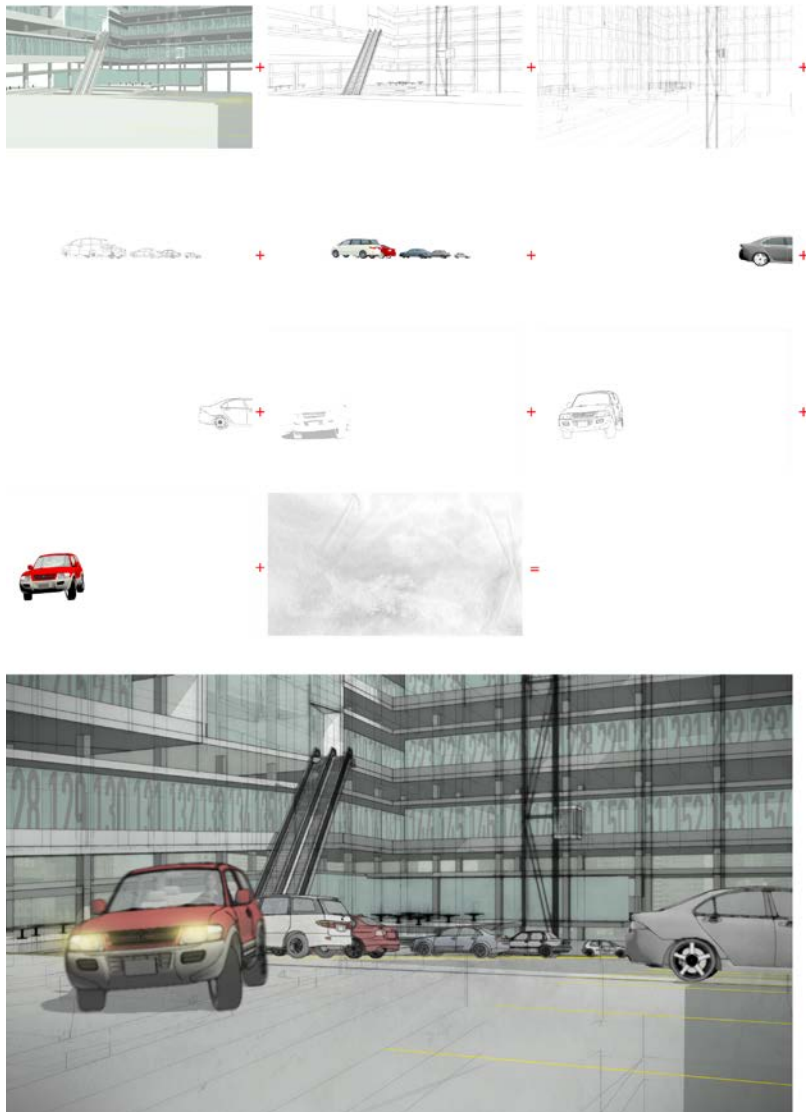


Figure 5.22.

A New Practice

In the making of any animation or film, compositing can be described as a vertical process of layering all the elements to create a single shot, and editing as a horizontal process of ordering that shot alongside others to create the narrative sequence. This newly developed (vertical) compositing technique could be reapplied to all of LTL's projects but the (horizontal) narrative structure is specific to any

one project. In this case, the Park Tower project was chosen for the animation. Park Tower was a speculative project created for the 2004 Venice Architecture Biennale as part of the US Pavilion (Figures 5.23–5.25). The project is described as:

Using the promised future of clean and quiet hydrogen fuel as a catalyst, *Park Tower* enables occupants to drive up the skyscraper without noxious fumes or excessive engine noise, transforming the time-consuming suburban commute into the seductive urban ascent, complete with panoramic views and urban garden stops. While employing a commonplace mix of programs – retail space on the ground level, hotel and office space in the middle, and residential on the top – *Park Tower* combines in the manner of a double helix a new intertwining of a continuous drive – through parking garage and a sandwich of occupiable architectural space.⁴

⁴ Lewis Tsurumaki Lewis Architects, retrieved 15 September 2008, <<http://www.ltlarchitects.com>>.

Park Tower was chosen because the journey-oriented nature of the project lent itself more easily than others to being developed into a narrative. As a speculative project it was also unencumbered by any external needs of a client. Furthermore, the building's design was never fully resolved, which may at first appear to complicate the process but instead offered an opportunity to allow the animation to fill in the gaps with what was necessary to serve the narrative.

While there may be parallels between the practices of architecture and filmmaking, developing a story required a very different mode of working from the usual processes employed by architects to design a building. The story, therefore, would not simply present itself through the project but would need to be created around elements within the project. As to animate is to bring to life, the building would be characterised through the events it could create. The main characters in the animation needed to be three-dimensional (to use a filmic term), displaying personalities, histories, lifestyles, goals and troubles they are trying to resolve in order to be more engaging to an audience. Developed this way we understand their motivations and they become 'foregrounded' as central figures in the animation rather than as scaling devices or props for the design. In other words, the building serves them, not the other way around.

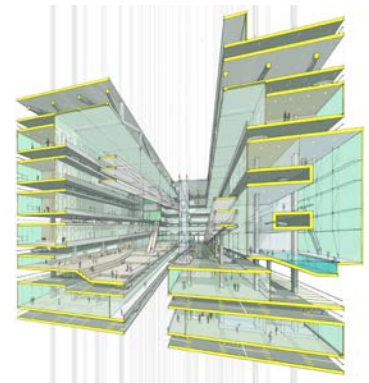
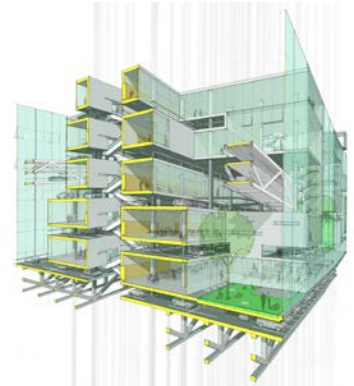
In the pre-production stage, having developed and tested the vertical compositing component to create the aesthetic, my efforts were dedicated to developing a story, which needed to describe the project within an event

that would be experienced through characters to whom viewers could relate. A treatment was created which framed the general plot: a short story about an architect intervening by design in the lives of two people as they are trying to meet but are caught on different pathways. One of them is a young man, John, who is chasing Katie by foot, and is desperate to find out what she has decided to do following a life-changing conversation they had days earlier. Katie, in a car, is driving up to the top of the Park Tower where John lives, hoping to find him at his apartment and share with him her decision, unaware that he has been running after her ever since he saw her down by the hotel. The architect, recognising that John and Katie are desperate to meet, redraws parts of the design on his drawing board to reconfigure the spaces of the building in an effort to bring John and Katie closer together. Yet this doesn't always go according to plan.



Figure 5.23 (left).

Figures 5.24., 5.25 (below).



Writing the script was the most difficult process of this animation; the script was continually redeveloped as it sought to achieve all the ambitions the project had initiated. It would always describe elements of the Park Tower, as that is where the story is set. However, describing the act of drawing and what occurs more generally in the mind of architects as they draw required a fantastical approach. Ambiguous as to whether this is all taking place in the architect's imagination, the story nevertheless describes the consequential nature of the architectural drawings as the resolving of one design problem that only raises new problems, leading to a continued cycle of designing and redesigning.

From the script the project moved into storyboarding. This was a slow process taking several weeks, as all the frames were hand-drawn, but allowed me the time necessary to consider how I would compose each frame to best capture the action taking place (Figure 5.26). This stage was followed by creating an animatic from these boards which concentrated on the continuity from one shot to the next, establishing various rhythms to reflect the drama of each scene (refer to DVD).

Often in film production the script and the storyboards suffice to begin shooting but nowadays, particularly on feature films with large budgets, storyboards are often replaced by previsualisations (aka previs). Previsualisation involves building the scene digitally to test camera setups, which are rendered and edited together as a draft to help organise the expensive process of shooting live-action scenes with crew members, actors and such. For my animation I also created a previs (Figure 5.27) as I saw it playing a different role to the storyboards. Creating the storyboards and animatic was an imaginative process but the previsualising was made to solve how the imagined scenes would be shot practically, resolving technical issues such as camera placement and movement, the lens length on the camera, the amount of room needed to recreate the movement of a person during the live-action shoot so that it would match the digitally rendered footage, the lighting and shadowing arrangement, and so on (Figure 5.28).

Looking back, each of these stages had played an important role in self-critiquing and developing the animation. The treatment and script resolved the narrative, the storyboards described the visual composition, the animatic spoke to the dramatic pacing of the narrative, and finally the previs helped solve how the shoots would be conducted, the amount of set building required, and assisted the actors as they performed in front of a greenscreen, allowing them to see the environments within which they would eventually be set. From here the project was ready to move from the pre-production to the production stage.

The first part of the production process was to build the greenscreen set and props. This involved a large amount of construction to create the 32-square-metre greenscreen studio with cyclorama corners between the walls and floor ((Figure 5.29). The filming involved breaking up the shoots from their narrative order and reorganising them according to acts and environments that could be grouped together to make better use of time, actors, lighting and camera arrangements. As an example, all the shots involving John running up and down stairs and escalators were all filmed on the same day to make better use of the props, and all the running and dolly shots

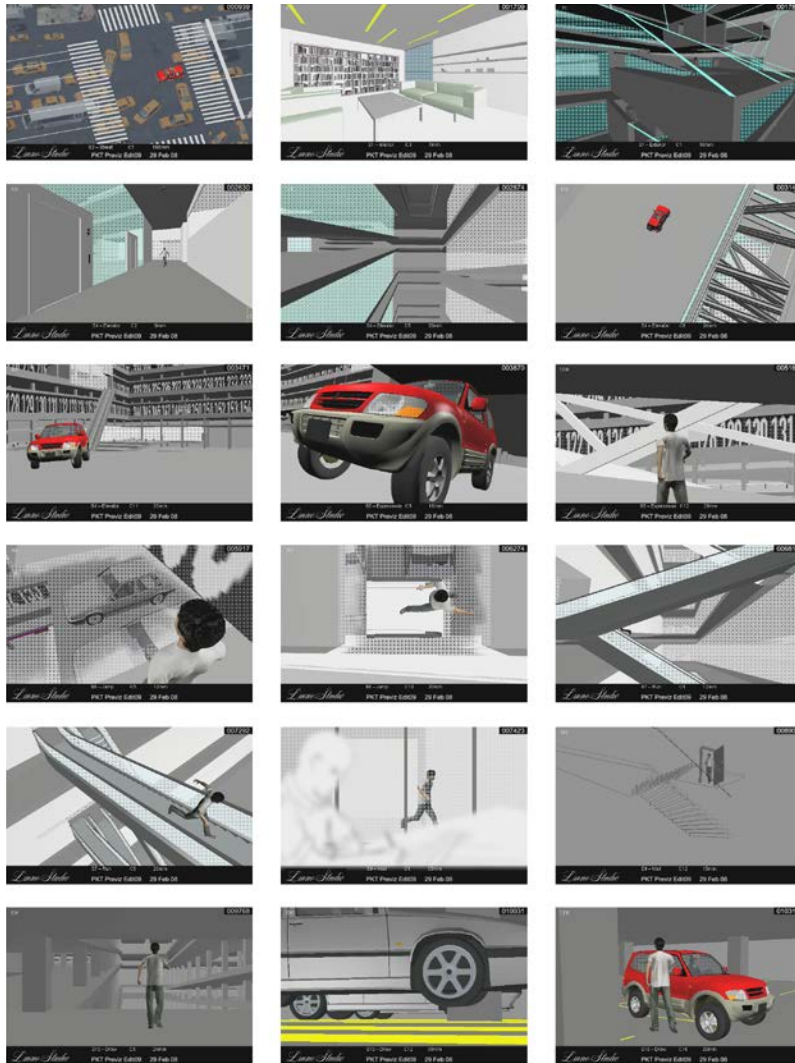
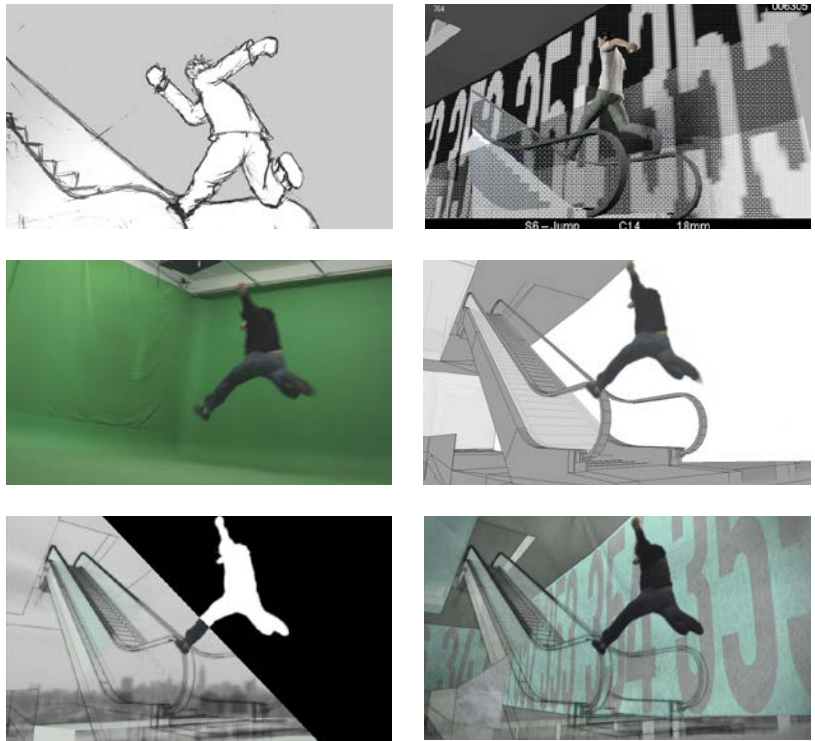


Figure 5.27.

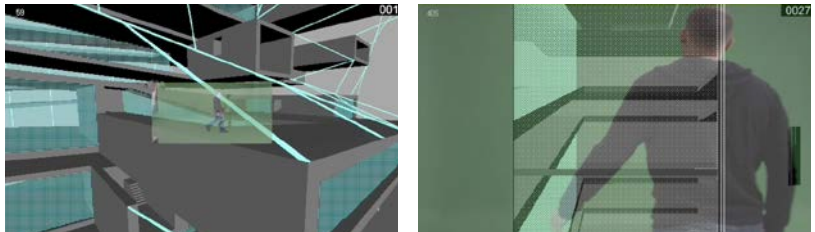
involving the electronic treadmill were filmed on another day. After each day of shooting, the takes (aka dailies/rushes) were overlaid (Figure 5.30), tested and reviewed in the edit before extracting the actors from the greenscreen backgrounds (also known as keying). This stage was not simply an execution of what was planned, as many new shots were introduced largely because of the strength of the actors. Certain qualities of their performances were highlighted with alternative takes and shooting angles. This deviation from the storyboard and previs is always worth pursuing, as it is part of the animation continuing to develop and refine itself.

The post-production stage began by editing together the greenscreen sequence focusing only on the characters, completely ignoring how the building would be presented behind them, as the eyes of the audience would be focused on them. Once the editing was finalised the shots were then individually constructed in a compositing environment. This involved extracting the actors from their greenscreen backgrounds, but only the shots that were

CHAPTER 5
A NEW PRACTICE

Figures 5.28.

used in the edit, which meant 90 per cent of the footage was discarded. Then the camera angles of the actors were perspective matched to those in the 3D software, which were then rendered out to be the background plates. In compiling the shots with 3D-rendered and photographic background content, additional elements were added, such as lighting effects for shadows, flares (headlights), screen burns (phone screen), and finally vignetting and colour grading. Each completed shot was then rendered out and brought back into the edit, exchanged for its placeholder from the original previs and synced with the actors' dialogue. The final edit was then used to construct the sound effects and the score, completing the animation (Figure 5.31). The production stages and pipelines are documented in the DVD.



Figures 5.30.

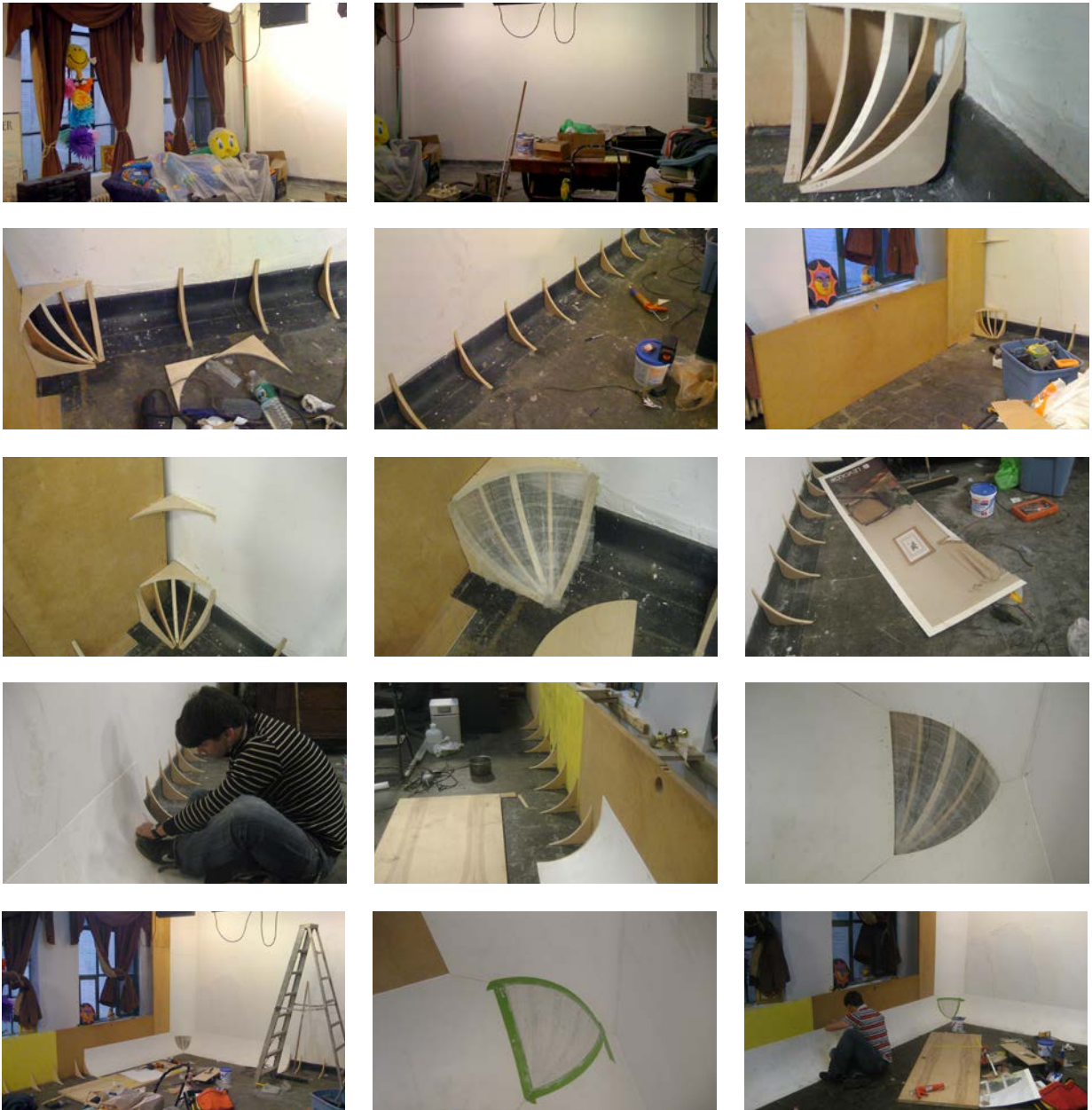
The Outcome

The outcome of this project is the animation itself and is best understood through viewing, but it is worth drawing out here some of the finer points that may not be so obvious. The animation sits away from the centre towards the edge of all the representations that illustrate the Park Tower project, offering an alternative way of engaging with the design that is unlike the traditional methods employed in architecture. It continues the graphic

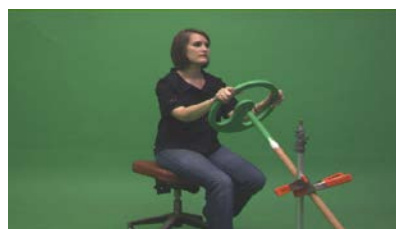
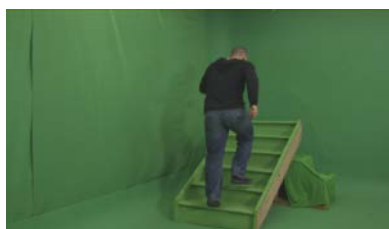
identity of LTL yet develops from the hybrid technique that merges digital and handcrafted elements into a fully digital practice. The animation also sits far enough on the periphery that it can stand alone as an animation about the practice of architects generally, describing the consequential nature of drawings by showing the architect, and later the lead character, drawing to create forms and environments. Yet I believe its autonomy stems mostly from looking beyond the geometry and the utility of the design to wondering about what situations might occur within it. Playfully suggesting how the design informs and creates such situations focuses the viewer's attention on the actors in the animation, who are not static cardboard cutouts but characters with motivations. It is the characters that bring the animation, the narrative and the building to life and ultimately foreground the qualities that remain elusive in more established modes of representation such as drawings and models. The animation re-humanises the work by focusing on the lived experience within the image – which inevitably, for the maker, shifts the attention away from geometry toward the interests of the viewer. In this state the animation overcomes so many of the shortcomings of an architectural flythrough by being suggestive rather than explicative, and speculative rather than predictive. The animation therefore demonstrates its potential for a wider audience, beyond the client and stakeholders to whom a flythrough usually plays, to describe the nature of architectural representation and the experiential quality of the building through characters. By allowing the viewer to connect with the ideas through more senses than the eye alone, by proposing a larger world and context beyond the building, we might assume that provoking such curiosities in the viewer and heightening his or her engagement means that this manner of work is heading more towards the field of cinematic animation, as it had always intended to do.

In privileging such an experience the animation shifts away from the architecture as an object, as I have described of Greg Lynn's representations, and in various ways it highlights the role and legacy of representation in the work of LTL's practice, something that is never fully acknowledged within the work of Lynn. Equally it tackles the concerns raised of Zaha Hadid's work, as the idea of experience is not just demonstrated in the viewing of the animation but also in its making, just as it must have been with her paintings. While it was a laborious process, each of the production stages made a distinct contribution to the outcome because each step was considered critically in terms of what it added to the experience of the final outcome. The various stages that all uniquely contributed to the development of the animation could be as useful for a design strategy as much as a cinematic narrative: each stage could help architects to rethink their buildings, allowing them to see their ideas through a new 'lens'.

CHAPTER 5

CONSTRUCTION OF
GREENSCREEN STUDIO

Figures 5.29.
Construction of greenscreen studio with
cycloramic surfaces, modified electric treadmill
for running and walking scenes and short stair-
case without railings for unobstructed film-
ing of bodies traversing stairways.



CHAPTER 5

STORYBOARD FRAMES

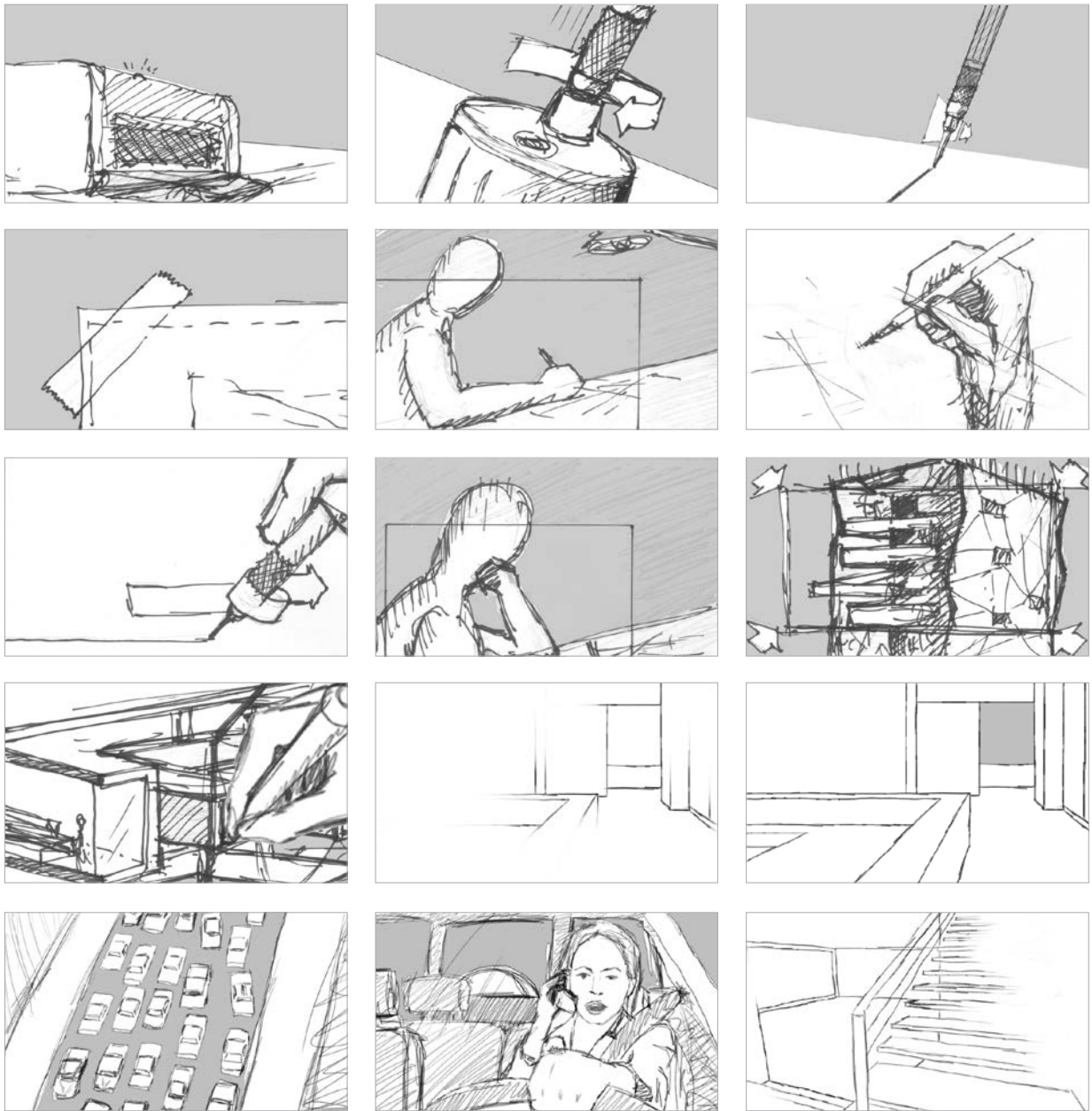
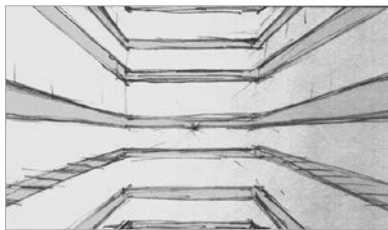
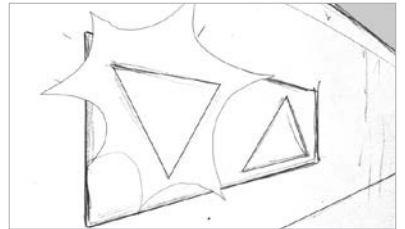
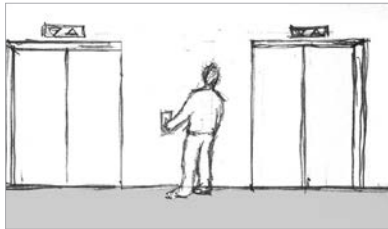
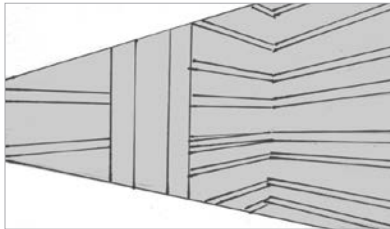
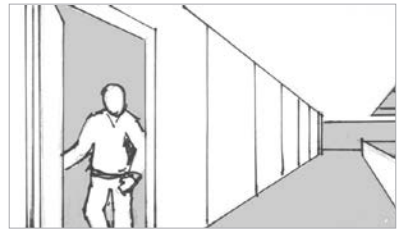
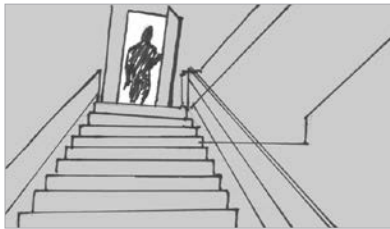
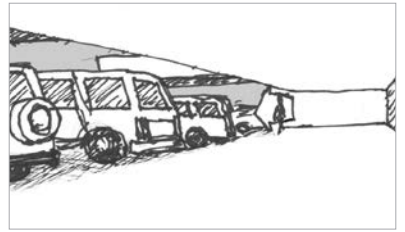
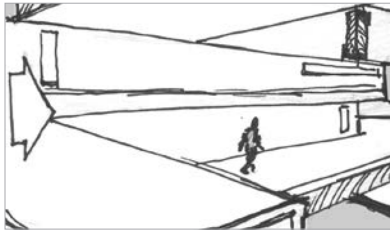
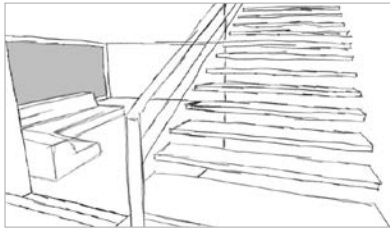
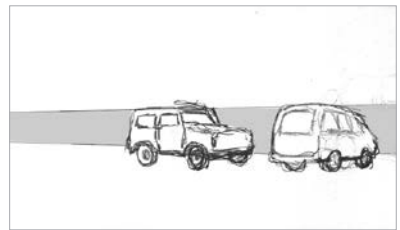
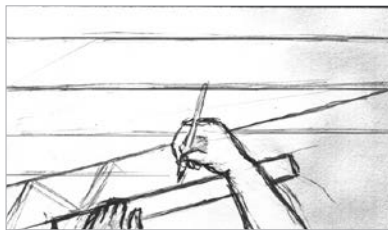
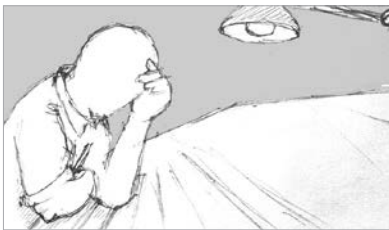
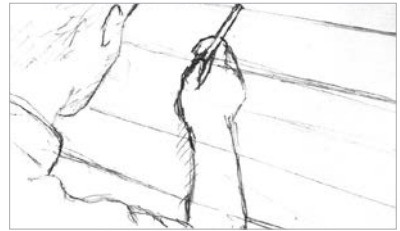
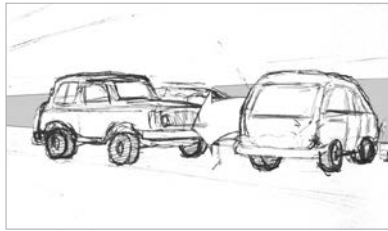
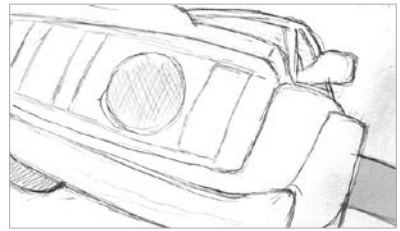
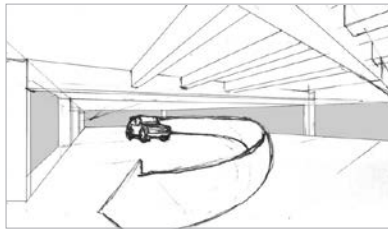
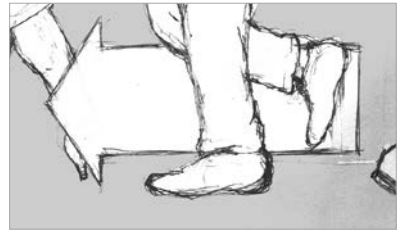
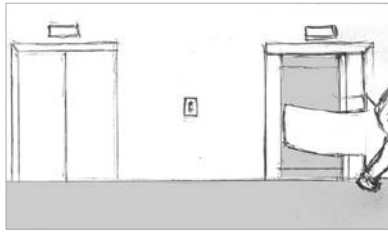
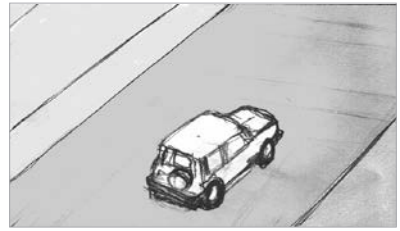
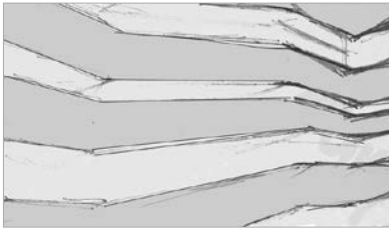


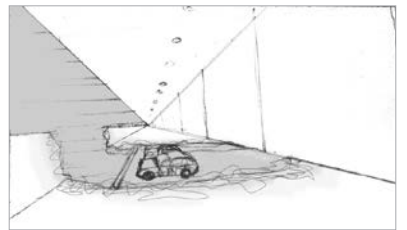
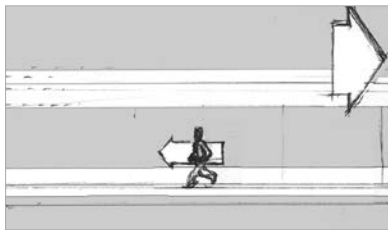
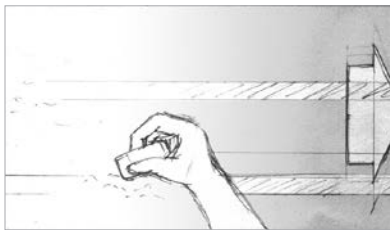
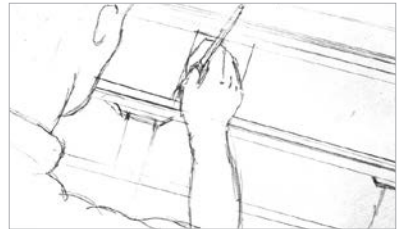
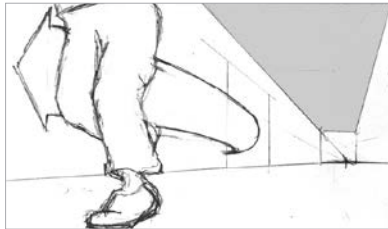
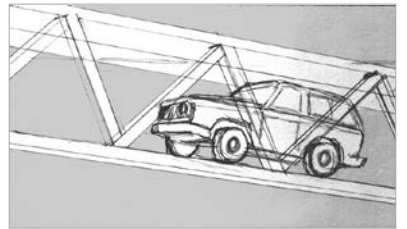
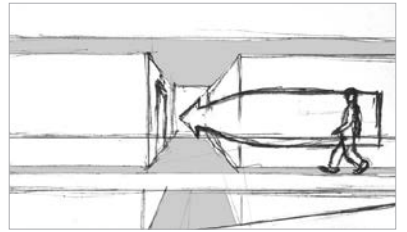
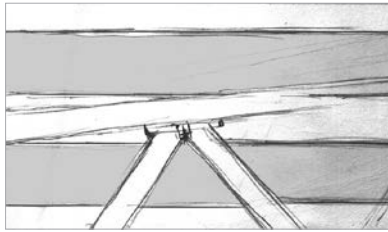
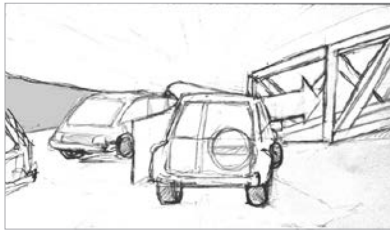
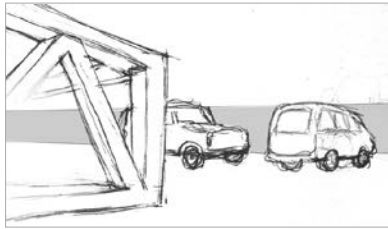
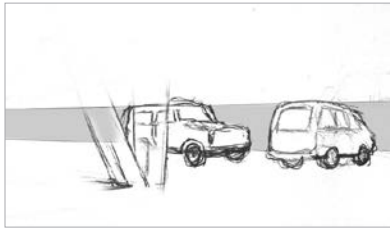
Figure 5.26.
Storyboard frames



CHAPTER 5

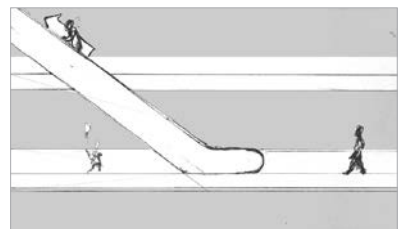
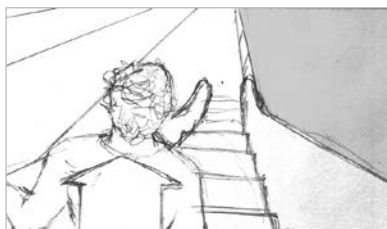
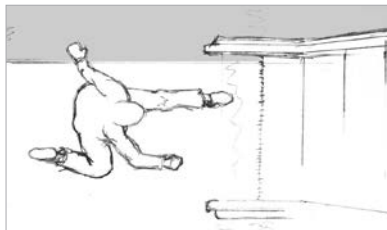
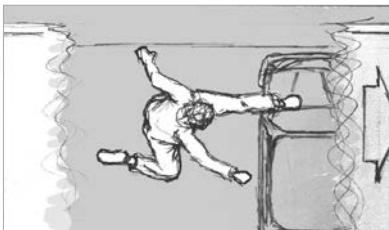
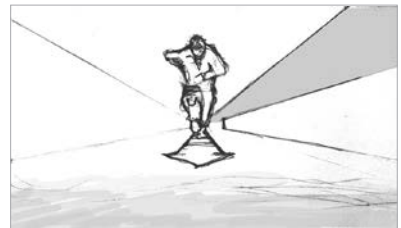
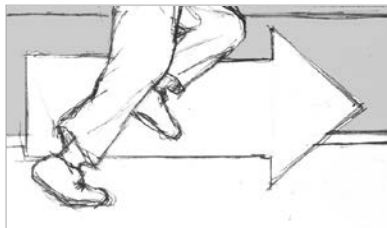
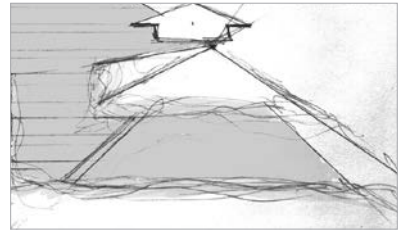
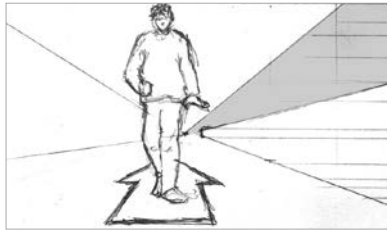
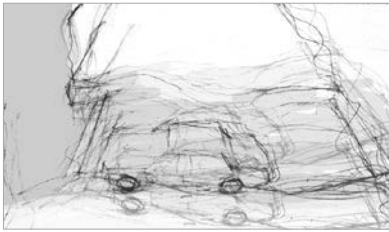
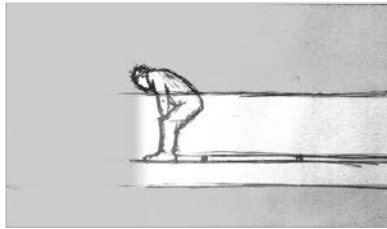
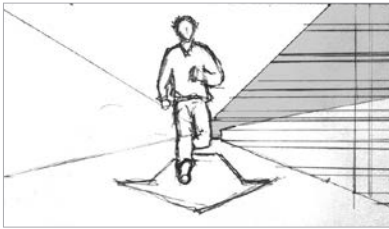
STORYBOARD FRAMES

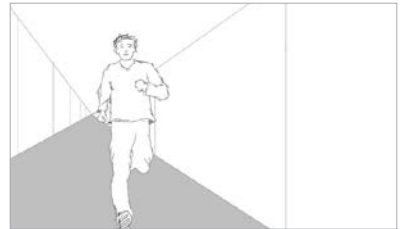
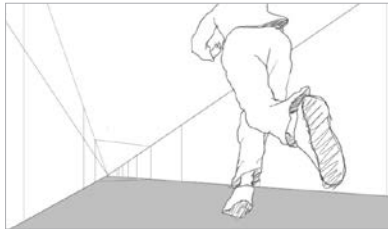
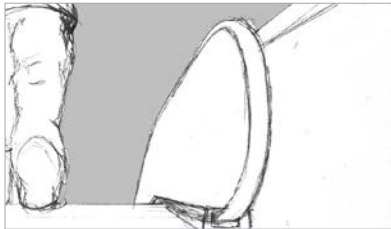
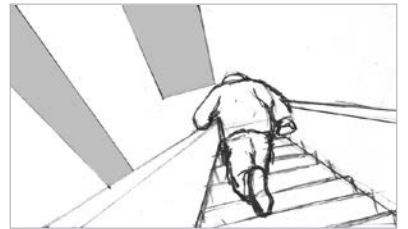
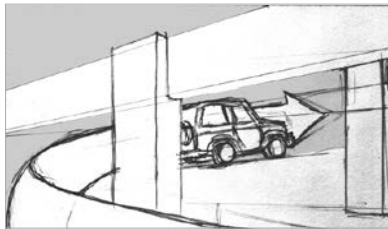
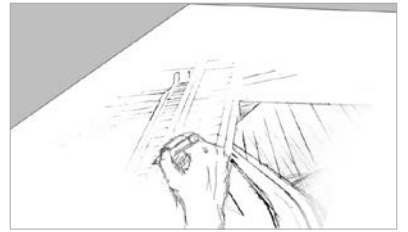
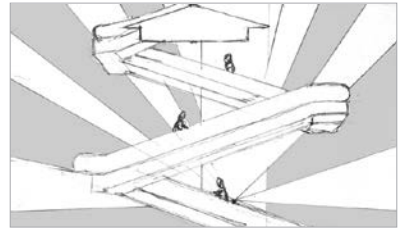
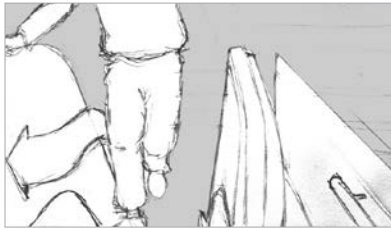




CHAPTER 5

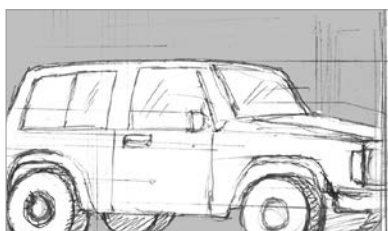
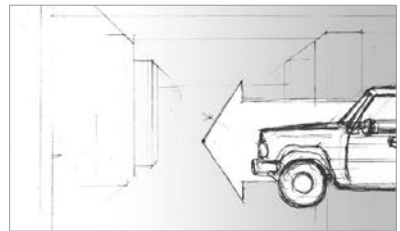
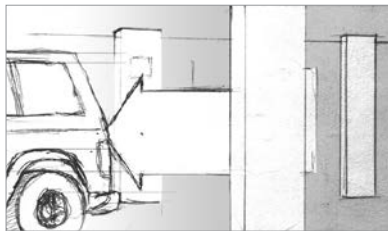
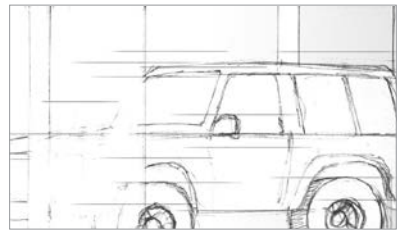
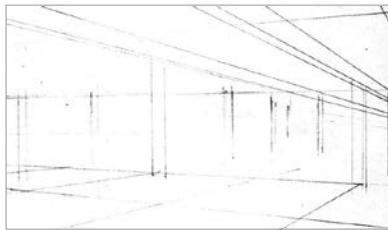
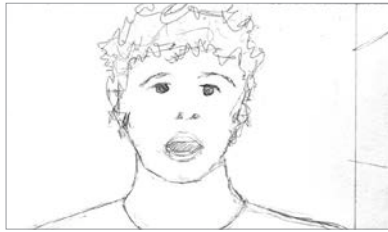
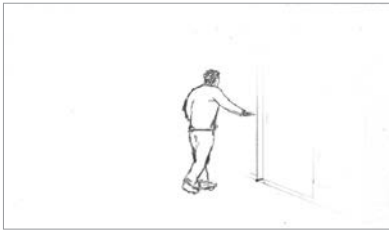
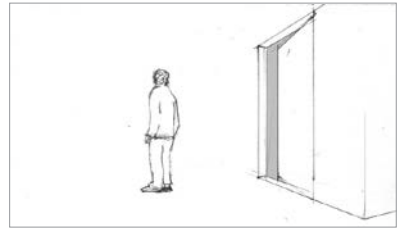
STORYBOARD FRAMES

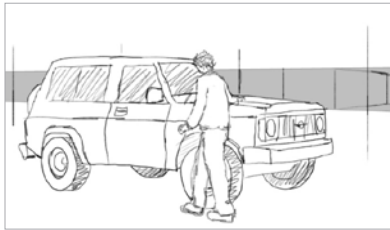




CHAPTER 5

STORYBOARD FRAMES





CHAPTER 5

STILL FRAMES FROM
PARK TOWER

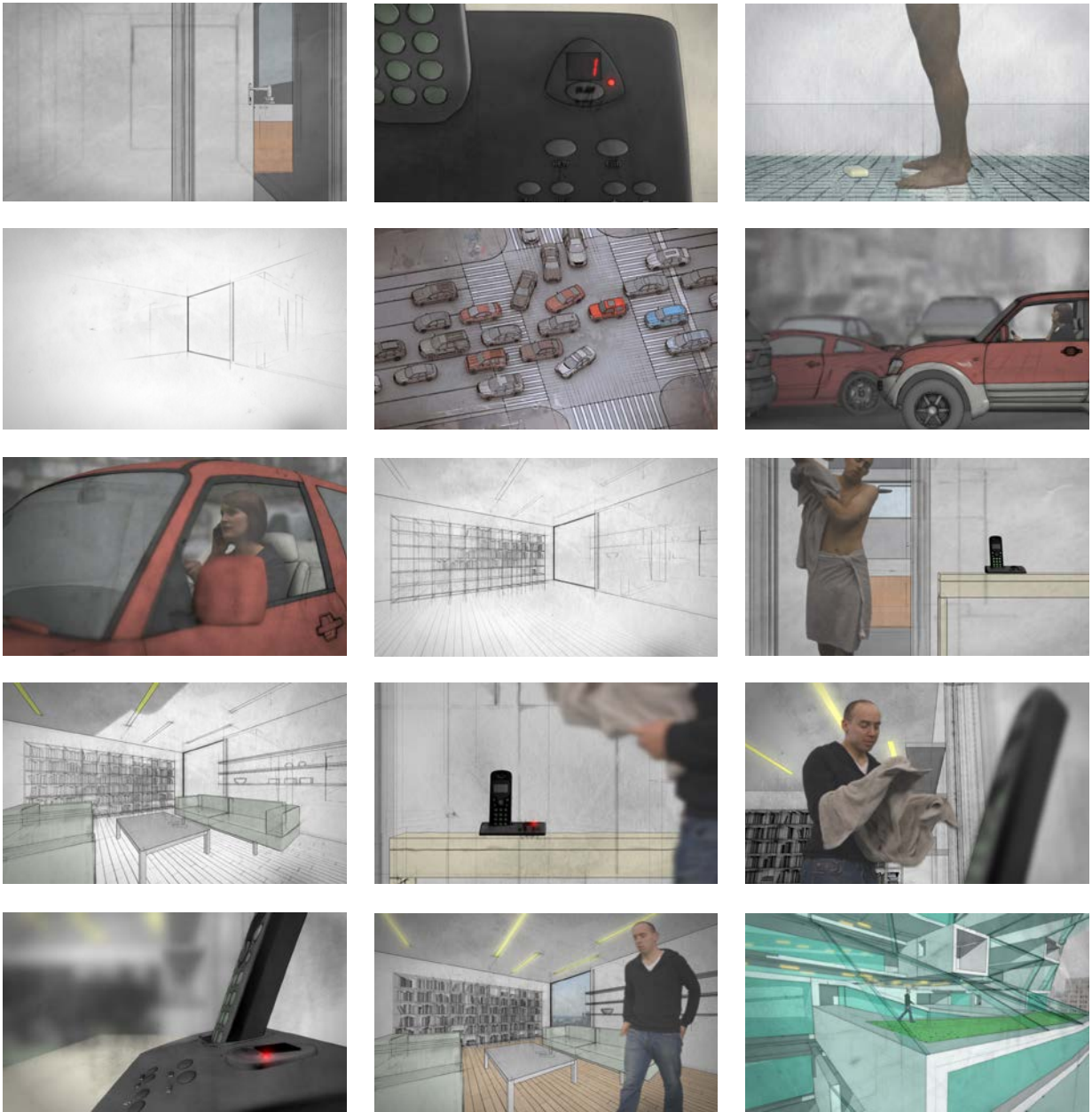
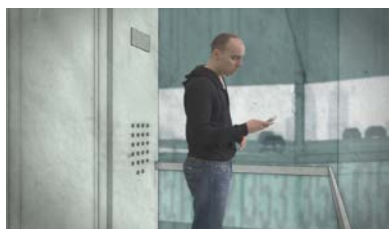
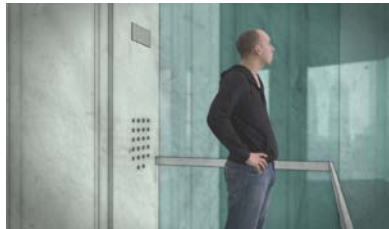
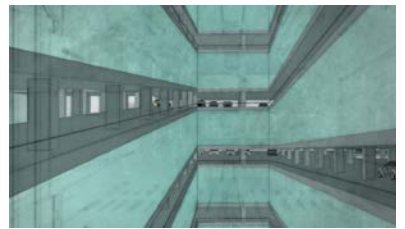
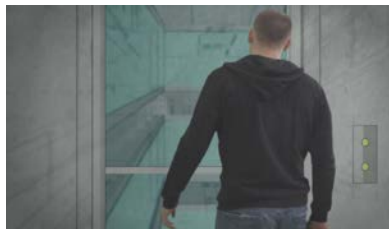
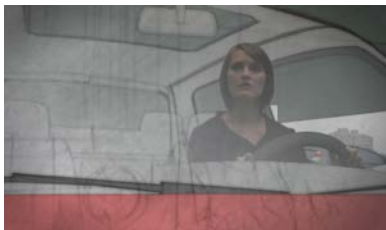


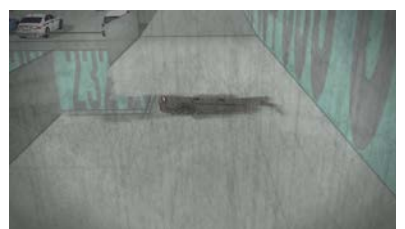
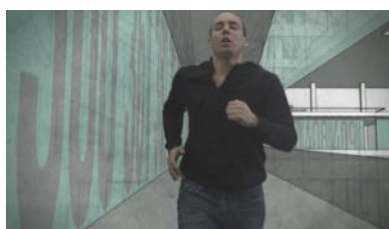
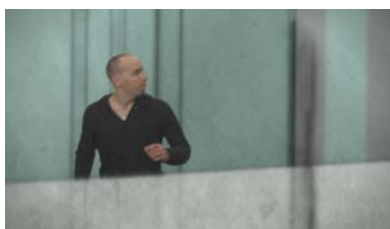
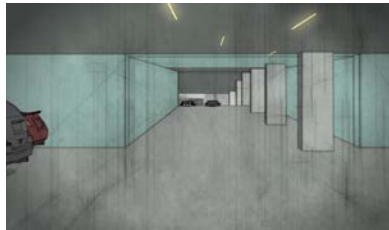
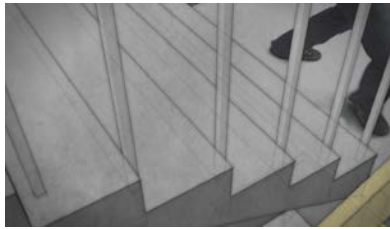
Figure 5.31.
Still frames from Project 2 animation,
Park Tower



CHAPTER 5

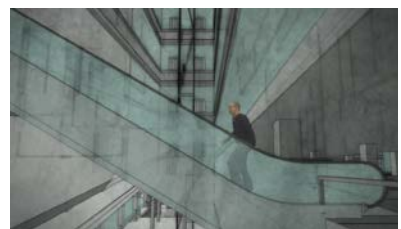
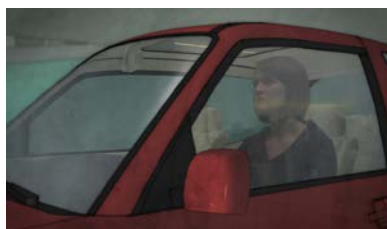
STILL FRAMES FROM
PARK TOWER

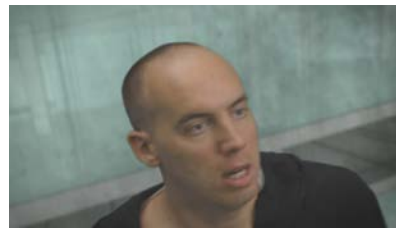
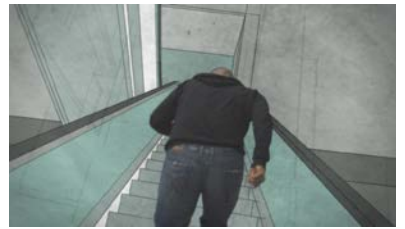
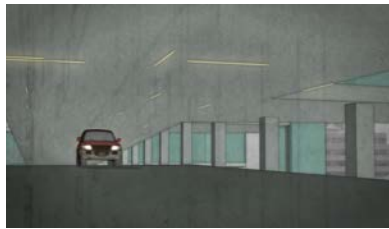




CHAPTER 5

STILL FRAMES FROM
PARK TOWER





CHAPTER
SIX
DISCUSSION AND
CONCLUSION

Interstitial Practices

It is worth returning to McLaren's quote mentioned earlier in Chapter 4, in which he describes the importance of the 'in between' in animation, as it is also very fitting in summarising the conduct of this research, which has continually operated within various interstitial spaces and periods. The research explores the practice of representation, not from a portfolio of completed projects but through the

acts and thoughts that have occurred between projects, where the outcome of one project has raised a new set of curiosities – which, when explored, have led to a new project attempting to put into action new ideas, creating new work and so on. The projects that bookend the research outlined in this exegesis are the works of moving image – and the text and discourse in between them largely represent a consequence of the research undertaken through the projects. This raises the question of where the inventiveness resides: is it primarily in the work between the discussions or in the discussions between projects? However, reducing this research by practice into simplified acts of thinking (writing) and making (animating) would create a false reflection. Instead it's better understood as a practice of research that, when broken down, is made from various modes – some deliberate and others more tacit. The making is not merely an instinctive act, just as the writing that follows is not simply a reflective period of thinking; each mode of research has been approached quietly and poetically at times, and in other instances directly and intentionally. To remain more broadly critical the research mode and medium switched between: words and images, production and consideration, techniques and debate, thinking as an architect and thinking as a filmmaker, self-reflection and questioning the work of others. The point at which the switching takes place, the 'in between', is what's critical as it occurs when the potentiality of another approach is seen to be more profitable than continuing in the current mode. This is effectively what has shaped the conduct and the outcomes of the research.

So while this body of work is a form of research located between two complementary practices of research (writing and making) – continually developing by cycling through discussions and projects – the outcome most importantly and quite fittingly is also about the 'in between'. Two things stemming from the writings of Robin Evans foreground this important point: that architects are unique among other artists as they mediate through drawings rather than work with the outcome itself, and that from this the drawings are created in a manner unlike the way the eyes will see the outcome, partly due to the fact that most drawings are two-dimensional and orthogonal, unlike the perspectival and stereoscopic nature of our eyes.¹ This separation between representation and outcome is not a shortcoming of architectural practice but an important and necessary quality of architectural representation, because in between these two states is a highly important interpretive gap – a gap which requires the active participation of the viewer. It is this gap that provokes the viewer to imagine the consequences of the outcome,

¹ R Evans, 'Translation from Drawing to Building and Other Essays', Architectural Association Publications, London, 1986, pp. 156.

beyond the building, by constructing in their minds a momentary experience of the building. This intervening step is crucial in different ways for all those who engage with the project because it occupies an intermediate period between the drawing and the building. The provocative nature of representations is most notable when drawings and representations need to be revised, because without their translatable quality the architect would never be able to cast his or her mind forward to the final outcome and anticipate the new opportunities that might arise from the changes.

The most significant aspect of a digital practice of architectural representation, as opposed to a non-digital or pre-digital practice, is the effect it has had upon this interpretive gap. Its effort has been to bring closer together the representation and the outcome, attempting to shrink and even eliminate the interpretive gap, and this has led to unfortunate outcomes and consequences.

The architectural flythrough, which has been a more focused concern of this research, is an attempt to fill this gap, considering it an unnecessary void. As a disembodied view wandering through an architectural proposition, rendered photorealistically to simulate the behaviour of optics, it is an impression intended as a substitute for the actual building's experience before it physically exists. Overlapping the representation and the outcome means that the viewer is no longer an active participant; the flythrough itself attempts to translate the representations into the outcome, replacing the vital role of the viewer's imagination. What occurs, most importantly, with representational examples such as the flythrough is that they generally only translate the material and geometric descriptions of the proposal, yet architecture stands for so much more than this. Photorealistic renderings and literal flythroughs become a conduit for only a narrow, almost empirical or quantitative understanding of architecture, failing to demonstrate its cultural significance and the ways in which architecture enriches our lives and daily experiences. The interpretive gap is an important subjective moment because it allows us to think beyond geometry. As it erodes, so does the human element within the representational practice, not just from within the image but from the maker and the viewer as well. Focusing upon the literal aspects of architecture through a literal practice of communication, what flythroughs, renderings and other mundane forms of digital representation gain is inevitably never as much as what they lose, since representations that are evocative are essentially limitless. Representations that only predict remain narrowly focused and more measured than those whose speculation reminds us that the design is still alive and growing at every stage, even after the building is physically constructed and carries on its ever-changing life as its users inhabit it.

So where digital representations have become too explicative, I argue in this research – and with my projects – that they need to be re-crafted to actively celebrate the gap separating them from the physical outcome. This is not to fall short of what representations are meant to describe; on the contrary, it represents the propositions more thoroughly, as re-establishing the gap takes into consideration the viewer for whom the representations were made rather than being entirely devoted to the object they illustrate. This in turn opens up a much wider appreciation of what is represented, and a more

enriching description of what the representation may translate to. This is not easy to achieve because strategies need to be developed whereby representations can maintain this separation from their built outcomes and avoid becoming too explicative but not detach themselves so much that they no longer serve the maker, viewer or design they represent.

Intervening Between Projects

I would argue that the interpretive nature of architectural representation existed more abundantly in a pre-digital period and has diminished significantly since, but I disagree that the digital practice of architectural representation is responsible for its demise. The second view is an oversimplified and unconstructive argument that doesn't offer a way forward. Comparing the two practices we can begin to pinpoint the cause. I would

argue that the problem lies in the relationship between orthographic drawings and perspectival representation, and that it is not an issue that has been introduced because of a digital practice.

In a pre-digital past, making perspective drawings was a separate act to creating plans, elevations and sections, and they could only be constructed after various orthogonal drawings were made. Today, as most perspectival representations are created digitally they are presented to us, calculated and projected automatically, in real time as the orthogonal views are drawn. With this great convenience architects have also lost the ability to intervene and manipulate the perspectival impression as necessary, something which Piranesi and Ferris did liberally in creating their most evocative works. This binding of orthographic drawing and perspectival representation is a crucial condition as to why, I would argue, in a digital environment, perspective has been relegated to an almost entirely explicative role. As architects no longer construct the perspective they're unable to control or distort it, because they are determined by and bound to the measured elements. So in order to separate the perspectival representation from the physical outcome (to re-establish the interpretive gap), perspective needs to also separate itself from two-dimensional orthographic drawings.

Unbinding perspectival representation from orthographic drawings and considering it as its own endeavour (as it once was) forces a shift away from the interests of measuring. Both projects in this research do this, as they are perspectival representations that have been undertaken to address their own unique concerns. As a consequence they have had an impact on other aspects of digital representation such as photorealism and the flythrough.

The technique of Project 1 creates such a separation by specifically avoiding the measured nature of conventional modelling. It creates a digital site model without site measurements and proposes a constructive technique that engages directly with the nature of perspective, from capturing and stitching together the initial site photographs to its output of perspectival renderings.

It does bear a resemblance to historical practices of architects and painters, most notably Pozzo and his quadratura technique, but those pre-digital similarities by themselves don't instigate a translational effect. What does make Project 1 worthwhile when questioned according to its translational quality is its potential as a digital technique to reintroduce the interpretive gap. Even though the animation that was produced was photorealistic, the technique (which is mostly made by photography and image manipulation) could shift away from a photoreal aesthetic as the source images could be filtered, recoloured and textured just as easily as they were retouched to erase the trees. The animation created was one example of its output, and was made to validate the process more than to pursue an architectural or aesthetic agenda. The photorealistic animation maintained the look of the original photography that captured the site but there is every opportunity, as it is a technique of pixels rather than measurements, to freely manipulate its impression to more appropriately reflect an architectural intention.

In discussing aesthetic options, one of the concerns raised early in Project 2 is that architects have been funnelling their representational ambitions through certain standardised techniques and software packages, leaving themselves little room to manoeuvre. As a result the techniques and software have aesthetically cast a lot of their work according to moulds that disregard their architectural (or architect's) agenda and have in effect become quite constricting. Part of the ambition of the second project was to raise an awareness of all the steps in making an animation where authorship over the technique and the outcome can be returned to the maker. It is something that the technique of Project 1 also does, as it forces the maker to be aware of the steps being taken throughout the process of creating perspectival imagery while easing the technical burdens and calculations that are solved by software. Reclaiming these acts that have been relinquished to the software not only creates greater authorship but also allows the maker to understand the extent of his or her authorship, much like a director learning to better understand his or her role in creating a film. Ultimately this develops a way of working that best reflects the architect's concerns. Effectively, the inventiveness in an architectural practice occurs not just within the design and the aesthetics of the representation but also in the technique used to create the representation. It is about opening up the technique to reveal what it's doing, and this is particularly intriguing if we consider that perspectival representation nowadays – within a digital context, as described earlier – no longer addresses such responsibilities, since orthographic drawings automate a perspectival outcome.

In Project 2 the concern is the narrative (rather than the geometry) and the technique involves compositing content from different sources. So not only is the entire animation separated from the two-dimensional drawings of the building, pursuing a new interest, but each frame of the animation is also its own individual construction – bringing together, in the spirit of the scene from *Mary Poppins* described earlier, assets from various sources to create a uniquely new impression. The three-dimensional material renderings of the building are textured and rendered separately to the line-work, which is both characteristically two-dimensional, as the lines themselves remain a constant thickness as if they were created by a pen, and three-dimensional, as

the geometry it delineates recedes towards the horizon. On top of these layers is the live footage of people that never strictly sits within the same perspectival field of vision. In the production stage, during the filming, the greenscreen had limited coverage and each person was shot to occupy the full frame where possible for greater resolution, and then scaled down to fit within the rendering. They don't always align with the depth of the rendering (which in some ways retains a quality from LTL's composites) because what's more important is that the shots chosen were selected, similarly to what Murch suggests in discussing what makes an edit work, by their narrative and emotional value rather than whether they were spatially correct. The theme of the narrative was about how the characters interacted with the ideas that led to the buildings design as much as the physical form of the building.

Avoiding photorealism is made easier through the techniques of both projects in different ways, because the separation of orthographic and perspectival representation means that as perspectives are no longer governed by a geometric truth they are less inclined to maintain a pictorial truth, shedding the burden of needing to appear 'real'. Yet the aesthetic issue is only half the concern as the outcomes of both projects were animations and not still images. The manner in which they unfold over time is equally important and this brings up other issues surrounding the flythrough.

The outcome of Project 1 was, admittedly, an animation created as a single shot - a key feature of flythroughs - but this was again to legitimise the technique. It was done specifically to prove that the technique could sustain a grounded appearance as the backdrop to a measured model while the camera moved about. However it would not be necessary in an applied scenario which would focus upon the architectural proposal and its ideas, as the technique can be used to create a number of individual shots from various angles, positions and paths (within a certain range) that could be edited together into a more compelling sequence. The technique itself doesn't automatically lead to a flythrough, and is not a digital process that was made to privilege digital and organic forms of architecture; on the contrary, it intends to be more egalitarian. Since the technique is also flexible in its pictorial aesthetic (as it can remain photographic or be treated in a more painterly or hand-crafted way) it can in fact be used to counter the flythrough and be employed to create imagery similar to that of the Park Tower animation from Project 2. Given an opportunity to use this technique with a properly designed architectural proposal, I would steer away from vivid realism if an alternative better described the underlying intentions of the architectural proposal.

A flythrough, which results from a collapsing of the technique and the representation, also attempts to fill the gap between representation and building. While Project 1 demonstrates an opportunity to get back in between the representational technique and its perspectival outcome, the animation of Project 2 attempts to expand the gap between the representation and the building by making one consider more widely the possibilities of the speculative design. Editing the animation was the most important act of creating this separation, as a cut always prompts an interpretation, no matter how small. This is best demonstrated by the Kuleshov effect from the early 1900s, in which a shot of the actor Ivan Mosjoukine maintaining a neutral expression was juxtaposed with others such as a plate of soup, a girl playing and

2 M Russell, 'The Kuleshov Effect and the Death of the Auteur' Forum, retrieved 4 March 2012, <<http://www.forumjournal.org/site/issue/01/michael-russell>>

a woman in a coffin. Even though Lev Kuleshov used the same footage of the actor each time, the audiences believed the character's expression was changing when it was sequenced with the other shots.² The flythrough's lack of editing is what most significantly erodes its interpretive potential. This (false) sense of cinematic continuity created by maintaining a single perspective view is intended, at best, to prove that what we are seeing is true and without distortion. Its single view, just as with the outcome of Project 1, seeks to measure and prove the proposal. Its character becomes very authoritative and instructional rather than seeking an exchange with the minds of its audience. The interpretive nature of animation can alternatively bring something back to architecture – like the sketches architects once brought to a presentation, which, in today's digital landscape, are rare to non-existent. Editing is once again about the in between, in the immeasurably small space and time between two juxtaposing shots that allows a new understanding to develop in the viewer's mind. And we can only begin to contemplate how the possibilities expand further when we take into consideration the contribution of good sound design, performance, lighting, cinematography and, of course, visual effects.

The purpose of photorealism and flythroughs is that the representations appear 'truthful' to the outcome, but they consider truth in a literal way. The technique of Project 1 and the animation and strategy of Project 2 are instead about being convincing. Since measurements were no longer the concern the projects allowed narrative to be employed to maintain their convincingness and reintroduce the interpretive gap. Project 1 is not without a narrative, even if it wasn't the intended focus. The design unfolds over time and a character is seen in the end engaging with the completed design; this does begin to shift the attention away from the design's objectivity. In Project 2 the aesthetic and the timing of the animation is constructed according to the narrative, both vertically in the compositing and horizontally through the editing.

So as both projects have been approached to treat each of the perspectival (and time-based) exercises as separate activities of their own, rather than as circumstances of digitally producing orthographic drawings, they effectively reintroduce the interpretive gap by unbinding perspectival representations from their respective two-dimensional drawings. Making them autonomous once again as they were in a pre-digital practice allows the animations to develop their more specific concerns and aesthetics. At the juncture between orthographic and perspective representation, the separation is a vital act in overcoming the literalness of digital perspectival representations, which as an automated output of orthographic drawings, have forced perspectival drawings and images to remain measured. The limitation of a purely geometric description is particularly noticeable when architects venture into the well-established fields of animation and film. Animation is so often about distorting and exaggerating both the content and the medium, and films don't explain; they suggest. Developing distinct perspectival techniques and strategies are precisely so that architects are able to liberally distort the making of perspective representations. Otherwise architects may continue practising as they currently do, with the limited potential of a linear digital practice that ties and overlaps what should be discrete acts of representation. This only encourages outcomes such as the problematic flythrough and photorealism, whereas

the separation between orthographic and perspective representation encourages the shift from measurements to narratives and from static drawings to animated experiences, bringing the images to life – as animation should.

Getting back in between – intervening in the two states of representation, severing the perspective representation from its measured representations and recharting its course so that new ideas can be pursued unencumbered by the limits of geometric and material truth – isn't something new or a result of a digital practice, even if it is so recognisable in the contemporary practice of digital representation. We can look back to all the key practitioners mentioned throughout this research and see that this has been a recurring act going right back to the origin of Renaissance perspective. There are various ways in which representational practitioners have intervened in the process of various perspectival modes of production in and beyond the field of architecture. Rejlander intervened in the photographic process through compositing in order to produce his *Two Ways of Life*, destabilising the truth of photography. Jeunet introduced animation into a live-action scene in *Amélie* as the limited physical potential of the actor could not fully communicate the emotional state of the character in that moment. The scene from Stevenson's *Mary Poppins* combined animation and live footage, mediating zoomorphism and anthropomorphism with different material qualities to composite together something new and in between. In architecture we can return to Piranesi and Ferris who chose not to adhere to geometrical truth with their perspective representations, fracturing the structured rules of linear perspective and creating works of greater narrative and imaginative potential that hold such great cinematic importance.

Then there are other interventions that have physically inserted something tangible in between. In Brunelleschi's case it was the mirrored surfaces that reflected the clouds to make the impression seem more convincing, just as mirrors and glass had been used in theatre (*Pepper's Ghost*) and cinema (the Schüfftan process). For others such as Dürer it was the drawing frame, an imprecise instrument encouraging perspectival representation that helped construct paintings with a story. Pozzo's quadratura technique most clearly illustrates an intervention for the sake of narrative and performance. Inserted into a physical architectural space, the same space that was redrawn and extended into the *tromp l'oeil* on the ceiling, was a technique assisted by a candle and strings that demonstrated an architecture (geometry) morphing toward a biblical vision (narrative). Pozzo's work best represents the efforts of all the aforementioned practitioners, and it reflects one of my main concerns through the two projects: that measurements are not the most important interest in perspectival representation but they still need to be convincing. The convincingness in all the examples mentioned above is achieved in various ways through narrative. Performance and timing (Brunelleschi and *Mary Poppins*) and sensation (such as Jeunet, Piranesi and Ferris), practical techniques, theories and stories (Brunelleschi, Dürer, Pozzo and Rejlander) are just a few of the elements employed to make all these special effects substantive, animated and cinematic. These intervening factors led to perspectival representations that were more convincing than what could have been achieved through a measured approach. Perspective representation today,

too, needs to be untethered from its orthographic source and pursued, once again, as its own interest to more broadly reflect the architect's concerns and highlight the ideas behind a project.

Addressing the Initial Concerns

Importantly, the re-characterising of architectural representation as an object-oriented explicative practice from the equally contemplative and meditative practice it once was. The timing, order, purpose, and appearance of today's perspectival imagery is a result of the linearised process of digital representation. The orthographic drawings generate the 3D model and its perspective renderings lead to the flythrough. It is because of this sequencing and generation, where creating one form of representation has encumbered another, that the initial object-oriented intention (of measured architectural drawings) remains throughout all the various forms of representation. They need to be unbound in order to more holistically represent the architectural idea.

Looking Back

The image that provoked my curiosities about digital representation in architecture, and which I spoke about in the introduction, is worth reconsidering. To say that it was successful because it created multiple readings between the architect, myself and the client would not be true, as my efforts were not to create something that would be interpreted but something that was literal, photorealistic and accurate. It is a question of intentionality. Had I, as the maker of the image, sought to create an image that would be interpreted, I would have done so in a manner that would have activated the imaginations of all its viewers. Neither occurred, but looking back it might have been a better approach as everyone would have viewed the image in a comparable way, not imagining the same outcome but engaging with the image similarly and deliberately. The original confusion surrounding that image is not unlike Rejlander's composited photograph, *The Two Ways of Life*, discussed in Chapter 3. Its audience was troubled by the truthfulness of photography

A non-orthographic understanding and approach of digital representation addresses many of the concerns that initiated this research: the homogeneity of photorealistic renderings; the privileging of the geometric and material order over the presentation of its poetic and symbolic qualities; using digital perspectival representations (both still and animate) only at the end of the design process rather than throughout; and, most

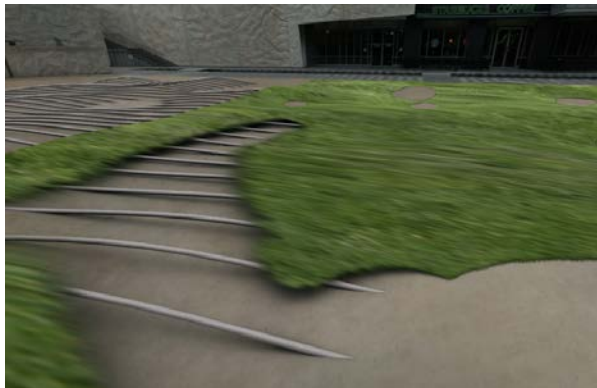
while other photographers were concerned more with the technique, when Rejlander was more interested in the ideas embedded in the image. This is similar to the issues of truth that surrounded the rendering I created. It was to look photorealistic but not like the outcome, as the trees and vegetation would not have appeared the same way, the design would have most likely changed and the overall quality of light and movement in the image would never have appeared as such, even if the client believed it would.

Limits and Expansions

Having spoken about the expansive quality of the gap, the limits of this research should also be described. It is largely about perspectival imagery. It is primarily about animation but is applicable to still images. It is about developing a set of techniques and practices for today around the current concerns of digital representation, rather than a historical account of representational techniques.

Its referral to historical precedents is to establish important periods and practices that directly inform the strategies being considered within the projects that are the true inventions of this undertaking.

It is specifically about the practice of digital representation and has referenced the notable works of architects, animators and filmmakers not only because they intervened in the systematic processes of perspective but also because they are practitioners, makers of perspectival imagery. They understood intimately the nature of their work and were able to disclose something unique. While their work is quite varied and from vastly different periods, they have been cited throughout this research because they are practitioners, and why I, as a practitioner myself, have found them so intriguing and influential.



Both my projects are about redesigning the representational techniques of architects when creating perspectival works of still and moving images, intending also to inform architects' larger representational practice (Figures

Figure 6.1., 6.2.

6.1–6.2). It is an effort to describe how architects can reclaim their authorship so that their representations have more agency, which has largely been about finding ways to bring a subjective quality back into representations by looking beyond geometry. The first project does this technically, by avoiding measurements in creating perspectival representation of environments, and the second, thematically, by privileging narrative over geometry. Both projects are in the end about perception. This is not to eradicate geometry as a focus of perspectival representation – because there is always a place for its descriptive and predictive role – but when architects engage with animation and cinema they need to become more versed in the representational traditions of the moving image. Otherwise they may not want to refer so liberally to works of moving images as ‘animations’ and ‘films’, or so freely describe them as ‘cinematic’, which suggests that they have not entirely grasped what constitutes those terms.

Animation is not an effort to fill the gap between representation and outcome but is intended to deliberately and strategically widen the potentiality of such moments. So as the role of the flythrough has been to merge the outcome and the representation, we should not consider animation as having to facilitate the building process, characterising it in the same way as a set of construction drawings, but as a technique for provoking the thoughts of its viewer by maintaining a separation between what is represented and what is eventually viewable to the eye. If we can overcome this restriction then we can say we have truly moved into a post-digital period of architectural representation.

A Summary of Discoveries

So as not to cloud or confuse the originality of the research and its contribution, it is worth stating bluntly what the findings are within the limits stated earlier. These are broad with perhaps a few more specific discoveries within each project, but they are best considered against all of the five general spheres of conversation the research has ventured into.

Technically, the research has generated through Project 1 a new way of digitally modelling environments that is related to historical practices of perspective in architectural representation. Historically, the research argues that the history of visual effects – and, more specifically, compositing – stems from a point predating the invention of photography, aligning with the early discoveries of Renaissance perspective. This was established by another discovery arguing that Brunelleschi was a compositor, without knowing it at the time as it is really only a contemporary field of practice. Theoretically, Project 1 critiques the wide practice of architectural flythroughs by comparing its making and agenda against all the disciplinary fields it is seen to straddle. This critique does not just question current animation practices in architecture but proposes how architects can overcome the flythrough. And this leads to the fourth discovery, practicality,

where Project 2 demonstrates a new strategy creating architectural animations, discussing and working through a number of steps of how architects can create more compelling outcomes – steps that are not widely being considered. These are all threaded back together to argue a larger point about the importance of maintaining the interpretive gap in architectural representation. As a practice-based body of research it proposes, practically, how to address a number of concerns by splitting perspectival representation into an autonomous endeavour. The fifth discovery is self-serving and about its impact on my own practice as the research has reoriented the way I move forward in developing, reflecting upon and positioning my work.

In this regard the discovery has been about developing my own critical and sustainable practice – one that extends past the expectations of a commercial practice to reconsider each project as an act of research with intentions to raise new questions to lead to new work and discoveries, while also working beyond some of the traditional limits of the academy, since the research is also applied. In other words, creating a new role as a practitioner-researcher.

These various discoveries can be woven into one large conclusion about the merit of this research and doing so goes back to the opening line – that it began with a hunch. My hunch, which I perhaps wasn't able to articulate at the time, was that digital pictorial representation in architecture could be furthered to communicate much more than what's currently being demonstrated. In order to discover how, I needed to determine what was limiting its potential. The research, in technically taking apart the existing practice of digital modelling and rendering to propose a new technique of digitally constructing perspectival representations, derived largely from the knowledge of visual effects techniques (Project 1). It led to exploring the evocative nature of cinematic visual effects and historic examples of perspective construction, only to discover they are rooted in and had flourished from the same discovery – Brunelleschi's demonstration (Chapter 3). As a consequence of this discovery two differing practices occurred for generating perspective: the use of perspective machines and linear perspective, which privileged different outcomes; and linear perspective, focused on describing geometry, which was a more object-oriented mode of creating perspectival imagery and as a tradition adopted by architecture explains the objectifying quality of digital representation today. But this tradition and its limits were contested by various and significant figures who all sought to fracture the rigidity of linear perspective in order to represent a more subjective and human quality, which in effect led to narratives. In an effort to better understand how architecture has engaged with the moving image within a more recent history, the question of the objective and subjective is brought to the fore once again and in comparing the flythrough (the most common example of an architectural animation) to all the fields with which it is associated – architectural representation, animation and cinema – I discovered it poorly executes the intentions of any of those fields. The representational concerns of all those fields do overlap greatly; however they fail to be represented in the flythrough. This highlighted the larger problem of digital representation in architecture: that what needs to be appreciated, just as it is in animation and cinema, is the interpretive gap and the role of the contemplating viewer. The Park Tower animation is therefore a demonstration of my argument,

something which as an outcome represents that which is beyond geometry, concerns itself with the human body, narrative, the imaginative process of an architect and the role of representation as it is tied to architectural thinking and practice. This body of work is about overcoming the limits of digital representation so as to widen the communicative opportunities for architects to demonstrate the significance of architecture by exploring the potentiality of the moving image in a manner that continues the evocative nature of architectural representation to encourage the imagination to see more than what is literally presented.

From Here On

In many ways this research has laid the groundwork for more investigations and exercises into architecture and the moving image. It establishes a position about architectural representation (and the moving image) and makes important links between contemporary digital practices and histories of representation in architecture. This research has built a platform that bridges over the digital allowing for new bodies of

research and future investigations that can extend the positions stated here or use them as an establishing argument to develop new works.

On a much larger scale it is worth considering, without wanting to overwork the analogy of the 'in between', how this research sits between others, particularly the new research that may be generated, furthering the developments of this body of work. As I have only investigated it very selectively, one area that I suggest needs more broad attention and research is the practice of visual effects, particularly the kind used in film but not to exclude those of theatre, painting and contemporary practices of digital art. I have always been intrigued by the general public's thirst to understand visual effects and the effort that goes into creating a shot. One obvious example is the bonus material contained as part of a film's DVD release, which generates its own separate viewing and often its own separate DVD packaged alongside the film. If the production and the practices of visual effects generate such a great interest, could we not also recognise that they are also of public importance and perhaps even socially significant, at least to a level that warrants some scholarly investment? I'm not advocating research into the technology, hardware and software behind visual effects, as I believe this already receives its fair share of attention within computer science programs. What I'm encouraging is something that has been largely ignored: a theoretical discussion about visual effects in contemporary cinema and society. We have a wealth of discourse surrounding film theory, touching on many areas, such as the work of certain directors, the deconstruction of themes, stories and narratology, and theoretical writings about other aspects of filmmaking such as cinematography, editing and sound design. What has had less than its deserved share of attention, even with such great public interest, seems to be the narrative and cultural value of cinematic visual effects. The writing

about visual effects in this research was quite specific and deliberate and very much through an architectural lens, and I am advocating a broader conversation about visual effects.

Yet this raises another recommendation: that future research could concentrate more on other architectural forms of moving image. One aspect of the moving image not explored was the area of interactive technology and practices. This has caught the attention of many theorists in the world of gaming but appears to be less frequently discussed in terms of how it would relate to architecture and even to the positions and discoveries of this research. I most likely will not pursue this myself as this is another kind of practice altogether and one that I personally am not involved in as a practitioner. My interest lies more in directed, 'non-interactive' (in a literal sense) works of moving image such as documentary, animation and fictional live action in both long and short form. Yet others should take up the interest.

This PhD is mostly for architects who are engaging with animation and, to a lesser extent, other areas of filmmaking such as live action, fiction and documentary. This suggests there is an opportunity to explore more thoroughly how architects engage with these other areas and the specific value of these areas for architecture. This has been covered in various ways by writers such as Dietrich Neumann³ and Donald Albrecht⁴ who have concentrated on architecture within film, and writers such as Juhani Pallasmaa⁵ and Norman Klein⁶ mentioned in Chapter 4, who theorise the nature of cinema and the moving image as it relates to architecture, which is of importance to architects who remain operating as architects but look to film to further their architectural ideas. Yet what I feel should be discussed more deeply are those rare architects who operate as filmmakers but identify themselves primarily as architects, such as Superstudio and the Eameses, mentioned in Chapter 4. The writing about such practitioners should come from someone deeply familiar with the practices of architecture and filmmaking, or from someone who operates as both a filmmaker and an architect, because it would provide a unique insight and perspective on the codependency of those two fields as a unique kind of practice.

3 D Neumann, *Film Architecture: Set Designs from Metropolis to Blade Runner*, Prestel Publishing, Munich, 1999.

4 D Albrecht, *Designing Dreams: Modern Architecture in the Movies*, Hennessey & Ingalls, Los Angeles, 2000.

5 J Pallasmaa, *The Architecture of Image: Existential Space in Cinema*, Rakennustieto Publishing, Helsinki, 2008.

6 N Klein, *The Vatican to Vegas: The History of Special Effects*, New Press, New York, 2004.

Conclusion

At times the research is a contemporary treatise. Instead of a treatise about perspective like those of the Renaissance, it is for architects operating in today's digital climate, and how they ought to practise to make the most of animation as a form of representation. It references those who developed treatises in the past and offers new technical approaches and theoretical positions on image-making with examples of out-

comes that could only have occurred through a project-driven mode of research. Just as with so many of those who wrote treatises during the Renaissance I too am a practitioner spanning multiple fields (of architecture and film) and remained positioned in between them for the purposes and benefit of this research.

There are a number of things a practitioner does for which only he or she can account. Looking back over the writing I had stated that I was approaching this research as a maker first and not as a historian or theorist; yet the bulk of the writing has been historical and theoretical. However I maintain that position, as this PhD's true inventiveness – and demonstration of that inventiveness – lies in the projects and their outcomes. Had someone else created them I might have written about them at great length but I would not be able to champion the meaning of pictorial forms of architectural representation and let the work present itself in its own way. In discussing the power of representation I brought forth and communicated the tacit understanding of the moving image just as I have always practised it. There is intelligence and a critical level of research exercised in practicing, and the discoveries and original contributions here would not have been made without taking this course with the projects and the theoretical narratives that underpin this body of research.

Bibliography

- Albrecht, D, *Designing Dreams: Modern Architecture in the Movies*, Hennessey & Ingalls, Los Angeles, 2000.
- Aufderheide, P, *Documentary Film: A Very Short Introduction (Very Short Introductions)*, Oxford University Press, New York, 2007.
- Baudrillard, J, *Simulacra and Simulation (The Body, In Theory: Histories of Cultural Materialism)*, University of Michigan Press, Ann Arbor, 1995.
- Bazin, A, *What Is Cinema? Vol. 1*, University of California Press, Berkeley, 2004.
- Berger, J, *Ways of Seeing*, Penguin, London, 1972.
- Betsy, A, K Hayes & L Anderson, *Scanning: the Aberrant Architectures of Diller + Scofidio*, Whitney Museum of Art, New York, 2003.
- Bizony, P, *Digital Domain: The Leading Edge of Visual Effects*, Billboard Books, New York, 2004.
- Bordwell, D, *Poetics of Cinema*, Routledge, New York, 2007.
- Brinkmann, R, *The Art and Science of Digital Compositing (The Morgan Kaufmann Series in Computer Graphics)*, Morgan Kaufmann, New York, 1999.
- Brooker, D, *Essential CG Lighting Techniques (Focal Press Visual Effects and Animation)*, Focal Press, Oxford, 2002.
- Brown, B, *Cinematography: Image Making for Cinematographers, Directors and Videographers*, Focal Press, London, 2002.
- Carels, E, 'Animation = A Manipulation of Artforms?', in B. Cook and G. Thomas (eds), *The Animate! Book*, Wallflower Press, London, 2007, pp. 14–16.
- Chandler, G, *Cut by Cut: Editing Your Film or Video*, Michael Wiese Productions, Studio City, California, 2004.
- Clark, F, 'Shuftan Process', *Intralinea*, 2009, retrieved 6 January 2009, <<http://www.intralinea.it/intra/ipermedia/magistro/En/Shuftan%20process.html>>
- Colomina, B, *Privacy and Publicity: Modern Architecture as Mass Media*, The MIT Press, Cambridge, Massachusetts, 1996.
- Cook, B, & G Thomas, *The Animate! Book*, Wallflower Press, 2007.
- Cory, C, W Meador & W Ross, '3D Computer Animated Walkthroughs for Architecture, Engineering, and Construction Applications', *International Conference Graphicon*, 2001.
- Crary, J, *Techniques of the Observer: On Vision and Modernity in the 19th Century (October Books)*, The MIT Press, Cambridge, Massachusetts, 1992.
- Cuba, L, interviewed in *The Star Wars Computer Animation*, video recording, YouTube, 1977, retrieved 2 September 2008, <<http://www.youtube.com/watch?gl=GB&hl=en-GB&v=yMeSw00n3Ac>>.
- Dahmen-Ingenhoven, R, *Animation: Form Follows Fun*, Birkhäuser, Basel, 2004.
- Damisch, H, *The Origin of Perspective*, John Goodman (trans.), The MIT Press, Cambridge, Massachusetts, 1995.
- Debord, G, *Society of the Spectacle*, Zone Books, New York, 1994.
- Diller, E & R Scofidio, *Back to The Front: Tourisms of War*, F.R.A.C. Basse-Normandie, New York, 1994.
- Diller, E & R Scofidio, *Flesh: Architectural Probes*, Princeton Architectural Press, New York, 1994.
- Doneus, M, 'Introduction to Photogrammetry', Universität Wien Luftbildarchiv, retrieved 10 June 2005, <<http://www.univie.ac.at/Luftbildarchiv/wgv/intro.htm>>.
- Duncan, J, 'Monsters in the Closet', *Cineflex*, no. 88, Don Shay, Riverside, 2002, pp. 15–26.
- El-Bizri, N, 'Imagination and architectural representations', *From Models to Drawings*, M Frascari, J Hale and B Starkley (eds), Routledge, London, 2007, pp. 34–41.
- Evans, R, *The Projective Cast: Architecture and Its Three Geometries*, The MIT Press, Cambridge, Massachusetts, 2000.

- Evans, R, *Translations from Drawing to Building and Other Essays (AA Documents)*, Architectural Association Publications, London, 1986.
- Fear, B, *Architecture + Animation (Architectural Design)*, Academy Press, London, 2001.
- Ficacci, L, *Piranesi: The Etchings*, Taschen, Cologne, 2006.
- Fordham, J, 'Paris by Numbers', *Cinefex*, no. 86, Don Shay, Riverside, 2001, pp. 15-28
- Fordham, J, 'Q&A: Peter Jackson', *Cinefex*, no. 96, Don Shay, Riverside, 2004, pp. 55-61
- Frascari, M, *From Models to Drawings (Critiques; Critical Studies in Architectural Humanities)*, Routledge, London, 2007.
- Fraser, I, & R Henmi, *Envisioning Architecture: An Analysis of Drawing*, Wiley, New York, 1993.
- Haseman, B, 'A Manifesto for Performative Research', *Media International Australia incorporating Culture and Policy*, no. 118, 2006, pp. 98-106.
- Hockney, D, *Secret Knowledge: Rediscovering the Lost Techniques of the Old Masters*, Viking Studio, New York, 2006.
- Ingraham, C, *Architecture, Animal, Human: The Asymmetrical Condition*, Routledge, New York, 2006.
- Jay, M, *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought (Centennial Book)*, University of California Press, Berkeley, 1994.
- Katz, S, 'The New Cinematography', *Millimeter*, November 2001, retrieved 7 September 2008, <http://digitalcontentproducer.com/mag/video_new_cinematography>.
- Kerlow, I, *The Art of 3D: Computer Animation and Effects*, 3rd edition, John Wiley and Sons, New Jersey, 2003,
- Klein, N, *Seven Minutes: The Life and Death of the American Animated Cartoon*, Verso, New York, 1996.
- Klein, N, *The Vatican to Vegas: The History of Special Effects*, New Press, New York, 2004.
- Kuhn, A, *Alien Zone II: The Spaces of Science-Fiction Cinema*, Verso, New York, 2000.
- Lang, P & W Menking, *Superstudio: Life without Objects*, Skira, Milan, 2003.
- Leeman, F, *Hidden Images: Games of Perception, Anamorphic Art, Illusion*, Harry N Abrams Inc, New York, 1975.
- Leggat, R, 'Rejlander, Oscar Gustave: A History of Photography', *Michael Pritchard*, retrieved 4 March 2012, <<http://www.mpritchard.com/photohistory/history/rejlande.htm>>.
- Lewis, P, M Tsurumaki, & D Lewis, *Lewis. Tsurumaki. Lewis: Opportunistic Architecture*, Princeton Architectural Press, New York, 2007.
- Lewis Tsurumaki Lewis Architects, accessed 15 September 2008, <<http://www.ltlarchitects.com>>.
- Lynn, G, 'Form', retrieved 15 January 2006, <www.glform.com>.
- Mannoni, L, W Nekes, & M Warner, *Eyes, Lies and Illusions: The Art of Deception*, Lund Humphries Publishers, London, 2004.
- Maschwitz, S, *The DV Rebel's Guide: An All-Digital Approach to Making Killer Action Movies on the Cheap*, Peachpit Press, Berkeley, 2007.
- Massey, L, *The Treatise on Perspective: Published and Unpublished (Studies in the History of Art Series)*, NGW-Stud Hist Art, New Haven, 2003.
- McClean, ST, *Digital Storytelling: The Narrative Power of Visual Effects in Film*, The MIT Press, Cambridge, Massachusetts, 2008.
- McCloud, S, *Understanding Comics: The Invisible Art*, Harper Paperbacks, New York, 1994.
- McGrath, B, & J Gardner, *Cinematics: Architectural Drawing Today*, Wiley, New York, 2007.
- McQuaid, M, & T Riley, *Envisioning Architecture: Drawings from the Museum of Modern Art*, The Museum of Modern Art, New York, 2002.
- Merriam-Webster's Online Dictionary, retrieved 20 July 2008, <<http://www.merriam-webster.com>>.
- Mitchell, WJT, *Picture Theory: Essays on Verbal and Visual Representation*, University of Chicago Press, Chicago, 1995.

BIBLIOGRAPHY

- Monaco, J, *How to Read a Film: The Art, Technology, Language, History, and Theory of Film and Media*, Oxford University Press, New York, 1981.
- Morse, M, *Virtualities: Television, Media Art, and Cyberculture (Theories of Contemporary Culture)*, Indiana University Press, Bloomington, 1998.
- Murch, W, *In the Blink of an Eye*, 2nd edition, Silman-James Press, Los Angeles, 2001.
- Neumann, D, *Film Architecture: Set Designs from Metropolis to Blade Runner*, Prestel Publishing, Munich, 1999.
- Ng, K, *Architectural Cinema: A Theory of Practice for Digital Architectural Animation*, University of Hong Kong, Hong Kong, 2009.
- Ng, K, M Schnabel & T Kvan, 'Architectural Animation Becomes Alive - Creating Spatial Narratives for Spatial Characters for Animations', *Communicating Space(s), Proceedings of the 24th eCAADe Conference*, Lisbon, 2005, pp. 598-603.
- Orpen, V, *Film Editing: The Art of the Expressive (Short Cuts)*, Wallflower Press, London, 2003.
- Pallasmaa, J, *The Eyes of the Skin: Architecture and the Senses*, Academy Press, London, 2005.
- Pallasmaa, J, *The Architecture of Image: Existential Space in Cinema*, Rakennustieto Publishing, Helsinki, 2008.
- Panofsky, E, *Perspective as Symbolic Form*, Zone Books, New York, 1996.
- Penz, F, & M Thomas, *Architectures of Illusion: From Motion Pictures to Navigable Interactive Environments*, Intellect Books, Bristol, 2008.
- Pérez-Gómez, A, & L Pelletier, *Architectural Representation and the Perspective Hinge*, The MIT Press, Cambridge, Massachusetts, 2000.
- 'Pervasive Animation', Tate Modern, 2007, retrieved 22 April 2009, <http://www.tate.org.uk/onlineevents/webcasts/pervasive_animation_across_disciplines/default.jsp>.
- Pilling, J, *A Reader in Animation Studies*, Indiana University Press, Bloomington, 1999.
- Porter, T, *How Architects Visualize*, Van Nostrand Reinhold, New York, 1979.
- Porter, T, *Architect's Eye: Visualization and Depiction of Space in Architecture*, Taylor & Francis, 1997.
- Rabiger, M, *Directing the Documentary*, Third edition, Focal Press, 1998.
- Ratinam, M, 'Falling into the Image', *ARQ: Architectural Research Quarterly*, vol. 9, no. 3-4, 2005, pp. 237-244.
- Ratinam, M, 'A Digital Renaissance: Reconnecting Architectural Representation and Cinematic Visual Effects', in M Frascari, J Hale and B Starkley (eds.) *From Models to Drawings*, Routledge, London, 2007. pp. 146-158.
- Ratinam, M, 'A Broken Engagement: A Review of the Architectural Fly-through', paper given at *Design Cinema Conference*, Istanbul University, Turkey, 2008.
- Ratinam, M, 'Architecture Unedited', paper given at *Chu Hai Archi-cultural Symposium - Film, Architecture, and City*, Hong Kong, 2010.
- Rattenbury, K (ed), *This is Not Architecture: Media Constructions*, Routledge, London, 2002.
- Ruby, A, P Schumacher, P Noever & Z Hadid, *Zaha Hadid: Architecture*, Hatje Cantz Publishers, Ostfildern, Germany, 2003.
- Russell, M, 'The Kuleshov Effect and the Death of the Auteur' Forum, retrieved 4 March 2012, <<http://www.forumjournal.org/site/issue/01/michael-russell>>
- Sanders, J, *Celluloid Skyline: New York and the Movies*, Knopf, Bloomsbury, UK, 2003.
- Seger, L, *Making a Good Script Great*, Samuel French, New York, 1994.
- Serrato-Combe, A, 'Something's Gotta Give - Architectural Animations', *SIGraDi, Proceedings of the 8th Iberoamerican Congress of Digital Graphics*, Brazil, 2004, pp. 257-261.
- Sontag, S, *On Photography*, Picador, New York, 2001.
- Soriano, F, *Diagramas @*, Fisuras, Madrid, 2002.
- Spuybroek, L, 'NOX: Machining Architecture', retrieved 15 January 2006, <http://www.noarch.com/flash_content/flash_content.html>.

Stafford, B, *Good Looking: Essays in the Virtue of Images*, MIT Press, Cambridge, Massachusetts, 1996.

PAGE 157

Spiller, N, 'Towards an Animated Architecture Against Architectural Animation', *Architectural Design*, vol, 71, no. 2, 2001, pp. 82-85.

Treadwell, S, 'Petrification and the Architectural Fly-Through', *Drawing Together: Convergent Practices in Architectural Education, Proceedings of the Association of Architectural Schools of Australasia (AASA) Conference*, University of Queensland, Brisbane, 2005.

Tschumi, B & H Ibelings, *Bernard Tschumi Architecture In/of Motion: Architecture In/of Motion*, Distributed Art Pub Inc, New York, 1997.

Uluo lu, B, A En ici & A Vatansever, *Design and Cinema: Form Follows Film*, Cambridge Scholars Publishing, Newcastle upon Tyne, 2006.

Varini, F, F Lopez-Duran, & L Muller, *Felice Varini: Point of View*, Lars Müller Publishers, Zurich, 2004.

Vineyard, J, *Setting Up Your Shots: Great Camera Moves Every Filmmaker Should Know*, Michael Wiese Productions, Studio City, California, 2008.

Virilio, P, *The Vision Machine (Perspectives)*, Indiana University Press, Bloomington, 1994.

Virilio, P, *War and Cinema (Radical Thinkers)*, Verso, New York, 2009.

Weston, R, *Architectural Research Quarterly*, vol. 9, no. 3-4, Cambridge University Press, Cambridge, 2005.

Filmography

- A Very Long Engagement*, Jean-Pierre Jeunet (dir.), Warner Bros., France, 2004.
- Amélie*, Jean-Pierre Jeunet (dir.), Claudie Ossard Productions, France, 2001.
- Avalon*, Mamoru Oshii (dir.), Deiz Productions, Poland, 2001.
- Baraka: A World Beyond Words*, Ron Fricke (dir.), Magidson Films, USA, 1992.
- Beneath Clouds*, Ivan Sen (dir.), AFFC, Australia, 2002.
- Cinema 16: British Short Films*, Warpfilms, UK, 2003.
- Cinema 16: European Short Films*, Warpfilms, UK, 2005.
- Cinema 16: American Short Films*, Warpfilms, UK, 2006.
- Citizen Kane*, Orson Welles (dir.), Mercury Productions, USA, 1941.
- Eames Films*, Charles Eames and Ray Eames (dir.), USA, 2001.
- Empire of Dreams*, Edith Becker and Kevin Burns (dir.), Twentieth Century Fox, USA, 2004.
- Fight Club*, David Fincher (dir.), Twentieth Century Fox, USA, 1999.
- Final Fantasy: The Spirits Within*, Hironobu Sakagushi (dir.), Square Company, Japan, 2001.
- Finding Nemo*, Andrew Stanton and Lee Unkrich (dir.), Pixar Animation Studios, USA, 2003.
- George Washington*, David Gordon Green (dir.), Cowboy Pictures, USA, 2000.
- Ghost in the Shell*, Mamoru Oshii (dir.), Bandai Visual Company, Japan, 1995.
- Heat*, Michael Mann (dir.), Warner Bros., USA, 1995.
- I Am Cuba*, Mikhail Kalatozov (dir.), Instituto Cubano del Arte e Industrias Cinematograficos, Cuba, 1964.
- Koyaanisqatsi*, Godfrey Reggio (dir.), IRE Productions, USA, 1982.
- La Haine*, Mathieu Kassovitz, (dir.), Canal+, France, 1996.
- Le Jetée*, Chris Marker (dir.), Argos Films, France, 1962.
- Los Angeles Plays Itself*, Thom Anderson (dir.), USA, 2003.
- Mary Poppins*, Robert Stevenson (dir.), Walt Disney Productions, USA, 1964.
- Mirror*, Andrei Tarkovsky (dir.), Mosfilm Unit 4, USSR, 1974.
- Memento*, Christopher Nolan (dir.), Newmarket Captial Group, USA, 2000.
- My Architect*, Nathaniel Kahn (dir.), Louis Kahn Project Inc, USA, 2003.
- No End in Sight*, Charles Ferguson (dir.), Magnolia, USA, 2003.
- Ocean's Eleven*, Steven Soderbergh (dir.), Warner Bros., USA, 2001.
- One Hour Photo*, Mark Romanek (dir.), Fox Searchlight, USA, 2002.
- Onedotzero Select 1-5*, The Arts Council UK, UK, 2003-2008.
- Panic Room*, David Fincher (dir.), Columbia Pictures, USA, 2002.
- Pather Panchali*, Satyajit Ray (dir.), Gov of West Bengal, India, 1955.
- Paul Debevec: Research and Animation*, Paul Debevec (dir.), University of Southern California, USA, 2000.
- Powaqqatsi*, Godfrey Reggio (dir.), Golan-Globus Productions, USA, 1988.
- Ratatouille*, Brad Bird and Jan Pinkava (dir.), Pixar Animation Studios, USA, 2007.
- Rear Window*, Alfred Hitchcock (dir.), Paramount Pictures, USA, 1954.
- Renaissance*, Christian Volckman (dir.), Onyx Films, France, 2006.

Rope, Alfred Hitchcock (dir.), Trans Atlantic Pictures, USA, 1948.

Star Wars, George Lucas (dir.), Lucasfilm, USA, 1977.

Star Wars: Episode V - The Empire Strikes Back, Irvin Kershner (dir.), Lucasfilm, USA, 1980.

Star Wars: Episode VI - Return of the Jedi, Richard Marquand (dir.), Lucasfilm, USA, 1983.

The Animatrix, Andy Wachowski and Lana Wachowski (writ.), DNA, USA, 2003.

The Conversation, Francis Ford Coppola (dir.), Paramount Pictures, USA, 1974.

The Cutting Edge, Wendy Apple (dir.), Warner Bros., USA, 2004.

The Fog of War, Errol Morris (dir.), Sony Pictures Classics, USA, 2003.

The Fountainhead, King Vidor (dir.), Warner Bros., USA, 1949.

The Italian Job, F. Gary Gray (dir.), Paramount Pictures, USA, 2003.

The Last Farm, Runar Runarsson (dir.), Zik Zak, Kvikmyndir, Iceland, 2004.

The Matrix, Andy Wachowski and Lana Wachowski (dir.), Warner Bros., Australia, 1999.

The Old Man and the Sea, Aleksandr Petrov (dir.), Densu Tech, Russia, 1999.

The Parthenon, Paul Debevec (dir.), University of Southern California, USA, 2004.

The Red Balloon, Albert Lamorisse (dir.), Films Montsouris, France, 1956.

The Work of Director Michel Gondry, Michel Gondry (dir.), Palm Pictures, USA, 2003.

The Work of Director Spike Jonze, Spike Jonze (dir.), Palm Pictures, USA, 2003.

The Work of Director Chris Cunningham, Chris Cunningham (dir.), Palm Pictures, USA, 2003.

The Work of Director Jonathan Glazer, Jonathan Glazer (dir.), Palm Pictures, USA, 2005.

The Work of Director Stephane Sednaoui, Stephane Sednaoui (dir.), Palm Pictures, USA, 2005.

The Work of Director Anton Corbijn, Video Anton Corbijn (dir.), Palm Pictures, USA, 2005.

The Work of Director Mark Romanek, Mark Romanek (dir.), Palm Pictures, USA, 2005.

Timecode, Mike Figgis (dir.), Red Mullet Productions, USA, 2000.

Tron, Steven Usberger (dir.), Walt Disney Productions, USA, 1982.

Vertigo, Alfred Hitchcock (dir.), Paramount Pictures, USA 1958.

Walking with Dinosaurs, Tim Haines and Jasper James (dir.) BBC, UK, 2000.

