The Spatiality of projection mapping:

A practice-based research on
projected moving-image installation

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

June 2017

This thesis has passed the final viva-voce examination with no correction.

Acknowledgements

Firstly, I would like to express my sincere gratitude to my supervisors Prof. Dr. Kevin Walker and Nicky Hamlyn for their continuous support of my Ph.D research and related practice, for their patience, motivation, and extensive knowledge. Their guidance helped me throughout the journey of research, practice and writing of this thesis.

Secondly, I am grateful to all of those whom I have the pleasure to work during this project. This practice-based research would not have been possible without the support of people who had helped me to exhibit my work in their institutions. I especially would like to thank Dr. Rosalie Kim and Laura Carderera at the Victoria and Albert Museum (V&A), who have been supportive of my practice and research goals during my residency at the V&A.

Last but not least, the support from my family has been the most important to me in the pursuit of this project. I would like to thank my parents and my brother, whose love and guidance are with me in whatever I pursue. My sincere thanks also go to my friends for supporting me spiritually throughout the research and my life in general.

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Abstract

This practice-based research investigates how projection mapping develops a distinctive relationship between screen, moving image, and space in projected moving-image art. Despite projection mapping's growing popularity, little in-depth research has been conducted on this medium. This lack of research and the superficial nature of many projects have led artists and researchers to regard the medium as a mere technique that serves only to decorate three-dimensional surfaces.

Rather than view projection mapping simply as a digital technique, my research situates it in the continuum of projected moving-image installation artwork. To do this, I examine projection mapping's screen, narrative, and surrounding space—the constituents of all projected moving-image installation art—through the lenses of surface and depth. In addition to considering cinematic frames, I analyse these traits through artistic lenses such as painting, site-specific art, and architecture to investigate how projection mapping reconfigures the constituents that comprise all screen-based projected moving-image works. In so doing, I define the ways which projection mapping develops its distinctive relationship among these constituents.

I conducted three projects in a cyclical developmental process using a reflective methodology derived from case study research: defining the question, recording the process, analysing, and reflecting. My practices as case studies are integral parts of this thesis investigation of how projection mapping generates a distinctive relationship.

This study aims to contribute to the body of knowledge about an under-researched area, projection mapping, by providing an in-depth conceptual and practical analysis of this medium. The knowledge resulting from the research is embodied in findings from contextual reviews and original artworks produced as case studies.

Chapter 1. Introduction

1.1 Critical Background—Problem and Perspective

The present research initially grew from my experience as an artist and lecturer with a background in painting but working mainly with digital projection. Projection mapping is a relatively new projection method that can be used to transform objects, often irregularly shaped, into display surfaces. This mode of projection wraps three-dimensional surfaces, from small objects to entire buildings, with digital moving images. By superimposing moving images, projection mapping generates spatio-temporal layers onto a static volume.

My career as a professional artist started with digital media, and my representative medium has become moving-image installations using projection mapping. The process of shifting from painting to digital media greatly affected the content of my work as a practitioner. It made me acutely aware of the distinctive characteristics of digital projection. In fact, in my practice, projection mapping goes beyond its function as a vehicle or medium to become both the subject and object of my works.

This mode of projection has quickly become popular due to technological advances and accessibility in mapping software, moving-image software, and hardware, such as projectors and computers. The rapid development of projection mapping work

has generally been situated in the commercial realm, and there is subsequently a lack of engagement with it beyond its technological aspects. Lukas Treyer points out that the content expressed with this relatively new medium merely uses three-dimensional volumes as canvases, devoid of deep reflection on the underlying concepts.[1] In the majority of projection mapping works, executed as commercial projects or Video Jockey (VJ) performances, the medium is often treated as a surface treatment instrument that merely generates decorative visuals. These practices are open-ended, illustrative improvisations that have obvious objectives to serve commercial promotions or music (e.g., VJ).

However, more artists are utilizing projection mapping to express concepts and ideas, with museums and galleries now showing these types of works. In this context, the lack of a conceptual frame can prevent the proper understanding of diverse practices. As Timothy Emlyn Jones argues, for artistic research in general, 'an advanced theorisation of how knowledge may be embodied or represented by a work of art' is needed.[2] The lack of such a theorisation places projection mapping in an ambiguous position within the contemporary art scene, since neither the existing frame for projected moving-image works, such as experimental film and video installation, nor

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[1] Lukas Treyer, Stefan Müller Arisona, and Gerhard Schmitt, 'Architectural projections: Changing the Perception of Architecture with Light, Live Visuals', Leonardo Electronic Almanac, 19(3) (July 2013), p. 148.

[2] Timothy Emlyn Jones, 'A method of search for reality: research and research degrees in art and design', in *Thinking through Art: Reflections on Art as Research*, ed. by Katy Macleod (London: Routledge, 2013), p. 230.

the approaches found in commercial projects can adequately capture projection mapping's distinctiveness as a creative medium.

Such issues also occur in academia. My teaching experience in the art departments of several universities and institutions has helped shape this research. Despite an increasing demand from both the art academy and students for projection mapping workshops and classes, and despite the growing number of projects in the field, formal literature and research is lacking. *Augmented Reality in Public Spaces. Basic Techniques for Video Mapping* (Donato Maniello, 2015) seems to be the only published book on projection mapping.[3] *The Office of the Future: A Unified Approach to Image-Based Modeling and Spatially Immersive Displays* (SIGGRAPH, 1998) by Ramesh Raskar is the precursor to the scientific approaches to projection mapping as a display technique. Indeed, the existing literature focuses on technological approaches rather than conceptual investigation. Exceptions are rare; Benjamin Knapton's doctoral dissertation, *Using Digital Projection to Evoke Aesthetic Ideas in Performance* (2014)[4] and Eleni-Ino Theodorou's MA thesis, *Architecture as optical machine: A visual deformation through light* (2014)[5] are exceptional works that conceptually investigate

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[3] *Practical Augmented Reality: A Guide to the Technologies, Applications and Human Factors for AR and VR (Usability)* (Steve Aukstakalnis, 2017) partially covers projection mapping as a part of augmented reality.

[4] Benjamin Knapton, *Using Digital Projection to Evoke Aesthetic Ideas in Performance* (unpublished doctoral thesis, Queensland University of Technology, 2014), investigates artists' uses of digital projection in performance to realize an aesthetic idea.

[5] Eleni-Ino Theodorou, *Architecture as optical machine: A visual deformation through light,* (unpublished master's thesis, Université Paris 8 - Spécialité: Arts et Technologies de l'Image Virtuelle, 2014),

projection mapping as a creative medium. This deficit prompted the need for critical reflection that underpins my research. Coupled with my teaching experience as a lecturer, critical reflection on the issue as a practitioner lent impetus to this study's development. I formed the view that a practice-based doctoral study would offer a context of sufficient academic and practical rigour in which to investigate projection mapping. As projection mapping is often considered part of media art or VJing, separate from the contemporary art context,[6] This disregards the continuity of projection mapping within the history of art. My aim is to investigate projection mapping within the continuum of moving-image art history and contemporary artistic practice, to go beyond this partial perspective. To investigate projection mapping in the continuum of projected moving-image installations, my research seeks the unique properties of projection mapping in terms of screen, narrative, and surrounding space, which are constituents of all types of projected moving-image installation works.

My research investigates how projection mapping generates a distinctive relationship between screen, moving image, and space compared to previous forms of projected moving-image works. To find this distinct relationship, I analyse projection mapping's reconfiguration of these constituents through the notions of surface and

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investigates projection mapping's architectural intervention.

[6] The term 'video jockey' comes from the term 'disc jockey,' 'DJ' ('deejay') as used in radio. Music Television Network (MTV) popularized the term in the 1980s. Video jockeying then expanded to incorporate live television feeds and other experiments with multimedia crowd participation. More equipment at the new Danceteria facilitated this collaboration, including real-time visual performances in accordance with music.

depth. In addition to cinema, I will detail the diverse influences from art such as painting, site-specific art, and architecture that enable projection mapping to develop its distinctive relationship.

For an in-depth understanding of projection mapping, my research investigates the aforementioned issues in the contextual review chapters to explore its distinctive characteristics. In the next section, I elucidate the scope of my research, research questions, and research methodology, followed by a thesis overview.

1.2. Research Scope and Key terms

In his 1766 essay *Laocooõn*, Gotthold Ephraim Lessing contends that successful artwork needs to adhere to the specific stylistic properties of its own medium.[7] In his essays in the 1940s, *Towards a New Laocoõn* and *Avant-Garde and Kitsch*, Clement Greenberg celebrates purity as the ideal state of medium-specificity, arguing that works need to be uncontaminated by the influence of other media. The pure material character of a medium thus becomes an autonomous force that communicates nothing outside of its own self-contained properties. Rosalind Krauss, however, claims a 'different specificity'. In *A Voyage on the North Sea: Art in the Age of the Post-Medium Condition*, Krauss problematizes the limitations of the Greenbergian notion of medium, which she defines as 'a medium being made specific by being reduced to nothing but manifest physical properties or essence'.[8]

Krauss argues that medium must be understood as differential; it can never simply collapse into the physicality of technical support. Her concept of 'different specificity' recognizes the complex relationships between different media. Therefore, my research avoids not only the technology-oriented approach that regards projection mapping as a formal container or material condition, but also the medium-specific perspective that attempts to secure the exclusive purity of each medium.

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[7] Lessing, Gotthold Ephraim (1766), *Laocošn*, trans. Edward Allen McCormick (New York: Bobbs-Merrill Company, 1984), p. 91.

[8] Rosalind Krauss, *A voyage on the North Sea: Art in the age of post-medium condition*, (London: Thames & Hudson), 2000, p. 7.

Rather, my research investigates the technical aspects of projection mapping to analyse how its form and content entwine to generate its distinctive characteristics. I also identify the influences of previous projected moving-image installations on projection mapping and examine the historical interactions between them to investigate this medium's distinctive characteristics. In doing so, I seek influences from a wider range of mediums, such as painting, site-specific installations, and architecture. My fundamental view in analysing projection mapping as a creative medium aligns with Richard Shusterman's view:

> What standardly characterizes aesthetic experience and artistic objects is the presence of form. But form, even in painting and sculpture, is not static spatial relations but the dynamic interaction of elements.[9]

As such, my perspective resists Modernist medium-specific views and addresses of the need for formal theories on projection mapping practice. Current superficial projection mapping practice might indeed be understood in the context of Greenbergian medium-specificity, focusing too much on the medium's technical facets that treat surfaces. Instead, I seek to investigate projection mapping's properties through the dynamic interactions between various media and their influences on projection mapping.

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[9] Richard Shusterman, *Pragmatist aesthetics: Living beauty, rethinking art*. (Oxford: Blackwell, 2000). p.7.

Projected moving image

I use ‘moving image’ rather than ‘video’ or ‘film’ to avoid limiting the scope of my research to certain confines. I specifically utilise and investigate digital moving images, but situate them in the long tradition of analogue video and film in projected moving-image art. My view aligns with Catherine Elwes’s notion of moving image:

> Moving-image implies a lack of discrimination between analogue mediums where video was regularly characterized as the poor relation of film. Beyond its blurring of conventional hierarchies and its sense of locomotion, moving image also encompasses the idea that film and video artists have significantly expanded and reframed the traditions of art as well as those of cinema and broadcast television.[10]

Secondly, my scope is ‘projected’ moving images displayed using a projector rather than on a monitor, LED panel, or any other device. The term ‘projection’ is variously used and is therefore a complex word to unpack. However, in the context of this study, I focus on the projection of moving images. The Oxford English Dictionary (OED) describes projection as a presentation of an image on a surface, especially a cinema screen, and an image projected on a surface.

In addition, projection alludes to the conceptual aspect of the work. In the OED,

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[10] Catherine Elwes, *Installation and the moving image*, (New York: Columbia University Press, 2015), p. 5.

the third meaning of projection is ‘the presentation or promotion of someone or something in a particular way.’ Employing this view, I use the term projected moving image to describe artists’ projection of their thoughts and intentions through moving images and onto the projected space. The term ‘projected moving image’ used herein leads to the next terms, screen and surface.

Screen and Surface

My research investigates projection mapping’s distinctive characteristics by comparing it with other projected moving-image works, such as experimental film and video installations. I question the notion of screen in the field of projected moving-image installations. From a technical perspective, the scope of my thesis specifically defines screen as projection screen. The projector screen’s size, installation type, material, and colour are all varied and have multiple aspect ratios.[11]

The word ‘screen’ has various diverging and converging definitions.[12] In the context of my research, I mainly focus on screen’s definition used in film studies and architecture. The OED defines screen as an upright surface for the display of objects

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[11] The most common video projector aspect ratios are 1:1 (square), 2.35:1 (cinematoscope), 4:3 (XGA & SXGA), 16:10 (WXGA & WUXGA), and 16:9 (standard HDTV, 1080p).

[12] In OED, definitions of screen are presented in following categories: Art, Film studies, Computer science, Military, Archaeology, Biochemistry, and Mechanical engineering.

and a flat panel or area on an electronic device, such as a television, computer, or smartphone, on which images and data are displayed. According to the Oxford Dictionary of Film Studies, a screen is a blank, typically white or silver, surface onto which a moving image is projected in a cinema. These are perhaps the best-known definitions of ‘screen’; that is, a neutral, flat plane for an image. The Oxford Dictionary of Architecture defines ‘screen’ as a partition or enclosure separating a portion of a room or church from the rest. In this view, a screen is a divider and mask, making its meaning dichotomous.

As found in the OED definition of projection, the idea of screen as a display leads into the examination of the screen as a surface. OED defines ‘surface’ as an outside part or uppermost layer of something, and an extent or area of material considered as a subject for operations. My research underscores the notion of surface because it is a broader concept than screen as it includes any shape, area, and operation. ‘Screen’ and ‘surface’ are therefore key terms in this thesis in relation to the contextual reviews and my case studies.

Topics not covered in this research

As mentioned earlier, my research does not prioritize the technical aspects of artistic creation using projection mapping. Thus, I will not address the technological features of projection mapping, such as how advanced optical technologies can warp

and distort the moving image in a three-dimensional way. Digital technologies that enable the rendering and viewing methods that are used to map a sculptural object or space are also not included in this research.

In addition, as discussed, my primary focus is the projected moving image from a projector, not the light from different lighting sources, such as bulbs or LEDs. Light installations that employ bulbs or other sources of light, such as Moholy-Nagy's *Light-Space Modulator* (1922-1930) and Julio Le Parc's spatial light installations, are thus not my focus. My research differentiates projected moving-image installations from the light installations that employ other sources of light. As light from bulbs is not able to contain moving images, it does not suit my main research scope (key term), the projected moving image.

My thesis also excludes evaluating viewers or investigating curatorial aspects of projection mapping works. Rather, it analyses only the resulting characteristics that emerge through projection mapping that are distinctive from previous forms of moving-image installations.

1.3. Research Question

My central aim in this thesis is to investigate how projection mapping develops its distinct relationship between screen, moving image, and space in the continuum of projected moving-image works. I attempt to investigate how projection mapping reconfigures the characteristics of projected moving-image installations, **screen**, **narrative**, **and surrounding space**, in its own way. Given the paucity of existing research on projection mapping, this thesis explores the following main research question to add to the overall body of knowledge:

> **What new relationship between screen, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?**

To answer this central question, I develop two sub questions through the course of contextual reviews.

Sub question 1:

> **How does the production process inform projection mapping's integration with its projection surface?**

Sub question 2:

> **What type of narrative does projection mapping generate by integrating moving images and space?**

1.4. Research Methodology

This section presents the methodology used in this thesis. My research first presents literature and practice reviews on screen, moving image and space in projected moving-image artworks. As Gray and Malins argue, artistic research does not simply survey traditional paper-based literature.[13] My research necessarily includes not only literature reviews, but also diverse artworks and digital formats on the web due to the lack of existing scholarship. Therefore, I use the term 'contextual review' to encompass various kinds of information in different media. Chapter 2 and 3 serve as contextual review chapters.

These chapters function as a conceptual ground to find projection mapping's unique characteristics that build its distinctive relationship between screen, moving image, and space. I firstly use a comparative method to situate projection mapping in the continuum of projected moving-image works, experimental film and video installation. Then I discuss influences from the history of art and architecture to seek projection mapping's distinctiveness. As a result, the contextual reviews in Chapters 2 and 3 lead me to develop the specific two sub questions found in Chapter 4.

Accordingly, this practice-based research seeks answers to these inquiries

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[13] Carole Gray and Julian Malins, *Visualizing Research: A guide to the research process in art and design*, (Farnham : Ashgate, 2013), p.14.

through my case studies. Informed by my critical reviews, my three case studies respond to the three research questions (one main question and two sub questions), respectively. Because the contextual reviews alone do not sufficiently address the research questions I devised to construct knowledge, my thesis requires analysis of my projection mapping practices.

1.4.1. Practice-based Research

My research is practice-based rather than practice-led. Therefore, it is important to acknowledge the difference between the two research types in the context of my research. My thesis aims to make original knowledge *through* practice, and to make a contribution to the relevant field by its outcome. In this type of research, practice is the core element that constitutes the research.

According to Christopher Frayling, who provided the initial framework for positioning art and design as research practices, 'the practice-based doctorate advances knowledge partly by means of practice, and the originality, mastery and contribution to the field are held to be demonstrated through the original creative work'.[14] As doctoral degrees in visual arts and design become more widely accepted, a distinction needs to

[14] Christopher Frayling, Christopher. *Research in Art and Design* (London : Royal College of Art Research Papers, Volume 1, Number 1, 1993/4), p. 14.

be drawn between practice-based and practice-led research. The difference between the two terms has been characterized as follows:

> Practice-based Research is an original investigation undertaken in order to gain new knowledge partly by means of practice and the outcomes of that practice.
>
> Practice-led Research is concerned with the nature of practice and leads to new knowledge that has operational significance for that practice.[15]

Linda Candy explains that practice-based research's originality and contribution to knowledge may be demonstrated *through* creative outcomes, which include artefacts such as images, designs, models, digital media, or performances and exhibitions. The main focus of practice-led research, on the other hand, is to advance knowledge *about* practice, or to advance knowledge *within* practice. Such research includes practice as an integral part of its methodology. This type of research may be described in text form and without the inclusion of a creative outcome.

Robin Nelson identifies a triangular model for understanding practice as research (PaR), which incorporates 'know how', including tacit and embodied knowledge, 'know what', knowledge gained through critical reflection, and 'know that', the equivalent of

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[15] Linda Candy, Practice Based Research : A Guide, 2006, pp.1-3.

academic knowledge.[16] At the centre of this model sits the art practice that is imbricated with theory. In this view, my research's contribution is demonstrated *through* my original projection mapping works. While the significance and context of the arguments are described in words, a full understanding can only be obtained by direct reference to my practices. As Peter Dallow explains, practice-based research is not merely *oriented* towards practice, but is quite literally *based upon* or located *in* the specifics of the problem posed, explored, and presented by a particular body of original creative work.[17] In the course of my research, the knowledge associated with my projection mapping installations is more significant because the investigations through my contextual review are not enough to conclude that projection mapping develops a distinctive relationship. Therefore, this thesis necessarily involves my practice case studies to respond to my inquiries.

In this regard, the difference lies in the specific role of practice. If the emphasis is on achieving new knowledge about the nature of practice and how to improve it rather than on creating and reflecting on new artefacts, the research is practice-led. If the emphasis is on the creative process and the works that are generated from that

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[16] Robin Nelson, *Practice as Research in the Arts: Principles, Protocols, Pedagogies, Resistances*. (London: Palgrave Macmillan, 2013) p. 45.

Peter Dallow, 'Representing creativeness: practice-based approaches to research in creative arts' , *Art, Design and Communication in Higher Education*, Volume 2, Issue 1, ed. Susan Orr, March (Bristol : Intellect, 2003), p. 54.

[17] Frayling, 1993, p. 52.

process, the research is practice-based.[18] I have concluded that my study is positioned in the realm of practice-based research because it seeks to uncover knowledge through my practices. Dallow regards the process of creative practice and the exploration and transformation that occur in this process as acts of research itself, where knowledge is gained in the creative act and can be directly attributed to the creative process.[19] My research aligns with this concept and adopts the process of my creative practice as central to my investigation. Creating and reflecting on my practices plays a vital role in generating new understanding of projection mapping.

[18] Linda Candy, ibid, 2006, p. 3.

[19] Peter Dallow, Representing Creativeness: Practice-based Approaches to Research in *Creative Arts, Art, Design and Communication in Higher Education, 2*(1) (March, 2003), (Bristol: Intellect Books) p. 55.

1.4.2. Practice methodology

Reflective cyclical case study

As identified, this thesis is practice-based and involves my creative practice. From this point of view, this thesis mainly employs a case study methodology because I deal with my practices as case studies, to investigate my questions. Robert K. Yin defines the case-study research method as an empirical inquiry that investigates a phenomenon within its context.[20] The case-study method enables a researcher to closely examine the data within a specific context. Gray and Malins point out that in art and design research, a case may be a practitioner's project or a commission. [21] In the context of my research, three projection mapping practice projects will function as the case studies in order to emphasise the critical analysis in response to my research questions. The basic steps of a case study are:

Step 1. Define the Research Questions

Step 2. Collect the Data

Step 3. Analysis

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[20] Robert K.Yin, *Case study research: Design and methods,* 2nd edn (Beverly Hills, CA: Sage Publishing, 1994).

[21] Carole Gray and Julian Malins, *Visualizing Research: A guide to the research process in art and design*, (Surrey: Ashgate, 2004), p. 117.

As Yin identifies, the case-study methodology is considered 'microscopic' because of the limited number of sampled cases. He also discusses that case studies are accused of having a lack of rigor because it is difficult to provide generalisation from a limited number of case studies.[22] Moreover, my informed perspective as a 'practitioner-researcher' may create another disadvantage, making it even more difficult to maintain rigour in the course of the case studies. As Gray and Malins describe, the practitioner-researcher identifies researchable problems raised in practice, and responds through aspects of practice.[23] As a practitioner, my personal experience of making artwork is integral to the development of my practice. However, similar to Michael Biggs' argument, I found it challenging to transfer the subjectivity of this non-transferable tacit experience[24] because my PhD research needs to 'provide a map for other researchers explaining the route by which the outcomes arrive.'[25]

To prevent my case studies from sliding into self-indulgence that lack rigour, the issue of critical distance becomes important. My role as practitioner-researcher[26] entails the 'insider' problem that often poses a barrier to the critical analysis of practice. To

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[22] Robert K.Yin, ibid., p. 10.

[23] Carole Gray and Julian Malins, ibid., p. 20.

[24] Michael Biggs and Daniela Buchler, 'Eight criteria for practice-based research in the creative and cultural industries', *Art, Design and Communication in Higher Education*, 7.1 (2008), p. 14.

[25] Christopher Frayling, 'Research in Art and Design', *Royal College of Art Research Papers*, 1.1, (1993/4), p. 13.

[26] Robson defines this role as 'someone who holds down a job in some particular area and at the same time carries out inquiry which is of relevance to the job'. (Colin Robson, *Real world research*, 1993, p. 446.) This differs from other fields of research such as the sciences, humanities, and social sciences, in which the researcher addresses a problematic phenomenon as a third-party observer.

avoid this trap, I acknowledge that my position of practitioner-researcher encompasses subjectivity as well as critical distance. As Anne Douglas argues, looking at my own creative practice means taking on both a creative and a reflective role.[27] For this purpose, I adapt the basic methodology of case study research in to a 'reflective cyclical case study' to acknowledge subjectivity, involvement and reflectivity.

To achieve this, my methodology for practice utilises a cyclical process of inquiry. In his seminal 1983 book, The *Reflective Practitioner*, Donald Schön details how experienced practitioners possess significant knowledge-in-action. To extract individual knowledge into a form that is transferrable to others, Schön proposed that a process of conscious 'reflection-on-action', composed of both reflecting on 'knowledge-in-action' and 'reflection-in-action', could provide a means for accessing and making implicit knowledge transferrable. According to Schön, reflection-on-action is 'thinking back on what we have done in order to discover how our knowing-in-action has contributed to an outcome'.[28] Interest in the integration of theory and practice, the cyclical pattern of experience, and the conscious application of lessons learned from experience, were central to Schön's development of reflective theory. Through reflection, the 'practitioner can surface and criticise the tacit understandings that have grown up around the repetitive experience of a practice, and can make new sense of the

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[27] Anne Douglas, 'Relationship between practice and research: the crafting of a metaphor', *RADical International Conference Proceedings,* (Aberdeen: Robert Gordon University, 1996).

[28] Donald Schön, *Reflective Practitioner,* (New York: Basic Books, 1984), p. 26.

situations of uncertainty or uniqueness which he may allow himself to practice'.[29]

In the context of my research, self-reflectivity can be understood as a framing instrument to facilitate the critical impact of my subjective experiences. I will use my case studies as a necessary agency, while maintaining some critical distance during the inquiry process. To do this, I adapt the steps of case study method to:

Step 1. Define the Research Questions

Step 2. Document the Process

Step 3. Analyse

Step 4. Reflect

As a result, this cyclical process invests my projection mapping practice with self-reflectivity, and adapts in response to the ongoing evaluation at each phase. In short, self-reflectivity is a critical construction that connects me as the researcher with my practice.

In conclusion, this methodology enables each case study to become part of a larger progressive cycle in which the inquiry process is developed consecutively. As detailed, my practice-based research includes all of my three case studies in response to my research questions. In this way, each practice, and its analysis, is reflected in the next practice in a progressive and phased continuum, allowing the results of each case

[29] Ibid, p. 61.

study to be fed into the next. At the end, the consecutive findings from the case studies address my central research question: what new relationship between screen, moving image and space does projection mapping enable in an artist's projected moving-image work?

To summarise, the methodology of my research draws primarily on the adaptation of case study methodology with Schön's model of reflective practice, wherein reflectivity is the locus of development. To minimise the case study's disadvantages, the research setting becomes far more important. Therefore, in Chapter 4, I identify the detailed research setting and inquiry cycle before the chapters on the three case studies. In the following section, I detail the second step of my research design: Documenting the Process.

1.4.3. Active documentation

My reflective cyclical case study methodology involves documentation of the practice process' as its second stage. As Gray and Malins argue, for practice-based research, good quality documentation is essential because case studies are parts of the bodies of evidence from which to make research arguments.[30] Moreover, unlike more traditional forms of art such as painting, sculpture, and installation, projection mapping is essentially immaterial in that it leaves no permanent physical object, trace, or residue. It also differs from film and video works, which use conventional screens. Whether single or multichannel, installations, film, and video works involve screening materials (walls or separately installed screens), as well as editions similar to prints and photographs. As Joseph Dune writes, film and video provide a definitive, 'unchangeable record'[31] that allows viewers to watch identical works again at any time.

In contrast, projection mapping is essentially incorporated within a space or object and cannot be archived in its original version; once de-installed from the exhibition venue, the artwork disappears. For this reason, projection mapping lacks the durability of art practices such as film and painting, and aligns more with live performance art in terms of transience, because performance's ephemerality provides it

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[30] Carole Gray and Julian Malins, ibid, p. 23.

[31] Joseph Dunne, 'Literature review: Archives, Documentation and Performance', *CEDAR project* (Clustering and Enhancing Digital Archives for Research), 2010, p. 5.

with an identity that separates it from other art disciplines; performance is identified through live actions in space and time before a live audience. In this view, projection mapping is also a temporal live-event that 'cannot endure itself outside of the temporal-spatial zone it unfolds in before an audience'.[32]

Therefore, documentation becomes a critical aspect in projection mapping works. As Kathy O'Dell write, the documentation of the live event provides both a record of it through which it can be restaged and evidence that it actually occurred.[33] As such, the connection between projection mapping and its documentation is, to use Philip Auslander's words, thought to be 'ontological, with the event preceding and authorizing its documentation.'[34]

It is important to acknowledge the scope of documentation in my thesis. Documentation is a huge research area in performance art that has manifold and debatable issues, and one of the important arguments is about the relationship between performers and audiences. Peter Brook and Robert Lepage value the vital interchange and mutual receptions between performers and audiences, arguing that documentary materials do not retain the shared awareness of the atmosphere. These arguments discuss whether documentation fully verifies the live quality of performance art. As my

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[32] Joseph Dunne, *Regenerating The Live: The Archive As The Genesis Of A Performance Practice* (unpublished doctoral thesis, University of Lincoln, 2015), p. 3.

[33] See Kathy O'Dell, 'Displacing the Haptic: Performance Art, the Photographic Document, and the 1970s', *Performance Research: A Journal of the Performing Arts*, 2 (1), pp. 73-81.

[34] Philip Auslander, 'The Performativity of Performance Documentation', *PAJ: a Journal of Performance and Art*, September 2006, Vol. 28, No. 3, 2006, p. 1.

thesis does not involve performative aspects, and my three case studies ran autonomously without performers, I should clarify that issues of performance documentation are outside my research scope. Also, unlike most performances that can be re-staged in different settings, my case studies are singular events that are inseparable from their specific places and times. In short, my practice-based research underscores the significance of documentation as a method because of the ephemerality of projection mapping as a medium. Here, I adopt documentation as an instrument for knowledge construction.

In this view, I use active documentation, adopting its use from Nancy de Freitas as a method through which ideas can be developed during the developmental cycle. The photographic, video, and text-based documentation before, during, and after the practice are integral artefacts in understanding the propositions of my study. De Freitas argues that what is central to this method is the associated reflective practice that is planned activities that engage the practitioner with the relationship between conceptual, theoretical, and practical concerns in a critical manner.[35] In the course of my case studies, I use active documentation as a method to collect the process of my investigative practices because it is unable to analyse them without the documented data due to the ephemeral nature of projection mapping. This methodology functions as an active interim checkpoint incorporated into the research procedure. In my process of

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[35] Nancy de Freitas, 'Towards a definition of studio documentation: working tool and transparent record', *Working Papers in Art and Design 2*, 2002, p. 2.

knowledge construction, active documentation is a practical tool to record the procedure, while at the same time reflecting its outputs into the next practice, therefore maintaining the inquiry cycle in a reflective and progressive mode. This method enables me to uncover the findings associated with the theoretical, conceptual, and practical intentions at each developmental stage of the three case studies.

As Gray and Malins argue, the evidence in case studies may vary. In my research, evidence includes drawings, photos, video recordings and digital 3D models of my case studies that I produced during the course of each case study. These are integral artifacts in investigating the propositions of my study. The medium of transmission then becomes an emergent issue.[36] Because a traditional paper-based approach is not adequate to fully grasp the diverse outcomes of my practice-based research, I chose to build a website as a container for active documentation:

http://yiyunkang.com/phd/appendix.html

This is a flexible platform that can accommodate multiple documentary materials in a way that effectively collects and analyses data and findings. There are three reasons for employing a website as an appendix. First, photographic

[36] Friedman points out that medium of transmission has recently become an emergent issue for the practice-based doctorate and argues that the method of transmission can vary in practice-based research. (Ken Friedman, David Durling, and Paul Gutherson, *Editorial: Debating the Practice-Based PhD*, 2002, p.12.)

documentation inserted in the linear textual thesis is inappropriate to the non-linear medium-specificity of projection mapping, which uses a moving image in a spatial way, requiring documentation in image and video formats. Second, the practices reported in this research are conducted through exhibition settings, and once an exhibition has ended, it is almost impossible to reproduce the work identically. This condition of practice must also be documented in multiple ways. Finally, the website is more sustainable than a DVD, for example, for active documentation. Rather than producing a limited number of DVD copies that remain inaccessible to a wider audience, hypertext offers an effective means of maintaining the documentation in an active way.

In the website, the before, during, and after phases of the practice are recorded in multiple formats. The website includes the following elements:

1. Image-based documentation before/during/after the practice process
2. Video documentation before/during/after the practice process
3. Explanations in text format

First, it contains the study of the exhibition venue before the installation, with drawings and 3D modelling studies. Second, it documents the technical infrastructure of executing the exhibitions. Since the selection of projectors, computers, and software programs depends on the specific conditions of each practice, this is integral to the creation of the work. Finally, the still images and video documentation of the finished installation are also included.

1.5. Thesis structure

The structure of this research is aligned with the practice-based approach. This allows me to unpack how, through the combination and integration of theories and practice, my research investigates projection mapping's novel relationship between screen, moving image, and space.

Chapters 2 and 3 are contextual reviews that explore both the continuity and distinctiveness of projection mapping. In these chapters, I explore bow projection mapping reconfigures previous notions of screen, moving image, and surrounding space, which are constituents of all types of projected moving-image installation works. To investigate this, Chapter 2 presents a comparative analysis on previous forms of projected moving-image art, such as experimental film and video installations, with projection mapping. Then, in Chapter 3, I explore how projection mapping integrates with its projected space in a distinct way from screen-based moving-image installations. This chapter focuses on investigating the relationships between projection, moving image, and surrounding space in projection mapping through the notion of surface and depth.

In the contextual review chapters, I detail historical inputs of art and architecture that influence projection mapping to shape its distinctive relationship between screen, moving image, and space. Therefore, I present diverse critical reviews not only from projected moving-image installations, but also from painting, site-specific art, and architecture. Through Chapters 2 and 3 collectively, I build my specific research

questions that seek how projection mapping develops a distinctive relationship between screen, moving image, and space.

In Chapter 4, I identify why my research requires my own practices as case studies to answer the research questions. Chapter 4 then clarifies the detailed research settings and inquiry cycle for my three case studies.

Chapters 5, 6, and 7 detail the three practical case studies, respectively. The practices were executed in exhibition settings in diverse museums and galleries. During this consecutive developmental process, the findings from each case study feed into the next, providing the conceptual background for each subsequent investigation.

Finally, Chapter 8 serves as the conclusion and summarizes my findings and contributions. It also suggests directions for possible future research.

Chapter 2. Contextual review on screen in projected moving-image work

This chapter presents the contextual reviews for this research offering an account of the notion of screen in projected moving-image installation works. I analyse how screen is employed in experimental film, video installation, and projection mapping in order to compare the differences between them. Through the contextual review, I investigate how projection mapping dismantles the conventional notion of screen and frame.

Apparatus theory[37] regards screen and projector as the main elements of the cinematic apparatus, and argues that film's effects depend on these technical bases.[38] Apparatus theory has limited relevance in my study of projection mapping, but can be usefully adapted to newer projection technologies and moving image consumption. I emphasize projection mapping's apparatus constituents—screen and projection (projected moving image and projected space)—to examine its distinctive relational characteristics. In this view, I focus on how projection mapping facilitates these traits. Found in other projected moving-image arts, whether they use a film or digital

[37] Apparatus Theory is a model of spectatorship and institutions. It was dominant in the 1970s (following the 1960s, when psychoanalytical theories and debates were very popular) and is derived from a combination of Marxist theory, semiotics, and psychoanalysis. This problematic theory is explored by Jean-Louis Baudry, Jean-Luc Comolli, and Christian Metz.

[38] Jean-Louis Baudry, 'Ideological Effects of the Basic Cinematographic Apparatus', *Film Quarterly*, 28(2) (Winter, 1974-1975), p. 40.

projector.

This chapter is a comparative review of projected moving-image installation, experimental film in the 1960-70s, multi-channel video installation in the 1990s, and projection mapping since 2000, with a specific focus on their usage of screen, to contextualise how projection mapping reconfigures the conventional screen by incorporating the physical space or objects as its projection surface. Before I continue to examine the screen, I offer a brief description of experimental film and video installation, and a more in-depth description of projection mapping.

2.1 Experimental film, video installation, and projection mapping

It is hard to demarcate experimental film practices clearly; variously called experimental cinema, expanded cinema, materialist film, avant-garde cinema, or avant-garde film, they overlap and share a fundamental attribute: a mode of filmmaking that rigorously re-evaluates, deconstructs, and subverts cinematic conventions. I use the term ‘experimental film’ in a broad sense to encompass these various practices.

Experimental filmmakers in the 1960s and 1970s focused on the apparatus of film: projector, screen, filmstrip, projected beam, and the ‘present tense’ of the experience as a one-off cinematic event. In 1974, Hans Scheugl and Ernst Schmidt,

Jr. wrote that expanded cinema describes the impulse to bring film back to its value as a medium, liberated from any narrative quality of cinema.[39] Experimental film artists in the 1960s and 1970s were primarily concerned with the properties of the projected beam and being present with the viewer. Chrissie Iles observes that artists have expanded film by contradicting it and reducing it to its constituent parts to explore their inherent qualities.[40] Elwes argues that experimental filmmakers in the 1960s and 1970s were principally concerned with the sculptural and phenomenological properties of the projection beam and the spatial relationship between the projector and image. [41]

In the early days of video art, projection was rare, in part because image quality was poor compared to film projection.[42] By the late 1980s, the quality and reliability of digital projection had improved dramatically and the cost decreased. This brought accompanying changes in the video art scene, as a growing number of artists began to use large projections as display methods. While early electronic video artists in the 1980s generally used television monitors as display devices,[43] the second generation of

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[39] Volker Pantenburg, 'Migrational Aesthetics: On Experience in the Cinema and the Museum', *Moving Image Review & Art Journal*, 3(1) (2014), p. 29.

[40] Chrissie Iles, in Catherin Elwes, *Installation and the moving image*, (New York: Columbia University Press, 2015) p. 167.

[41] Catherin Elwes, *Installation and the moving image*, (New York: Columbia University Press, 2015) p. 172.

[42] Peter Campus and Keith Sonnier attempted a video projector installation in the early 1970s, but, due to its disappointing quality, they described it as 'not only prohibitively expensive, but ludicrously unfaithful to the transmitted image'. (John Ravenal, *Outer and Inner Space: Pipilotti Rist, Shirin Neshat, Jane and Louise Wilson, and the History of Video Art,* (Seattle, WA: University of Washington Press, 2002), p. 1.)

[43] Early video artists questioned the properties of the TV monitor in relation to the broadcasting system with a critical awareness of its effects on people's consciousness and perception. Eleanor Hearty points

video artists in the 1990s began to incorporate large-scale projections instead of monitors. This transition prompted significant changes not only in the display mode, but also in content. Chrissie Iles notes how large digital projection triggered an unprecedented change in video installation, with a crossover and merging of the languages of video and film.[44] It actively adopted cinematic conventions to renew the norms of mainstream cinema's structure.

An in-depth investigation of projection mapping is necessary because projection mapping is a relatively new medium that is less familiar than other forms of moving-image art, such as experimental film or video installation. Indeed, there are several terms to describe such works, including 'spatial augmented realty', '3D mapping', and 'video mapping'. My research uses 'projection mapping', which is the most widely used term, not only because it is broadly accepted, but also because it best captures the nature of the medium. '3D mapping' restricts the understanding of projection mapping to a medium that only uses physically three-dimensional materials, and 'video mapping' does not cover the diverse digital image sources used in projection mapping works, such

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out that the role of early video art was to break down the rhetorical devices of commercial media to expose their manipulations and mendacity. (Eleanor Heartney, *Video Installation and the Poetics of Time* from *Outer and Inner Space* (Virginia Museum of Fine Arts, 2002), p. 18.) Artists such as Nam June Paik and David Hall adopted a television monitor as an aesthetic and communicative instrument to reject the blind acceptance of television's image production. Here, the relationship between the displaying medium (TV monitor) and its content was unavoidable and of paramount interest. As Wolf Vostell asserted in 1970, 'we don't need (broadcasting) program time to show our works, we want to do something with the medium of electronics, with the channel of information'. (Wolf Vostell, interviewed by Wolfgang Becker, in Wolf Vostell Elektronisch, exh. cat., *Neue Galerie der Stadt Aachen*, p. 10., p. 25.)

[44] Chrissie Iles, 'Issues in the New Cinematic Aesthetic in Video', in *Saving the Image: Art After Film*, (Glasgow: Centre for Contemporary Arts, 2003), p. 132.

as computer-generated images and motion graphics.

Projection mapping uses projection technology to turn objects or spaces into display surfaces for moving imagery. These can be irregularly shaped objects or complex landscapes, such as buildings, small indoor objects, or theatrical settings. By using specialized software, imagery is spatially mapped on the real environment onto which it is to be projected. Software distorts images to fit the surface of the target object. By warping moving imageries to fit any surface of a three-dimensional volume, it can manipulate viewers' perspective and trick their eyes. This illusion is an important character of this medium. Thus, projection mapping has rapidly attracted many artists, designers, architects, and advertisers who intend to add extra dimensions, optical illusions, and notions of movement onto normally static objects. In addition, projection mapping is commonly combined with, or triggered by, audio to create an audio-visual narrative.

Figure 2.1. Basic concept of projection mapping © Projection Mapping Central

Ramesh Raskar writes that projection mapping offers a method for realizing compelling illusions of virtual objects coexisting with the real world. The images could appear in 2D on a flat display surface or be 3D above a planar or irregular surface.[45] Via the superimposition of a virtual layer over something real, projection mapping changes a viewer's idea of a geometric volume to create perceptually different spaces and/or to deliver a message. The formal characteristics and meanings of the structure are taken into account, and the boundaries between the digital realm and the actual space are conflated into a 'spatial augmented realty' environment, which was the initial term to describe projection mapping.

In terms of creative potential, projection mapping is undergoing rapid growth. Recent developments combine projection map ing with real-time tracking technology, thus enabling mapping onto a performer or object in movement, opening even more dynamic possibilities. Due to its flexibility to map any object or space regardless of scale, projection mapping often creates audio-visual spectacles that attract massive audiences. As presented in Figure 2.2, these kinds of works create fascinating effects emphasizing spectacular visuals, rather than pursue concept or content-driven works; this superficial spectacles embrace projection mapping. However, rather than its superficial character that highlights technical implementation, my research attempts to develop the conceptual understanding of projection mapping as a creative medium.

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[45] Ramesh Raskar, Greg Welch, and Henry Fuchs, 'Spatially Augmented Reality', *First International Workshop on Augmented Reality*, San Francisco, 1 November 1998. <http://web.media.mit.edu/~raskar/UNC/Office/0~IWAR_SAR.pdf> [accessed February 2017]

Therefore, I focus on non-commercial mapping projects created by artists and media art collectives, as opposed to commercial projects.

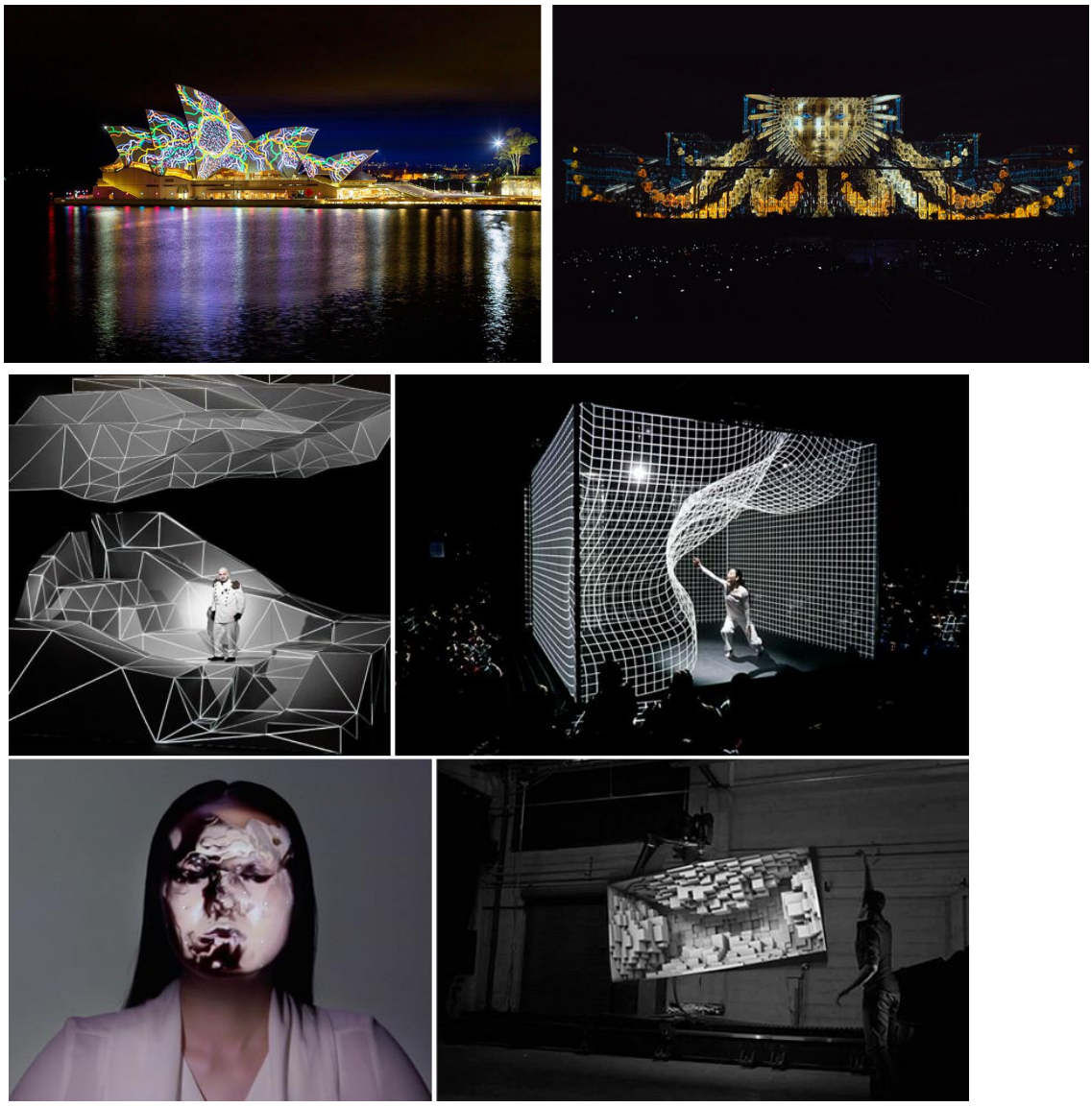

Figure 2.2. Examples of recent projection mapping works:
Universal Everything, *Living Mural* (2015, Sydney Opera Hose) © Destination NSW
Limelight, *Interconnection* (2016) (iMapp Bucharest Winner) © Limelight
URBANSCREEN, *Idomeneo* (2011, operatic staging) © URBANSCREEN
Adrien M / Claire B, *Hakanai*, (2013, performance setting) © Courtesy of AMCB-HKN
Nobumichi Asai, *Omote* (2015, real-time face tracking & projection mapping) © Nobumichi Asai
Bot & Dolly, *Box* (2013, projection mapping combined with robot, real-time tracking). © gmunk

In the late 1990s, several corporations and researchers began studying the technological aspects of projection mapping. Disney (1994) and General Electric (1997) were pioneers who had the earliest patents on spatial projection technology. In 1998, Ramesh Raskar, Greg Welch, and Henry Fuchs presented 'The office of the future: A unified approach to image-based modelling and spatially immersive displays' at the Special Interest Group on Computer Graphics and Interactive Techniques (SIGGRAPH) conference. This early work on projection mapping investigated the technological features of the medium from engineering and computational perspectives. For example, the issues addressed included how to interactively modify projected images for vivid and realistic projection with applications to amusement and optical engineering,[46] or a method to precisely superimpose images of computer models onto corresponding physical objects in a physical space.[47]

Since 2005, the advent of inexpensive, off-the-shelf mapping software elicited even more changes. Earlier mapping software, such as Isadora (2002), VDMX (2005), and MadMapper (2011), enabled artists to more easily use projection mapping. In 2017, there are approximately 30 different mapping software programs available.[48] As the

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[46] Disney, Apparatus and method for projection upon a three-dimensional object, 1994 (Patent number : US5325473 A)

[47] General Electric, Projection of images of computer models in three dimensional space, 1997 (Patent number: US 5687305 A).

[48] Projection mapping software run on different operating systems (Code: 7, Mac OSX: 16, Window: 20,

amount of free, open-source mapping software increases, so too does the quantity of projection mapping works.[49] Recent technological advances in projectors and computers have also contributed to the rapid growth of projection mapping practices.

However, projecting imagery onto arbitrary, complex surfaces has a long history in the trajectory of art. My research attempts to analyse projection mapping in the continuum of spatial projected moving-image works, and my focus does not prioritize the technical aspects of the medium. To investigate projection mapping as distinct from previous forms of moving-image installations, it is thus important to trace the connections and differences between previous works and projection mapping. Therefore, the next section presents a comparative analysis of previous projected moving-image works and recent projection mapping works.

Linux: 4, iOS: 2, Media Servers: 8, Hardware: 8). Some run on many systems, and others are exclusively run on a single system. Also, software such as Spalsh, Frameworks, and MadMap are open-source, free software, lowering the barrier of cost to artists' entry.

[49] Bruce Sterling, 'An illustrated history of projection-mapping', *WIRED* (October 2016) <https://www.wired.com/2013/10/an-illustrated-history-of-projection-mapping/> [accessed February, 2017]

2.2. Projection and Screen

Having detailed what projection mapping is, in this section I will explore how projection mapping dismantles and reconfigures previous uses and notions of screen, which differentiates it from screen-based projected moving-image works, such as experimental film in the 1960s and 1970s and video installation, which emerged in the 1990s.

There are various examples in 1960s and 1970s experimental film works that played with layers of superimposition, split screens, and multiple-screen projections to provide a catalogue of resistance to the dominant form of cinematic display. For example, Paul Sharits's *Shutter Interface* (1975, Figure 2.3), is an optical work with strobing colour sequences that uses four 16mm film projectors in loops, overlapping four projections of varying lengths and flicker effects.

Figure 2.3. Paul Sharits, *Shutter Interface* (1975) © copyright Anthology Film Archives

Filmmakers such as Malcolm LeGrice and Lis Rhodes (Figure 2.4) also elaborated on projection installations beyond the standardized formation of the cinematic apparatus, which is composed of a single screen with the direct positioning of the viewer in front of the proscenium screen. Instead, they emphasized multiple, parallel, and opposite arrangement of screens in space to explore cinema's technical parameters and material-spatial components.

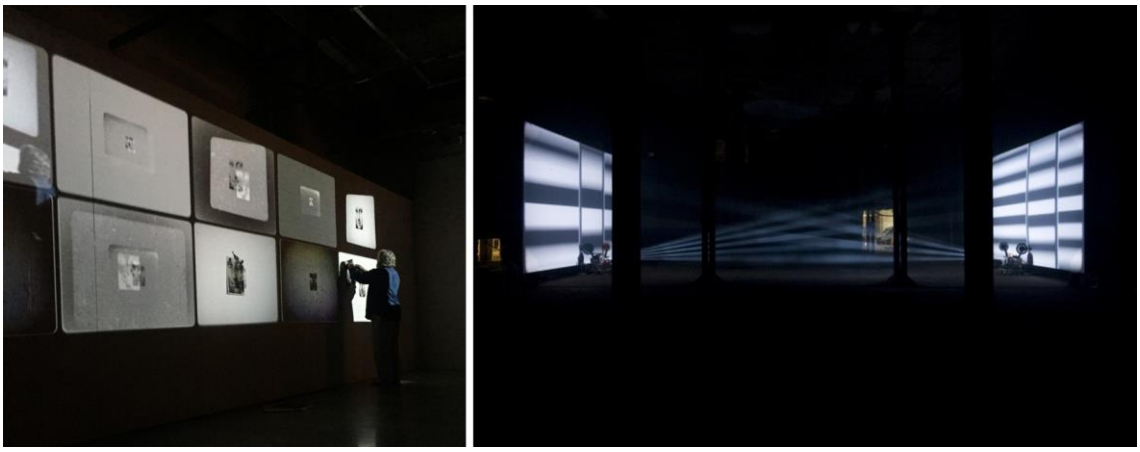

Figure 2.4. Malcolm le Grice, *After Leonardo* (1973) © Photo Josh Huxham;
Lis Rhodes, *Light Music* (1975) © photo, Lucy Dawkins Copyright Tate

However, most experimental film works do not actively challenge the given shape and proportion of the conventional screen inherited from cinema. Though they experiment with multiple, merged, and superimposed projections, they mostly remain constrained to the default proportions of the screen, maintaining the rectangular frame. Even in the case of recent experimental film works, they do not truly reconfigure the proportioned screens within such frames because it is not their primary concern. Simon Payne's *Primary Phases* (2012) and Neil Henderson's *Black and Light Movie* (2013), for example, present diverse experiments with the materiality of film strip and projection; however, their works do not radically challenge the notions of the screen and its rectangular frame, as shown in Figure 2.5.

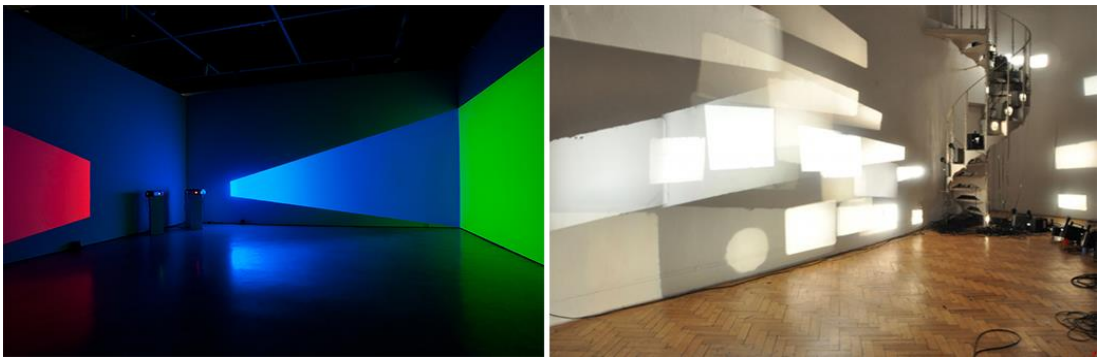

Figure 2.5. Simon Payne, *Primary Phases* (2012), Neil Henderson, *Black and Light Movie* (2013).

Video installation since the 1990s also has not, on the whole, restructured the canonical use of screen and frame. As seen in Figure 2.6, despite the differences in concept, narrative, and spatial arrangement of screens, most multi-channel video

installations treat the screen as a container, a passive surface for moving images. While they might detach the screen from the wall by locating it in the middle of a space, they do not radically alter the conventional screen within a frame inherited from cinema.

Rather, video installation adopted the formal characters of cinematic screen to disrupt the cinematic narrative of the theatre setting. Jihoon Kim writes that Doug Aitken's and Eija-Liisa Ahtila's works (Figure 2.6) illustrate the adoption of multiple projections onto several screens as a way of distributing images within spaces. Their works are different from the self-reflexive inquiry of early video practices using television monitors to interrogate TV broadcasting systems.[50] Rather, the two artists shift the location of large-scale projection works from the theatre to art spaces (gallery or museum) to renew images' narrative spaces in different ways than cinema and to explore the images' impact outside the normative cinematic apparatus.

[50] Jihoon Kim, *Between Film, Video and the Digital: Hybrid Moving Images in the Post-Media Age*, (London: Bloomsbury Academic, 2016) p. 269.

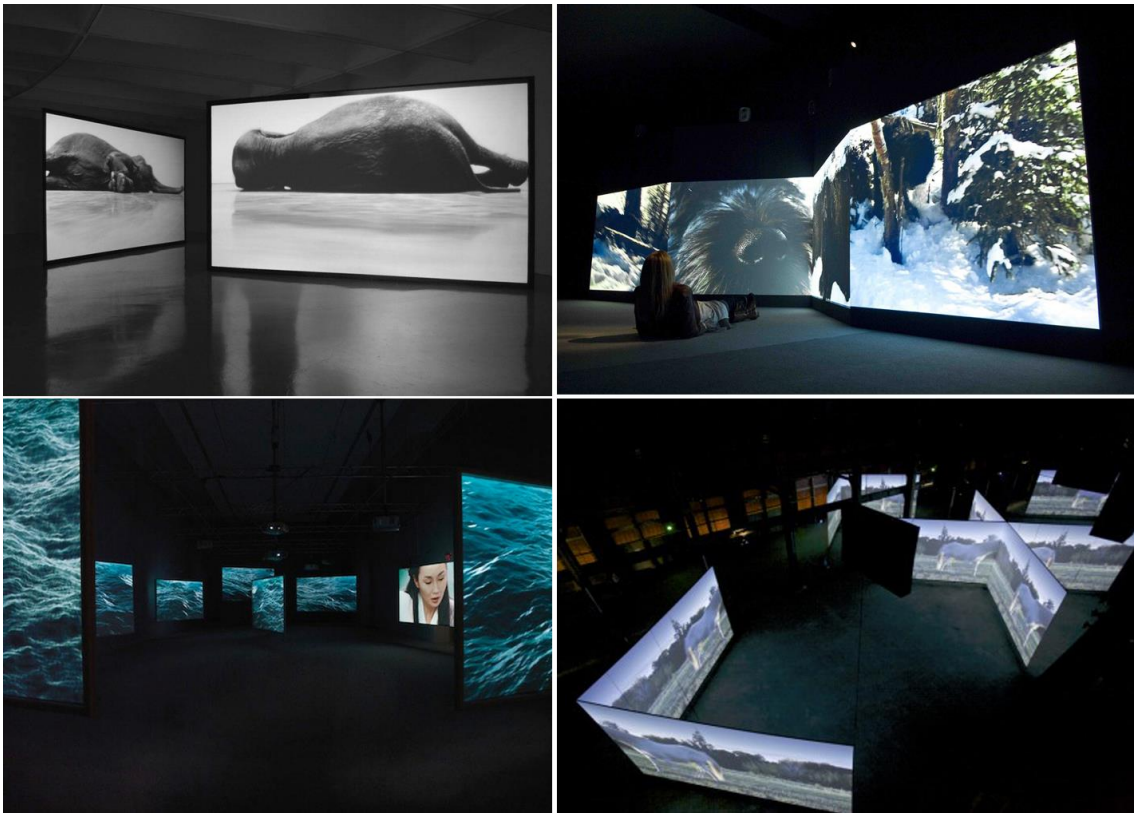

Figure 2.6. From top left:
Douglas Gordon, *Play Dead; Real Time* (2003) © Courtesy of the artist;
Eija-Liisa Ahtila, *The Hour of Prayer* (2005) © Crystal Eye Ltd Helsinki Courtesy Marian Goodman Gallery;
Issac Julien, *Ten Thousand Waves* (2010) © Courtesy of the artist and Victoria Miro Gallery;
Doug Aitken, *Altered Earth* (2012) © Doug Aitken Workshop and LUMA Foundation 2012

As a result, the two-dimensional flat surface of the screen within the fixed, proportioned frame was not actually renewed or transformed from cinema conventions in most experimental film and video installation works. Whether using purely abstract images (Paul Sharits, Malcolm Le Grice, and Lis Rhodes), live action-based narrative images (Douglas Gordon, Doug Aitken, and Issac Julien), or hand-drawn animation

(William Kentridge), and whether they consist of single or multi-channel projections, most of these projected moving image works adhere to the conventional screen within a frame, which is the default mode of the projector.

2.3. Screen, Phenomenology, and Passivity

To investigate projection mapping's distinctive screen configuration, it is important to analyse how experimental film and video installation's use of screen hardly differs from that of cinema. In this section, I will identify how experimental film and video installation's screen is still conventional, treating it as a passive container.

Since its translation into English in 1962, Maurice Merleau-Ponty's philosophy, influenced by the work of Edmund Husserl, has had a wide-reaching influence on visual art. Paul Crowther suggests that phenomenology's influence in visual arts rests on the basic condition of existence, which is that visual arts occupy space.[51] By centralizing the corporeal relationship between artwork and space, visual arts, such as minimalist sculpture and installation art, exemplify the reciprocal interaction of work and environment most central to the space-occupancy.

Building on this, a number of theorists and critics posit phenomenological interpretations of projected moving-image art. They emphasize what they identify as a sculptural or environmental quality in the works. Christiane Paul, for example, argues that even though Merleau-Ponty's theories do not seem directly related to notions of digital light, they are in fact important to the role light plays in the projected

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[51] Paul Crowther, *Phenomenology of the Visual Art (even the frame)* (Palo Alto, CA: Stanford University Press, 2009), p. 25.

environment and the way the viewer relates to the screen.[52] Many theorists, like Kate Mondlock, argue that experimental film and video installation's employment of multiple screens develop active space, distinct from the passive viewers associated with cinema. She writes that non-cinematic installation of screens was assumed to 'inevitably produce active, empowered spectators categorically distinct from the passive viewers associated with illusionist cinema.'[53]

In *The Return of the Flâneur* (2000), Dominique Païni describes the viewer of a video installation in an art museum as a flâneur who cohabits with the projection.[54] In the sense that the visitor is not forced into the proscenium viewing position of a theatre spectator, video installation may seem to encourage the physical freedom of the mobile spectator to some extent. To Païni, the mobilization of the spectator is a step toward active collaboration. However, as Volker Pantenburg argues, Païni's analogy between the flâneur and the gallery/museum visitor disregards that the street and urban space, the necessary medium for a flâneur, is based on an entirely different concept of publicness than the museum and the gallery.[55]

Similar to Païni, Margaret Morse also distinguishes video works from cinema,

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[52] Christiane Paul, 'Mediations of Light: Screens as Information Surfaces' in *Digital Light*, (edited by Sean Cubitt), (London : Open Humanities Press, 2015) p.183.

[53] Kate Mondloch, *Screens: Viewing Media Installation Art* (Minneapolis, MN: University of Minnesota Press, 2010), p. 61.

[54] Dominique Païni, 'Le Cinema Expose: Flux Contre Flux', *Art Press*, 287, (2003), p. 25.

[55] Volker Pantenburg, 'Migrational Aesthetics : On experience in the cinema and the museum' *MIRAJ*, Volume 3, Issue 1, (April 2014), p. 33.

painting, and photography, because the former are kinaesthetic, while the latter are proscenium.[56] According to Morse, video installation, as opposed to proscenium art, invites the viewer to physically participate. Païni, Mondlock and Morse argue that this spatial development of images on one or several screens actively involves the viewer by enhancing their freedom in mobility, similar to installation art. These interpretations find common ground in a phenomenological analysis of facilitating space.

However, my research questions whether the dismantling of the single frontal screen truly gives spatial freedom to viewers, and realizes the phenomenologically activated relationship between the work, viewer, and surrounding space. I propose that the major flaw of this argument is equating viewers' temporal freedom (i.e., less control of durational engagement than cinema) in projected moving-image installations with their freedom of movement and their active participation.

A.L. Rees claims that the key difference between cinema and experimental film is whether or not a work is predetermined. Cinema is already made, as the record of an event that has previously taken place, and so can be recognized independently of its projected instantiation. Conversely, expanded cinema is made in and through its projection that takes place in real-time.[57] William Raban also argues that expanded cinema has a special place within film history due to the way it dissolves clear

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[56] Margaret Morse, 'Video Installation Art: The Body, the Image, and the Space-in-Between', in Doug Hall and Sally Jo Fifer (eds.), *Illuminating Video* (New York: Aperture, 1990), p. 155.

[57] A.L. Rees, 'Expanded Cinema and Narrative: A troubled history', in *Expanded cinema: Art, performance, film*, (London: Tate Publishing, 2011), p. 14.

distinctions between time of production and time of exhibition. For example, viewers of Rhode's *Light Music* experienced the work in the present tense rather than following the pre-recorded, finished narrative of cinema.

In experimental film, the narrative space of cinema is thus collapsed into an encounter with the lived, watching experience. Experimental filmmakers attempted to disrupt narrative cinema's temporal order, which aims to bring spectators into the pre-recorded realm contained within the screen. Malcolm le Grice attempted to alter this order by making the spectator's temporal encounter with the work primary. He thereby demonstrated how experimental filmmakers increased the spectator's awareness of their own physical presence in the space of projection.[58]

The activated viewer in experimental film installations originates primarily from the temporal character that is distinctive to cinema. By prioritizing present tense, film projection can generate duration of experience, in and through which it dissolves clear distinctions between time of production and time of exhibition. Le Grice notes that the notion of duration implies a subjective awareness that belongs to the spectator.[59] The concept of viewers as active participants of experimental film was thus initiated by the liveness of their temporal engagement with the moving image, not by the spatial deployment of multiple projections. In contrast to the illusionary effect of cinema that

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[58] Malcolm Le Grice, 'Time and the spectator in the experience of expanded cinema', in *Expanded cinema: Art, performance, film*, (London: Tate Publishing, 2011), p. 163.

[59] Ibid, p. 169.

takes viewers into a separated realm and makes them forget about reality, experimental film works make them aware of the specific here-and-now while facing the projected screen. Indeed, this awareness does not necessarily involve the actual spatiality of screen.

Similarly, in the case of video installations, the installation of multiple screens does not really challenge the cinematic proscenium spatiality, but alters the temporal autonomy of the viewer. Kate Mondloch's term 'exploratory duration' describes a length of time spent viewing the work that is different from cases of institutionalized cinema in ways 'unburdened by externally imposed timetables'.[60] Maria Walsh's term 'peripatetic mobility' also explains the 'mobile trajectory of the gallery spectator who enters the space at an arbitrary point in the film, leaves at any time or stays and watches the replay of the loop'.[61] Both Mondloch and Walsh underscore the temporal flexibility of video installations compared to cinema.

In *Roundtable: The Projected Image in Contemporary Art* (2003), Anthony McCall argues that gallery visitors are typically motionless in installations with projected film and video, and that they do not look at video screens and sculptures in the same way.[62] George Baker also claims that viewers automatically form a cinematic

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[60] Mondloch, *Screens*, p. 41.

[61] Maria Walsh, 'Cinema in the Gallery – Discontinuity and Potential Space in Sally Tykka's Trilogy', *Senses of Cinema*, 28, (2003), <http://sensesofcinema.com/2003/cinema-and-the-gallery/salla_tykka_trilogy/> [accessed April 2016].

[62] Anthony McCall, 'Roundtable: The Projected Image in Contemporary Art', *October*, 104, (2003), p. 76.

arrangement for themselves before a video installation, which then becomes 'just another kind of theatrical cinematic product'.[63] Iles notes that when people see a moving image installation, their immediate reaction is to stand still and watch it.[64] Anne Friedberg argues that the spectator is not actually moving, as his or her head and body remain relatively immobile.[65] In the *Transmediale Conference* 07, Timothy Druckrey also asserts that video projection installation is about passivity; to be standing still is to be an observer.[66] Collectively, these arguments suggest that video installations do not actively reconfigure the conventional spatial setting of cinema theatre. Rather, the spatial deployment of multiple screens seeks to deconstruct the linear narrative and temporal modes of cinema.

Thus, the relationship between space and screen in both experimental film and video installation changes little from the cinematic setting. While museums, private galleries, and alternative spaces were cleared of seats for experimental film projection events and multi-channel video installations, the viewing arrangements and canonical screen in fact remained unchanged from cinema. As Elwes claims, simply walking past a single- or multi-channeled projection does not give substantial freedom to viewers. In terms of movement, spectators have limited spontaneity in that they need to pause at

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[63] Ibid, p. 92.

[64] Ibid, p. 93.

[65] Anne Friedberg, *The Virtual Window: from Alberti to Microsoft*, (Cambridge, MA: MIT Press, 2006), p. 162.

[66] Diedrich Diederichsen [de], Inke Arns [de], Olia Lialina [ru/de], Timothy Druckrey [us], 'Media Art Undone Discussion', *Transmediale Conference* 07, Berlin, 2007 <https://pastwebsites.transmediale.de/site07/111.html> [accessed June 2016].

their ideal viewing positions, just as they would in a cinema.[67]

In my study, it is important to investigate the passive relationship between the conventional screen and the space to find how projection mapping's reconfiguration of screen generates a distinctive relationship with the projected space. To explore this, I refer to Catherine Elwes, Anne Friedberg, and Andrew V. Uroskie's views on frame. Elwes claims that cinema's frame is 'the stage for the interplay between the *dramatis personae* of line, form, texture, colour, rhythm, and time rushing through the field of vision and into the space of the imagination.'[68] A cinema's reality is thus circumscribed by the frame, and viewers maintain the distinction between the two realities with the help of the screen frame. To Elwes, frame is 'the fixed boundary that delimits the image, a demarcation line constantly hovering on the periphery of vision'[69] that invites viewers to a virtual, illusionary world that is separated from the real space. Friedberg also writes that the screen's frame marks a separation—an 'ontological cut'—between the material surface of the wall and the view contained within the frame's aperture.[70] The cinematic framed screen, whether it uses the wall or a freestanding screen, and whether it is single- or multi-channel, has an inherent border that separates the real world from the world of moving images.

Andrew V. Uroskie argues that previous projected moving-image works have

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[67] Catherine Elwes, *Installation and the moving image*, 2015, p. 155.

[68] Ibid, p. 33.

[69] Ibid, p. 147.

[70] Anne Friedberg, *The Virtual Window*, p. 157.

two different places: the ‘represented place’ inside the screen and the ‘taken (exhibited) place’ outside the screen (the actual location of the moving-image screen).[71] The rectangular screen circumscribed by a frame demarcates the two discrete sites. In this system, the represented site and the exhibited site cannot be integrated in experimental film and video installation works. Uroskie’s description of the two discreet places of most projected moving-image works, the ‘represented place’ and ‘taken place’, also aligns with Elwes’s and Friedberg’s notions on the conventional screen as an ontological division. Multi-channel projected installation works draw a clear distinction between the ‘represented place’ inside the screen and the ‘taken (exhibited) place’ outside the screen. Here, the two spaces can never be integrated. Distinctively, projection mapping does not separate the represented place from the exhibited place, because the former is superimposed onto the latter.

Projection mapping does not bring a viewer’s gaze to a separated reality contained inside the screen and does not detach the moving images from the surrounding space. As seen in Figure 2.2, projection mapping incorporates any type of surface for projection and merges with the surrounding environments. It superimposes the represented place onto the surface of taken place. This augmentation is enabled by projection mapping’s overturn of the conventional screen delimited by frame. Projection mapping dismantles the previous notion of conventional screen and abolishes the

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[71] Andrew V. Uroskie, *Between the Black Box and the White Cube: Expanded Cinema and Postwar Art,* (Chicago, IL: University of Chicago Press, 2014), p. 6.

ontological cut created by the frame's constraints. This reconfiguration of the canonical screen is an essential attribute of projection mapping that distinguishes it from other projected moving-image works, which place discrete screens as separated objects, and develops a distinctive relationship with the projected space.

Most experimental film and video installations, then, have not seriously questioned or challenged the screen circumscribed by frame inherited from cinema. Even though both experimental film and video installation subvert cinematic conventions and find alternatives to traditional cinematic narratives or methods, their display modes remain unchanged. Their primary intention may be to deconstruct cinematic norms, but their results are greatly influenced by cinema. As such, the relationship between the screen and projected space remains unchanged.

There are several terms adopted to describe those works. 'Experimental film', 'structural film', and 'expanded cinema' all imply connections to film and cinema. In addition, critics and theorists have offered even more terms. Jean Christophe Royoux's 'cinéma d'exposition (cinema exhibition)' (1997), Dominique Païni's 'cinematographic images' (2000), Catherine Fowler's 'gallery films' (2004), Maeve Connolly's 'artist cinema' (2009), Juliane Rebentisch's 'cinematic installation' (2012), Raymond Bellour's 'autre cinema (other cinema)' (2012), and Jihoon Kim's 'cinematic installation' (2016) all directly refer to the inextricable relationship of artists' film/video

installations with cinema. [72] Maintaining the cinematic display mode makes experimental film and video installation inextricably connected to cinematic concerns.

In contrast, projection mapping disrupts the passive relationship between screen and space by abolishing the conventional screen. In this perspective, it is important to investigate the exceptional works in the 1960s that actively challenged the canonical screen and used a mapped screen with projection. These works are detailed in the next section, investigated projection, were freed from a fixed, proportioned frame and formed a close relationship with their surrounding space in diverse ways.

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[72] Jean-Christophe Royoux in 'exhibition Cinema: the spacing of the term' in *Art Press* (2000), Maeve Connolly in *The Place of Artists' Cinema: Space, Site and Screen, Intellect* , (Bristol / Chicago, University of Chicago Press, 2009), Juliane Rebentisch in Gabriele Knapstein: Filmic projections beyond Cinema: From expanded cinema to the cinematographic installation, *Beyond Cinema-The art of projection*, (Berlin, Hatje Cantz, 2007), Raymond Bellour in 'Of an Other Cinema'. *Black Box Illuminated*, ed. Sara Arrhenius, (Propexus, Sweden, 2003). Jihoon Kim in *Between Film, Video and the Digital: Hybrid Moving Images in the Post-Media Age*, (London: Bloomsbury Academic, 2016), Malcolm Turvey in Round Table: The Projected Image in Contemporary Art : *October*, Vol. 104 (Spring, 2003), Kate Mondloch in *Screens: viewing media installation art*, (Minneapolis, MN: University of Minnesota Press, 2010), Catherine Elwes in *Installation and the Moving Image* (New York: Columbia University Press, 2015)

2.4. Projection without frame

A few exceptional early works employed film projection more spatially beyond the rectangular, framed screen. In *Shower* (1964), Robert Whitman projected a film of a woman washing herself under a showerhead onto shower curtains, with actual steam and running water. Although her figure was a filmed projection, the life-sized projection coupled with the real running water appeared alive.

Figure 2.7. Robert Whitman, *Shower* (1964)
© courtesy of the artist

James Turrell is known for his coloured fluorescent light installations, but his early works used projected light, what he called 'cross corner projections'[73], and he articulated projection in sculptural ways. In *Afrum (White)* (1967, Figure 2.8), Turrell projected light onto the wall without screens. These early projection works allowed projected light to have a physical presence in the space, oscillating between materiality and immateriality. Eugenia Fratzeskou states that Turrell's early projection works 'constitute a representative case of *in situ* intervention, in which light and space play dominant roles'.[74]

Figure 2.8. James Turrell *Afrum (White) cross corner projection* (1996)
© Photo 2013 Museum Associates, LACMA

[73] Craig E. Adcock, James Turrell, *James Turrell: The Art of Light and Space*, (California: University of California Press, 1990) p.28.

[74] Eugenia Fratzeskou, *REVEALING INTERSTITIAL SPACES. PART 2*, (2011)
< http://www.digicult.it/digimag/issue-064/revealing-interstitial-spaces-part-2/> [accessed March 2016].

In his ‘light sculptures’, Anthony McCall used projection to discard the conventional screen. *Line Describing a Cone* (1973) was made from a beam of light emitted from a film projector. The animated film of a thin, arcing line gradually came together to become a complete circle, tracing the circumference of the circle as a projection on the far wall, while the beam took on the form of a three-dimensional hollow cone. Mist from smoke machines gave the projected light a dense volume, making it appear tangible. As a result, the ephemeral light of the cone, which viewers could enter, could be seen as either convex or concave. McCall’s light sculptures were devoid of the conventional screen, and used a three-dimensional space for projection.

Figure 2.9. Anthony McCall, *Line Describing a Cone* (1973)

Turrell's and McCall's works exemplified how projected light can dismantle the conventional screen and integrate it with architectural space. However, the projected light in their works was used in a similar way to the light from bulbs that are devoid of any figurative or narrative elements. In this perspective, these works do not perfectly align with projection mapping, which superimposes the content of moving images onto real surfaces.

Other examples can be found in Hans Walter Müller's and Michael Naimark's projection pieces in 1970s and 1980s. In the late 1970s, Müller projected still images of shapes and colours onto the outer and inner surfaces of public buildings and geometrical structures. His *Topoprojections* series was applied to various sites and monuments.[75] In the 1980s, he further extended his experiments to the surfaces of inflatable structures. In *Topoprojections on Inflatables* (1980), Müller used semi-spherical, transparent, and malleable architectural objects as screens. Though Müller used a slide projector to cast static images on the entire exterior of buildings, his projections are distinguished from Turrell's and McCall's works because the projected images were literally incorporated with the space and requires viewers to enter and examine the space, similar to projection mapping.

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[75] Les Baux de Provence (1979), Troyes Cathedral (1981), Tokyo (1990), Florence (1993), New Palace of the Republic in San Marino (1996), and the Church of Santo Spirito in Florence (1998). Eleni-Ino Theodorou, *Architecture as Optical Machine: A Visual Deformation through Light*, (Master thesis, Universite Paris 8 and Ecole des Beaux-Arts d'Atehenes, 2014), p. 9.

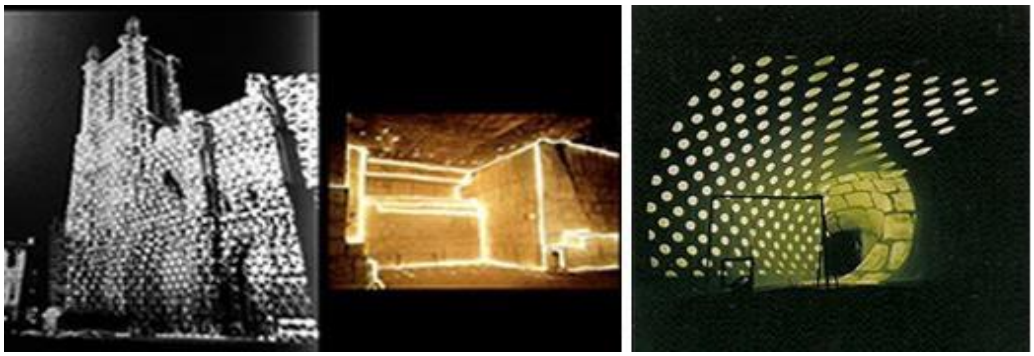

Figure 2.10. Hans Walter Müller, *Early projection pieces* (1980s).

From 1980 to 1984, Michael Naimark created *Displacements*, an installation piece that he described as an 'environment art installation'.[76] He installed actual, physical interior settings, such as an archetypal living room, and two performers were filmed in the space using a motion picture camera on a rotating 360-degree turntable fixed at the room's centre. After shooting, he painted the entire setting white so it could act as its own screen and replaced the camera with a 16mm film projector, whose movement was synchronized with that of the camera. In this way, the pre-filmed image could be projected back onto itself. He defined this technique as 'relief projection',[77] which attempts to establish a spatial correspondence between the recorded space and the physical one. Naimark's projects were a precursor to the later calibration technique that

[76] Michael Naimark, Spatial Correspondence in Motion Picture Display**,** Proceedings of the *SPIE*, Volume 462, p.81.

[77] Ibid.

underpins current projection mapping. However, *Displacements*' projected moving images were a simple replica of real settings; the filmed footage was projected back onto the setting as the facsimile rather than as a transformation or re-interpretation of the real setting.

Figure 2.11. Michael Naimark, *Displacements* (1980–1984)

Distinctively, projection mapping not only produces the replica of the 'taken place', but also transforms it through the superimposed moving images to add narratives onto the space. In this view, William Raban's *After Duchamp* (2003) explored the dynamic of space and time through film installation. He used film and performance to present a three-dimensional rendition of Marcel Duchamp's *Nude Descending a Staircase No. 2*. Three films depicting a naked female figure descending an open iron spiral staircase from three different positions were simultaneously projected onto the staircase and the walls behind it. Like *Displacements*, it was projected onto the same location in which it was shot, yet it created a more complex interplay between the filmed moving images and the real event.

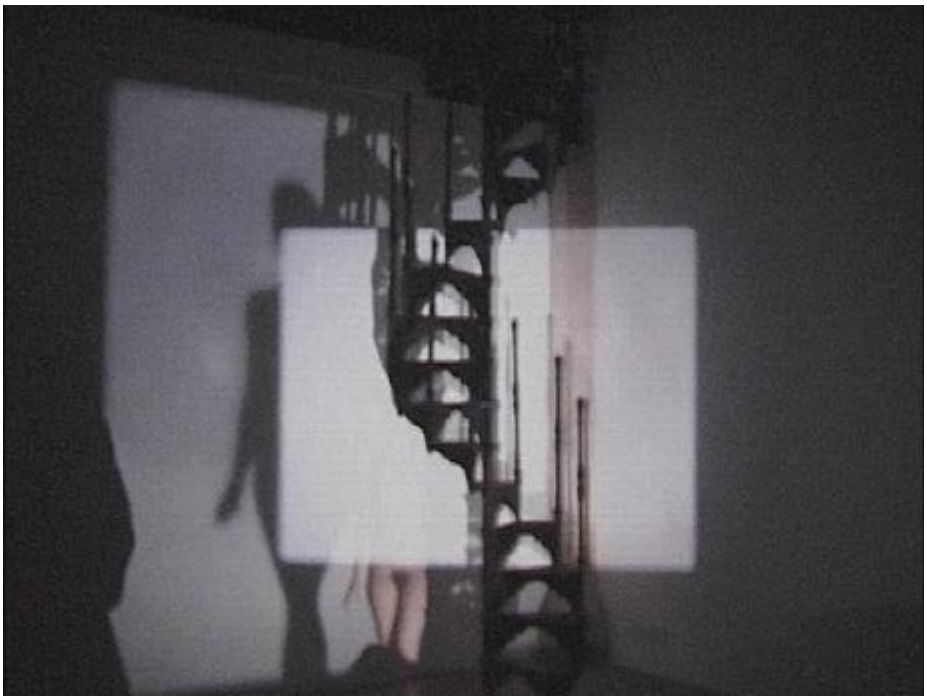

Figure 2.12. William Raban, After Duchamp (2003) © Courtesy of the 291 Gallery

Nicky Hamlyn writes that the work can be seen as ‘an interaction between a given architectural feature and its cinematic re-presentation, in which film and feature are both illuminated and obscured.’ [78] The relationship between the real space (wall and staircase), moving images, and the shadows cast by them moved Raban’s expanded spatial exploration beyond a simple replica or simulation. It disrupted the distinction between the ‘taken place’ and ‘represented place’ and illustrated his filmic interpretation of Cubism.

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[78] Nicky Hamlyn, 'Site Specificity in Film and Video Installation', *Experiments in the Moving Image*, (Luton : Epigraph, 2004).

In this chapter, I have explored the different modes of employing a screen in experimental film, video installation, and projection mapping in order to analyse the relationship between screen and space. By focusing on exceptional film and video works that have disrupted the canonical screen and frame, I have argued that these examples offer insight into projection mapping's dismantling of a cinematic screen, and thus this medium can be understood in the continuum of projected moving-image works.

Building on this contextual review, in the next chapter I will identify the unique spatial relationship in projection mapping as well as how this relationship develops a narrative space that is distinctive from that of screen-based projected moving-image installations.

Chapter 3. Contextual review on space in projection mapping works

In the previous chapter, I identified how maintaining the canonical screen inherited from cinema results in a passive relationship with projected space in most experimental film and video installations, and leads to the relationship between the screen and surrounding space being only partially modified in comparison to cinema. In contrast, projection mapping dismantles the conventional screen, moving beyond the screen's confinement and incorporating the surrounding architectural space. Projection mapping does not use a separately installed canonical screen but instead incorporates any shaped surface of any architectural space or object. In this chapter, I aim to investigate how context-specific projection develops a distinctive narrative space and eventually a novel relationship with projected space in projection mapping works. Different from content, context refers to the set of circumstances—the economic, philosophical, social, cultural or physical *situation*—in which an artwork is created. Through the lens of surface and depth, I will consider influences from painting, site-specific art, and architecture to analyse projection mapping's distinctive qualities.

3.1. Context-specific Projection

In early 1990s, several artists began to challenge canonical notions of screen and frame in an unconventional manner. Jennifer Steinkamp's first site-specific projection, *Gender Specific* (1989), was rear-projected computer animation onto

windows and pointed to the possibility of linking projection with architectural features. This piece was presented in an alternative exhibition space in Pasadena called Bliss. The space was not a gallery but the home of Ken Riddle, who also ran Bliss. Steinkamp rear-projected the animation of a whirling vortex onto the house's two large picture windows so that moving images could be seen from the street as well as from inside. She was intrigued by the space at Bliss because it was a house, and she was interested in addressing issues of location and gender differentiation. Glenn Philips writes that Steinkamp related the ideas of femininity and masculinity to the house's interior and exterior structure and took over the architecture from her point of view.[79] In *Gender Specific,* Steinkamp used the windows not as neutral containers, but as context-specific architectural surfaces.

Christopher Miles claims that Steinkamp's installations defy viewers' expectations for cinematic projection, which they commonly associate with distance and detachment from the real world and attachment to a separate realm.[80] Distinctively, Steinkamp's digital moving-image integrates with architectural space and has no beginning or end. Rather, it repeats endlessly in a loop, lacking the cinematic narrative that is adopted in video installations. Her cropped and masked projections superimpose a fusion of abstract and figurative digital animations onto the surfaces of architectural spaces. What is important in her installation is the physical and phenomenological

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[79] Glenn Phillips, *California Video: Artists and Histories* (Los Angeles, CA: Getty Publications, 2008), p.211.

[80] Christopher Miles, Brightness Falls, *Art in America* (New York: March, 2007), Vol. 95 Issue 3, p.130.

situation in which the space and projected moving-images merge. It calls for viewers' awareness of the conceptual link between the architectural surface onto which the moving images are superimposed and the content of work. Thus, *Gender Specific* can be fully understood only in tandem with the specific site, the house in which the projected moving-image is located. In this way, Steinkamp's site-specific projection pieces align with the concept of site-specific art.

Figure 3.1. Jennifer Steinkamp, *Gender Specific* (1989)

Site-specificity initially denoted a literal site at an actual location—a singular space. It originated from the aesthetics of minimalism that prioritized the displacement

of a portable modernist sculpture in favor of an environmental practice located in a specific place. After the first phase of phenomenological and experiential site-specificity came institutional site-specificity. In *One Place After Another*, Miwon Kwon explains that the investigations of institutional critique reconfigured a site as a relay or network that frames and sustains art's ideological system.[81] This complicated the site of art as not only a physical area, but also one constituted through social, economic, and systematic processes. In more recent discourses, the site of art has been redefined as discursive, often extending beyond familiar art contexts to public realms. It involves much broader cultural, social, political, economic, and discursive fields.

Art historian and critic James Meyer uses the terms literal site and functional site. A literal site is similar to phenomenological site-specificity, and a functional site is a combination of Institutional Critique and discursive site-specificity.[82] Kwon writes that there are no discrete separations or neat periodizing breaks between these diverse types of site-specificities.[83] Rather, artists operate these paradigms in overlapping ways in their practices.[84]

Site has been critically considered in projected moving-image installation works.

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[81] Miwon Kwon, *One Place After Another* (Cambridge, MA: MIT Press, 2002), p.3.

[82] James Meyer, 'The Functional Site; or, The Transformation of Site Specificity', in *Space, Site, Intervention: Situating Installation Art*, ed. by Erika Suderberg (Minneapolis: University of Minnesota Press, 2000)

[83] Kwon, p.3.

[84] More recently, many artists, critics, historians, and curators have engaged in problematizing received notions of site-specificity and offered alternative formulations such as context-specific, site-determined, site-oriented, site-referenced, site-conscious, site-related, and site-responsive.

Christiane Paul and Andrew V. Uroskie employ the notion of site-specificity in analysing artists' projection works. Uroskie writes that a situational perspective became fundamental to investigations of moving images in contemporary art in which the institutional and cultural dialectic of the black box and the white cube remains a 'perplexing quandary'.[85] He explains that moving images never merely represent place; they must always also take place, meaning that they must be produced and exhibited within spaces that are structured through institutional vectors.

Uroskie emphasises framing experimental film (expanded cinema) works within the Institutional Critique's notion of site. According to him, the primary function of 1960s and 1970s artists' film works, such as Paik's *Zen for Film* (1964), was not to raise consciousness and thereby improve socio-political conditions; nor were these works mediative inquiries into the artists' own consciousness. Rather, they showed an emerging consciousness of the site specificity of cinematic practice.[86] As seen in Chapter 2, with their major goal being to generate a radically new way of experiencing the moving image, these artists both necessitated and helped to forge a novel institutional location between the white cube of the art gallery and the black box of the cinematic theatre. This locational interrogation transformed viewers' understandings of moving images by situating itself beyond the site of cinema. Consequently, experimental film's exploration of moving image in particular institutional sites (black

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[85] Andrew V. Uroskie, *Between the Black Box and the White Cube: Expanded Cinema and Postwar Art* (Chicago, IL: University of Chicago Press, 2014), p.6.

[86] Ibid., p.12.

box and white cube) is meant to leverage the aesthetic, historical ontology of cinema to initiate an interdisciplinary transformation.

In this view, previous projected moving-image works are thus embedded within the institutional context. As detailed in Chapter 2, experimental film and video installations moved from theatres to museums and galleries to challenge the narrative space of cinema with the lived watching experience. A primary concern in altering the location was to situate the event of film in the 'present here-and-now' outside the theatre. Therefore, the universal concept of art institutions as different from cinema has been regarded as highly important. Here, location, situation, and environment are conceptual and general rather than literal and specific.

As seen in *Gender Specific,* projection mapping distinctively and inevitably involves the phenomenological notion of site-specificity as it uses the surface of a literal space. It focuses on, in Kwon's words, 'establishing an inextricable, indivisible relationship between the work and its site for the work's completion'.[87] Similar to phenomenological site-specific art works, projection mapping relocates creative meaning from within the art to the contingencies of its location, the projection surface.

More importantly, projection mapping encompasses the notion of a discursive site. For example, HOUSEWATCH PROJECTS and Krzysztof Wodiczko actively incorporate the specific meanings of sites into their projection pieces. HOUSEWATCH

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[87] Kwon, p.12.

PROJECTS (1985-1992) is the group of six artists[88] whose film work transcends the traditional frameworks of cinema and exhibition space. Their first project, called 'Cinematic Architecture for the Pedestrian,' employed an architectural building as an outlet for artistic expression. Using the façade of Ian Bourn's East London terraced house as a screen for rear-projecting films, the event 'transformed the visible content of the building,' turning the window of the domestic interior 'into openings or surfaces.'[89].

Figure 3.2. HOUSEWATCH PROJECTS, (1985-1992) © Luxonline

In 1990, HOUSEWATCH PROJECTS returned to their initial venue in East

[88] Ian Bourn, Lulu Quinn, George Saxon, Tony Sinden, Stan Steele, and Alison Winckle

[89] Ian Bourn, 'HOUSEWATCH (1985-1992): Compiled by Ian Bourn for the "Remix" Catalogue and Intended as an Introduction to Housewatch's work for Japanese Audiences' <http://www.rewind.ac.uk/documents/Ian%20Bourn/IBO009.pdf> [accessed June 2017]

London to present *Wounded Knee*. In this project, the artists projected film onto two buildings and two cars located on the street. The combination of the moving images, recorded sound and music, car horns, engine noise, and the rattle of the nearby railway produced a complex ambience, interrogating the situation in which the event took place was central to *Wounded Knee*. The site was slated for demolition, and the residential community was thus under threat from a motorway building scheme.[90] The artists used home buildings and cars for their projections to pose a question about the notion of transport, housing, and environment. Therefore, in addition to the phenomenological meaning of the space, the political and social contexts of the site became decisive elements in the installation. Michael O'Pray describes HOUSEWATCH's lighting up the street as 'not simply an artistic demand but a social one.'[91]

Wodiczko is renowned for his large-scale moving-image projections onto architectural façades. His works seem to be the precursor of the conceptually-driven projection mapping practice that has emerged since the 2000s. His projections of politically charged images on architectural façades incorporate public buildings and monuments as backdrops. St. Louis Projections (2004) was a community art project comprised of the audio testimonies of St. Louis residents who had lost loved ones to violent crimes. Videotaped images of the speakers' hands were projected onto the

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[90] Ibid.

[91] Michael O'Pray, 'Video', *Art Monthly*, 92 (Dec/Jan 1985/86), 34.

library's façade to accompany their voices. The effect was anthropomorphic, as if the library itself was speaking to the city. What Wodiczko attempted to do was create a 'ghost haunting the monument' to disrupt the static, massive monument by creating something frighteningly real and living.[92] As Liam Otten explains, his projection created a healing process for the participants and the community, voicing their grief in a powerful and constructive public forum.[93]

Figure 3.3. Krzysztof Wodiczko, *St. Louis Projections* (2004)

[92] Wodiczko, K. and Ferguson, B.W. (1992) 'A Conversation with Krzysztof Wodiczko' in *Krzysztof Wodiczko: Instruments, Projeccions, Vehicles* (Barcelona: Fundacio Antoni Tapies, 1992), p.51.

[93] Liam Otten, 'The St. Louis Projection at St. Louis Public Library April 16-18', <http://news.wustl.edu/news/Pages/740.aspx> [accessed March 2016].

Wodiczko writes that the meaning of city monuments 'must be secured through the ability of the inhabitants to project and superimpose their critical thoughts and reflections on the monument forms.'[94] Therefore, he unveils the complexity of public monuments' architectural, ideological, and political contexts through projection to displace the authority of the massive structures. His works' point of departure is thus the analysis of an architectural space in the interest of disrupting it; as Kaye points out, Wodiczko's ephemeral projections produce a 'counter-monument.'[95] In Wodiczko's works, architecture and monuments are not neutral screens but active projection surfaces that reflect collective memory and the histories of marginalized citizens. He disrupts the static monumentality of public space and invigorates it through projecting local people's images and sounds that address human rights, violence, and democracy. Using the context is thus central to his work: the meaning and placement of the monuments in public spaces are the essential properties for projected moving-images. Wodiczko's work demonstrates how the discursive specificities of a projection's site—its historical, social, and locational properties—become integral parts of a moving-image work.

As seen in the work of HOUSEWATCH, Steinkamp and Wodiczko, projection

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[94] Krzysztof Wodiczko, *Critical Vehicles*, p.62.

[95] Nick Kaye, *Site-specific Art: Performance, Place and Documentation* (London and New York: Routledge, 2000), p.37.

mapping integrates a multitude of indoor/outdoor spaces beyond the white cube space, embracing not only the phenomenological situation but also the political, historical, and/or cultural contexts of the location. Reflecting on this, space in projection mapping becomes, to use Meyer's terminology, a mixture of the literal site and the functional site. This means that the specific 'context' of the surface (site) become a critical aspect of the body of work. The complicity of the artwork within its context is intrinsic to its meaning. As such, phenomenological, institutional, and discursive contexts become integral in projection mapping works. As Nick Kaye argues, if events are affected by their specific position, by the situation of which they are a part, then works of art are also defined in relation to their place and position.'[96]

In summary, projection mapping discards the conventional screen, removing the constraint of frame placed on and around previous projected moving-image installations to integrate it with its projected space. It employs a literal and phenomenological architectural space as its projection surface and generates a new relationship between the projection surface and moving images in place of the neutral container of screen-based moving-image works. In the next section, I aim to investigate this difference through the lens of surface and depth.

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[96] Kaye, p.1.

3.2. Surface and Depth

As detailed in Chapter 2, the conventional notion of screen does not fit well with projection mapping. I argue that the notion of surface better captures projection mapping's distinctive relationship with its projected space. Moreover, as discussed in the previous section, the projection surface of projection mapping is not a neutral container; rather, it is an integral entity that has significant influence on the content and form of the work. Therefore, the projection surface of projection mapping has an illusionary and conceptual depth.

Surface (n)[97]

1**:** The outside part or uppermost layer of something. *'the earth's surface*

Depth (n)[98]

1**:** The distance from the top or surface to the bottom of something. *'water of no more than 12 feet in depth'*

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[97] OED,
1.1 The level top of something. *'roll out the dough on a floured surface'*
1.2 The area of an outer part or uppermost layer of something. *'the surface area of a cube'*
1.3 The upper limit of a body of liquid. *'fish floating on the surface of the water'*
1.4 The outward appearance of someone or something, especially as distinct from less obvious aspects. *'Tom was a womanizer, but on the surface he remained respectable'*

[98] OED,
1.1 The distance from the front to the back of something. *'the depth of the wardrobe'*
1.2 The distance from the top or surface of something to a specified lower point within it. *'loosen the soil to a depth of 8 inches'*
1.3 The apparent existence of three dimensions in a picture or other two-dimensional representation. *'texture in a picture gives it depth'*

By definition, ‘surface’ and ‘depth’ are antonyms. Nevertheless, I argue that in projection mapping works, surface and depth are co-existing rather than colliding concepts. In this chapter, I investigate how these two contradictory concepts merge in projection mapping.

Joanie Lemercier’s *EYJAFJALLAJÖ KULL* (2010) and *Fuji* (2014) show the merging of surface and depth. Inspired by other artists such as Sol LeWitt, Vasarely, and M.C. Escher, Lemercier experiments with what he calls ‘reverse mapping,’ which is ‘to create the content in advance, a drawing or a sketch that would become his canvas for mapping, then to project on it to animate it’.[99] These ‘reverse mapping’ pieces combine Lemercier’s real painted drawings with his projected moving-images. Each work is a flat plane but different from the neutral screen because the drawing of the artist functions as a projection surface. Lemercier projects a layer of moving images onto a painted drawing to create illusionary three-dimensional depth effects. This gives the painting motion and virtual depth, and thus a spatio-temporal attribute. Even though the painting is drawn on a flat surface—the wall—Lemercier produces a three-dimensional illusion and narrative onto it through moving images.

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[99] ‘Joanie Lemercier: Light and space spanning the arts’, interview with *Digitalarti*, interviewed by Maxence Grugier, <http://media.digitalarti.com/fr/blog/digitalarti_mag/joanie_lemercier_lumiere_et_espace_a_la_croisee_des_arts> [accessed February, 2017]

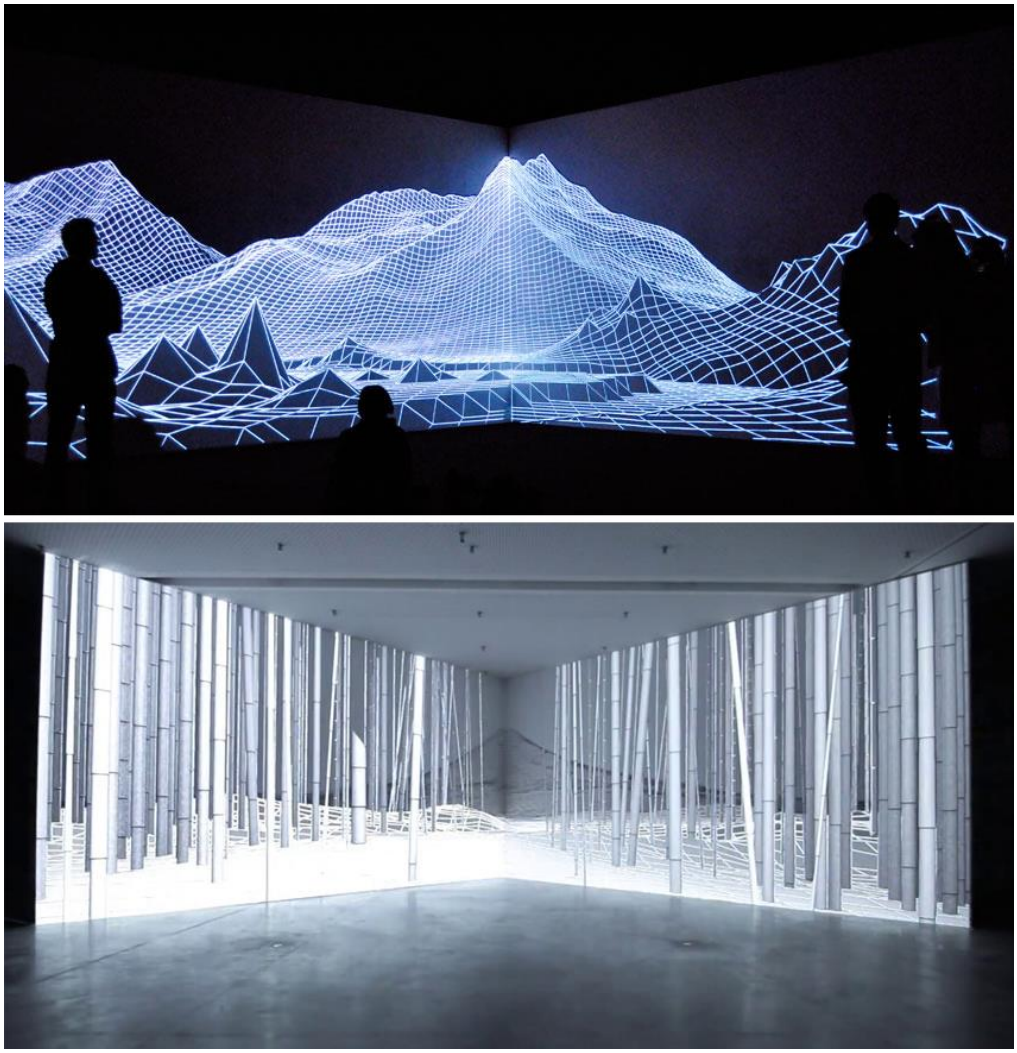

Figure 3.4. From top: Joanie Lemercier, *EYJAFJALLAJÖ KULL* (2010), *Fuji* (2014)

In *Surface*, Giuliana Bruno addresses the need to advance the theorization of screens, arguing that 'screen-membrane' is emerging in contemporary moving-image works. She writes that screens perform as connective tissues, turning architectural

spaces into *planes* of moving images. She notes that the current screen becomes a site in which 'distinctions between inside and outside temporally dissolve into the depth of surface'. [100] Lemercier's works and Steinkamp's projection surfaces are, indeed, reconfigured as a type of canvas. Lemercier transforms a painting's static surface into a dynamic, three-dimensional, moving landscape, and Steinkamp's projection blurs the boundary between the physical architectural space and the represented (illusionary) space of moving image. In this view, Bruno's understanding of screen as surface-membrane aligns with projection mapping's projection surface; however, they are different in that she still emphasizes the *plane* property of the screen, whereas I attempt to discover the influences on projection mapping's projection surface in trompe l'oeil,[101] Op art,[102] and contemporary architecture.

Projection mapping's illusionist perspectival tricks and surface transformation are found in examples of trompe l'oeil and Op art that create illusions on the surface. Maximum precision is sought in the control of surfaces to evoke an exactly arranged retinal response. To achieve a convincing illusion, artists creating both trompe l'oeil and Op art employ techniques from perspective drawing. Trompe l'oeil artists draw realistic

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[100] Giuliana Bruno, *Surface* (Chicago, IL: University of Chicago Press, 2014), p.5.

[101] Trompe l'oeil is a picture that creates a deliberate visual illusion that is intended to deceive the viewer into thinking that it is a real, three-dimensional object rather than a two-dimensional representation of it.

[102] Op art is an abbreviation of 'optical art', a form of abstract art developed in the early 1960s which aimed to stimulate the eye through a radical use of space and colour. This abstract art exploits optical phenomena to cause a work to seem to vibrate, pulsate, or flicker. Maximum precision is sought in the control of surfaces and edges in order to evoke an exactly prescribed retinal response. Many Op art paintings employ repeated small-scale patterns arranged to suggest underlying secondary shapes or warping or swelling surfaces.

paintings onto the two or three-dimensional surfaces of architectural spaces and canvases to explore the boundary between image and reality (Figure 3.5), and Op art artists create abstract paintings and sculptures that give the viewer the impression of movement to imply underlying shapes or swelling or warping surfaces and generate vibrating patterns. Not every Op art work involves the illusion of depth, but Victor Vasarely's and Bridget Riley's works shown in Figure 3.6 show how the use of illusions can create the impression of depth, volume, and movement simultaneously on a flat surface.

Figure 3.5. Left: Andrea Mantegna, fresco, *Camera degli Sposi*, Palazzo Ducale, Mantova (c. 1470) Photo © Yiyun Kang
Right: Pierre Delavie, modern trompe l'oeil, *Immeuble déformé,* 39 av Georges V, Paris 8 (2007) © Pierre Delavie

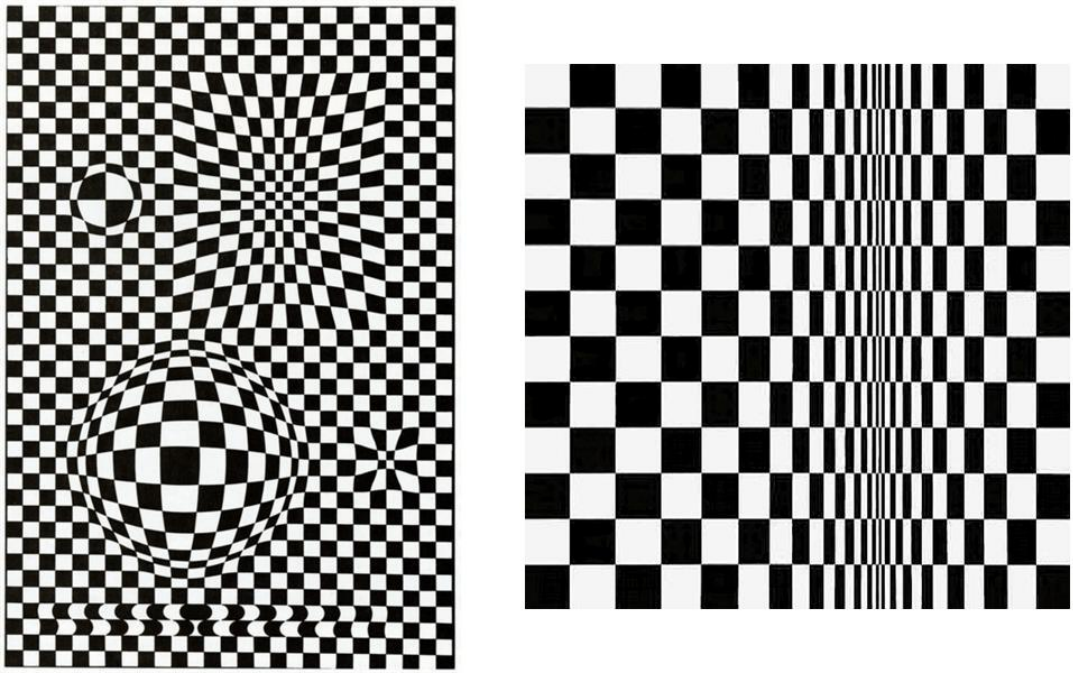

Figure 3.6. Left: Victor Vasarely, *Vega* (1957) © Victor Vasarely
Right: Bridget Riley, *Movement in Squares* (1961) © Bridget Riley

The surface deformation found in trompe l'oeil and Op art works thus continues in projection mapping. I contend that projection mapping incorporates the characteristics of both types of paintings.

Like Op art, Steinkamp's abstract pulsating moving-images, to use Elwes' words, 'soften the rigid geometries of the space with roiling vortices of line and

color'.[103] Her projection pieces generate a perceptual tension in which the interplay between the surface and the illusion takes place. In addition, as her work incorporates a physical architectural space as its projection surface, it aligns with trompe l'oeil that was a more fully integrated approach to architectural illusion.

In the case of Lemercier's 'reverse mapping' *EYJAFJALLAJÖKULL* (2010), a horizontal illusion is created at the orthogonal corner. Therefore, while viewers have full autonomy to explore the moving images, they also seek the optimal angle that provides them with the most convincing illusion. In so doing, Lemercier's work perpetuates diverse viewing arrangements that may or may not involve a proscenium. Lemercier's projections carefully manipulate perspective to create illusions on the surface that fit precisely into his drawings. As Lemercier's choice of referential artists (Victor Vasarely, M.C. Escher and Sol Lewitt) indicates, his works engender a surface tension through the illusion, as if the space expands and contracts, similar to trompe l'oeil and Op art.

Projection mapping's links to trompe l'oeil and Op art illustrate that the concepts of surface and depth are merged at the architectural surface. In *Surface Architecture*, David Leatherbarrow and Moshe Mostafavi argue that the surface of contemporary architecture is not superficial; rather, it gains meaning and autonomy. Before the twentieth century, the surface of architecture was regarded as the layer that

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[103] Elwes, *Installation*, p. 13.

conveyed the intent and purpose of the building on behalf of the rest of the structure. Technological advances have enabled the divorce of surface from inner structure and given architectural surfaces new expressive possibilities.[104] As seen in the architecture of Frank Gehry, Jean Nouvel, Zaha Hadid, and Herzog and de Meuron, surfaces do not serve only as exterior coverings for inner spaces. For example, Gehry describes his self-supporting surfaces as 'ris[ing] up, like some kind of magic carpet, to define the space.'[105] The Bilbao Guggenheim and the Disney Concert Hall exemplify how the architect gives depth to the surface. Jeremy Gilbert-Rolfe writes that in these buildings, 'planes dissolve volumes in the course of expanding and complicating them,' and 'surface describes volume, identifying its skin closely with its mass and shape.'[106] Moreover, Gehry's undulating surface of stainless steel reflects the ever-changing lights and transforms the appearance of the building ceaselessly. The curvy shape and its reflections thus add the impression of movement to the static surface.

From this perspective, surface and depth are not definitively contradictory notions; they are intrinsically entwined, and projection mapping also embodies this co-existence. Alicia Imperiale acknowledges the conceptual shift from viewing surface and depth as opposing forces to examining the oscillating conditions between the two. It

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[104] David Leatherbarrow and Mostafavi Moshen, *Surface Architecture* (Cambridge, MA: MIT Press, 2002), pp.9-19.

[105] Jeremy Gilbert-Rolfe and Frank O. Gehry, *Frank Gehry: The City and Music* (Brighton: Psychology Press, 2001), p.86.

[106] Gilbert-Rolfe and Gehry, p.110.

favours ‘smooth exchange, flow, continuous surface, skin, membrane and bubbles.’[107] She argues that with the advance of digital technology, surface has become an unstable condition which is not superficial but profound; surface is a complexly layered organ with its own interiority.[108] The division between exterior and interior defined by surface melts away.

In Lemercier’s work, the division between surface and depth loses its validity. It adds a narrative dimension and choreographs movement onto an existing surface through projected moving-image. It can be defined as neither surface nor depth, but an augmented dimension that has its own interiority and autonomy. The projection surface is a new surface embedded and developed in relation to the existing one. It is also important to note that the merging of surface and depth in projection mapping is not only illusionary and optical (visual), but also conceptual. As seen in Wodiczko’s work, projected moving-images enhance the conceptual depth of the projected site.

Trompe l’oeil challenges the notion of the surface and depth of an inner architectural space, and contemporary architecture alters the absolute boundary between the two concepts at the exterior surface of the architecture. Seen through this lens, projection mapping thus inherits both and reconfigures the previous conventional notion of a flat screen into an optically and conceptually dense place. Drawing on this

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[107] Alicia Imperiale, Digitla Skins in *Skin* (edited by Ellen Lupton), (New York: Princeton Architectural Press, 2007), p.55.

[108] Ibid.,

perspective, I aim to describe the projection surface of projection mapping as a ‘deep surface.’ Here, the form and content of a work of projection mapping cannot be detached from its projected site; the narrative of projection mapping is created at the very surface of its projected space.

Sylvia Lavin investigates the new relationship between art and architecture through the notion of ‘kiss.’ In *Kissing Architecture*, she argues that the disciplinary boundaries of today’s architecture are increasingly being pushed back and superimposed on the boundaries of other fields such as projected moving-image works. Lavin also points out that the relationship between large-scale projected images and architecture has been only partially explained by video art and institutional critique, as I have detailed in the previous sections. She uses the notion of ‘kiss’ to describe the novel contact between architecture and moving-image installations because in recent projects, they converge into one without collapsing. Lavin notes that ‘kissing is not a collaboration between two that aims to make one unified thing; kissing is the intimate friction between two mediums.’[109] Lavin’s adoption of the notion of kiss helps to explain projection mapping’s ‘deep surface.’ Projection mapping generates, to use Lavin’s term, a ‘kiss’ that coalesces the surface of an architectural space and projected moving-images and generates conceptual and illusionary depth.

As seen in the works of Steinkamp, Wodiczko, and Lemercier, projection

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[109] Sylvia Lavin, Kissing Architecture: *POINT: Essays on Architecture* (Princeton, NJ : Princeton University Press, 2011), p.54.

mapping ‘kisses’ the space; it does not disrupt or harm the qualities of the conjoining entities of architectural space and projected light. In this view, it aligns with Lavin’s notion of ‘kiss,’ as two non-identical surfaces collide in order to ‘reconcile the opposing qualities of depth and flatness, as well as the far and near.’[110] In the next section, I investigate how projection mapping’s ‘deep surface’ develops a type of narrative that is distinctive from that of screen-based projected moving-image installation works that employ a neutral screen.

[110] Ibid., p.57.

3.3. Making Space

Art has maintained varied relationships with architecture by being presented within architectural spaces. Christiane Bjone claims that the relationship between art and architecture has been mostly passive, with architecture as a supportive background, a 'simple framing device' for the art object.[111] In this relationship, she argues, the artworks do not engage with the space and purpose of the architecture, resulting in a visual and intellectual disconnect between building and art.

In contrast to this, I have examined the ways in which projection mapping incorporates the surface of the architectural space as a 'deep surface' in the previous section. Even though it only touches the surface, projection mapping extends and expands that surface by superimposing moving images. I argue that as a result, this 'deep surface' of projection mapping alters the dynamic of the architectural space and dramatizes it by adding narratives—though not the kind of narratives typically found in films. Pablo Valbuena's and Joannie Lemercier's works illustrate how projection mapping 'makes' space.

Pablo Valbuena's *Quadratura* (2010) and *Parasite* (2011) illustrate how projection mapping's engagement with the architectural surface changes the dynamic of

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[111] Christiane Bjone, *Art + Architecture: Strategies in Collaboration* (New York: Springer Verlag Ny, 2009), p.14.

entire space. *Quadratura* (2010, Figure 3.7) is an outdoor site-specific projection mapping installation at the Matadero Madrid. As the title *Quadratura*[112] suggests, this installation follows the principles of trompe l'oeil that manipulate architectural space but by means of projected light. In *Quadratura,* Valbuena projected a perspective grid between two rows of columns and onto the floor and wall between them, thus creating the illusion of an infinite pathway. *Parasite* (2011, Figure 3.8), an indoor projection mapping installation, perceptually transforms its architectural space. Valbuena projected ever-changing perspectival animations on the surface of the empty white wall of the exhibition space, thus creating a convincing virtual dimension that seems to exist behind the white wall.

In both projects, the moving images projected on the surface of the architectural space create spatial configurations that parallel the real architecture. Both works arise directly from the architectural spaces where they are located. Valbuena produces delicate 3D animations that use virtual light and shadow to add illusionary dimensions and movement to already familiar places. As a result, his installations are 'invariably site specific, intrinsically related to the architecture and interacting with the spaces they are conceived for.'[113] That said, his projections entirely change the dynamic of the

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[112] Quadratura refers to the technique used in the Italian Renaissance, Baroque, and Rococo to extend architecture through trompe l'oeil and perspective constructions generated with paint or sculpture. This term was initially used in the baroque period to designate the architectonic illusions that domes and walls extended through trompe l'oeil, generally using paints or sculptures. Spatial effects are used to create the illusion of three-dimensional space on an otherwise two-dimensional or mostly flat ceiling surface above the viewer.

[113] Pablo Valbuena, 'Para-Sites' <http://www.laboralcentrodearte.org/en/exposiciones/pablo-valbuena.-

original space with the projected moving-images.

Figure 3.7. Pablo Valbuena, *Quadratura* (2010) © Pablo Valbuena

para-sites/?searchterm=pablo%20valbuena> [accessed April, 2017]

Figure 3.8. Pablo Valbuena, *Para site* (2011) © Pablo Valbuena

In this view, the relationship between projection mapping and architectural space aligns with Gordon Matta-Clark's and Christo's architectural interventions. Despite the visual and formal differences between their installation works, both artists seek to transform the dynamics of existing buildings and architectural spaces. Matta-Clark's cutting and Christo's wrapping practices critically engage architectural space in ways which turn buildings into extraordinary structures.[114]

[114] Matta-Clark's actions were formal and aesthetic investigations on a tangible architectural vocabulary that targeted the symbolic and cultural status of architecture, and Christo's wrapping pieces create temporal transformations of monuments that unexpectedly enhance viewers' awareness of the monumentality rather than simply hide them from view.

Martin Hogue interprets both artists' works as 'site-making' (not destroying) explorations in which the artists use existing buildings as the object of their explorations. Hogue writes that in their works, 'building and intervention merge to create a third, indissociable whole'.[115] As a result, each architecture is presented with a fresh new double, yet also realigned with its own past, endowing a new meaning to familiar places and conditions. Hogue argues that 'the idea of re-framing implies to look at again, perhaps harder, and tell the story in different, more poetic terms.'[116] Similarly, Valbuena's projection pieces critically frame works against the background of physical and conceptual conditions that are already embedded in architectural spaces by dealing with existing buildings and spaces. In so doing, his 'site-making' process also induces a 'third, indissociable whole' that parallels the real space, making viewers examine the projected spaces more closely.

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[115] Martin Hogue, Buildings Cast, Carved, Wrapped: The Intervention Practices of Rachel Whiteread, Gordon Matta-Clark and Christo, 87th *ACSA ANNUAL MEETING* (Association of Collegiate Schools of Architecture), 1999. pp.195-202.

[116] Hogue, p.196.

Figure 3.9. Gordon Matta-Clark, *Conical Intersects* (1975)

Figure 3.10. Christo, *Wrapped Reichstag* (1995) © Christo

As such, the relationship with the architectural spaces in Valbuena's works shares commonalities with Matta-Clark's and Christo's, as the site-making process

directly relates to the physical structure of the object itself in order to discover it anew. Gemano Celant details that Christo's works depend on the specific environmental situations that are responsive to the particular locations in which they were set.[117] Similarly, Matta-Clark's and Valbuena's interventions rely on the specific support of architectural settings. As Houge argues, these types of interventions can 'neither physically nor conceptually stand alone as a work of art, but rather are inextricably tied to the building or site which they engage, producing a third whole.'[118]

Without removing (Matta-Clark's cutting) or adding (Christo's covering) any materials, projection mapping incorporates both types of spatial exploration through the (im)materiality of projected light. Whereas Matta-Clark's cutting practice seeks to open up the volume of a building and expose depth through the gap, Christo's work covers the surface of the architecture to question the identity of the building. Hogue points out that Matta-Clark 'uses the light as poetic material, whose tangible presence is achieved in contrast with the darkness of the interiors'.[119] The works of Valbuena are like Matta-Clark's in that they divide and distort the architectural surface by means of light and expose the depth of the space, unveiling the volume of it, but in a virtual way. Like Matta-Clark, Valbuena uses projected light as a material to intervene in the static volume of the space.

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[117] Gemano Celant, *Christo and Jeanne-Claude: Water Projects* (Milan: Silvana Editoriale, 2016), p.30.

[118] Hogue, p.199.

[119] Ibid., p.199.

However, projection mapping directly treats only the surface, much like Christo's wrapped fabric operates as an outer layer that fuses with the building's monumentality. This layer, hanging over the surface, eventually gives an impression that softens the inert materiality of the building. Anthony Bond posits that Christo's veiling functions as a membrane that demarcates between the monumentality of the building and the viewer's constructed image of it.[120] Valbuena's installations also touch the very surfaces of architectural spaces, wrapping it with projected moving-images. However, these installations are distinctive from Christo's wrapping because the blankness of Christo's wrapped fabric abstracts the specificities of monuments, whereas Valbuena's interventions in architectural spaces by means of projection parallel the actual spaces through superimposition on the spaces themselves. Therefore, Valbuena's work exposes the specificities of a space instead of veiling them. It does not abstract the space, but rather dramatizes it.

What is unique to projection mapping is that this architectural intervention co-exists with the incorporated space without physical alterations. Lavin suggests that the new relationship between projected moving-images and projection surfaces generates the union of the architecture's surface and the surface of the projected images. She argues that this union produces 'a doubling of the architectural medium: the collision

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[120] Anthony Bond, The Real and the Revealed, in *Christo.* (Sydney: The John Kaldor Art Project; Art Gallery of New South Wales, 1990). P.20.

and superimposition of the architectural surface with the projected images'.[121] As the (im)materiality of projection interrupts the original architecture without adding physical alteration, it provides a penetrable transparency through which the architectural surface remains visible. Due to this co-existence, projection mapping cannot abstract the space; rather, it activates the space through layering temporal narrative onto it. Through the processes of collision and superimposition, projection mapping creates its own distinctive narrative space.

In this view, projection mapping expands moving-image works' temporal narrative structure to the spatial dimension. The narratives of film and video installations are normally understood in linearity. Whether it is a linear or non-linear narrative, the chronological order is the central notion in understanding the narrative aspect of films and video works. On the other hand, projection mapping's narrative is a three-dimensional sequence incorporated into the surrounding environment. To investigate this, I address Deleuze's and Peter Eisenman's notion of fold. Eisenman addresses the notion of *event* in architecture. He argues that today's architecture becomes a part of an environment comprised of light, movement, and event.[122] He displaces the traditional architectural theory that prioritizes a static environment and introduces Deleuze's notion of *fold* into architectural environments.

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[121] Lavin, Ibid., p.56.

[122] Peter Eisenman, 'Unfolding Events', in *Zone 6: Incorporations*, ed. by Jonathan Crary (Cambridge, MA: MIT press, 1992), (p.424).

In Deleuze's idea of fold, the smallest unit of matter is the fold, not the point.[123] Deleuze argues that the process of folding constitutes the basic unit of existence. The fold is the form of connection, and the object is thus a process of folding and unfolding the outside, which creates an interior that is not an inside grown autonomously from the outside world. Deleuze links this concept of fold to event, and it is important in understanding projection mapping's narrative space. Deleuze argues that our notion of the object in the current technological era has changed: it is no longer defined by an essential form. He calls this new object an 'object-event' that is concerned with a temporal modulation that implies a continuous variation of matter as a continuous development of form.[124] The form unfolds through the agency of the fold, and thus, form is a continuous process that articulates new relationships beyond vertical and horizontal.[125] In so doing, Deleuze's fold attributes depth and temporal dimension to objects.

Applying this notion, we see that projection mapping's 'deep surface' is similar to fold. It adds narrative to the surface through projected moving images, turning a static object into a temporal 'object-event.' The projection surface of projection mapping creates a virtual dimension and illusionary space within it, thus encompassing not only the X and Y axis, but also the Z axis simultaneously. Eisenman claims that the concept of fold gives the traditional idea of edge new dimension as somewhere in-

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[123] Gilles Deleuze, 'The Fold', *Yale French Studies*, 80 (1991), (p.231).

[124] Gilles Deleuze, *THE FOLD: Leibniz and the Baroque* (London: Continuum, 2001), p.20.

[125] Eisenman, p.425.

between or a third dimension: ‘what was seen as an abrupt line now has a volumetric dimension.’[126]

Including his residency at Kanazawa University in Japan, Lemercier’s works such as *Paper and Light* (2013) are influenced by origami,[127] the traditional Japanese paper folding craft. In *Paper and Light,* he uses sheets of paper folded into pyramids onto which he projects moving images. It is interesting that Deleuze employs origami to describe how the fold itself contains a shallow depth which can be superposed. He focuses on the paper’s fold because it defines a minimum depth on the scale.[128] Lemercier’s projection investigates the spaces of the folded papers; the jointed dots, lines, planes, and gaps between them. Through his projected moving-images, the folded paper gains continuous movements, colours, and shapes, as if it ‘divides into an infinite number of folds or disintegrates into movements.’[129] As a whole, the moving images superimposed onto the folds create a volumetric and temporal dimension, that is, in Deleuze’s words, a ‘compressive elastic force’ that turns an inert object into an object-event.

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[126] Ibid., p.426.

[127] Origami (折り紙?, from ‘ori’ meaning ‘folding’, and ‘kami’ meaning ‘paper’) is the art of paper folding which is often associated with Japanese culture. developed since the Edo era ADD MORE

[128] Deleuze, ‘The Fold’, *Yale French Studies*, p.245.

[129] Ibid., p.231.

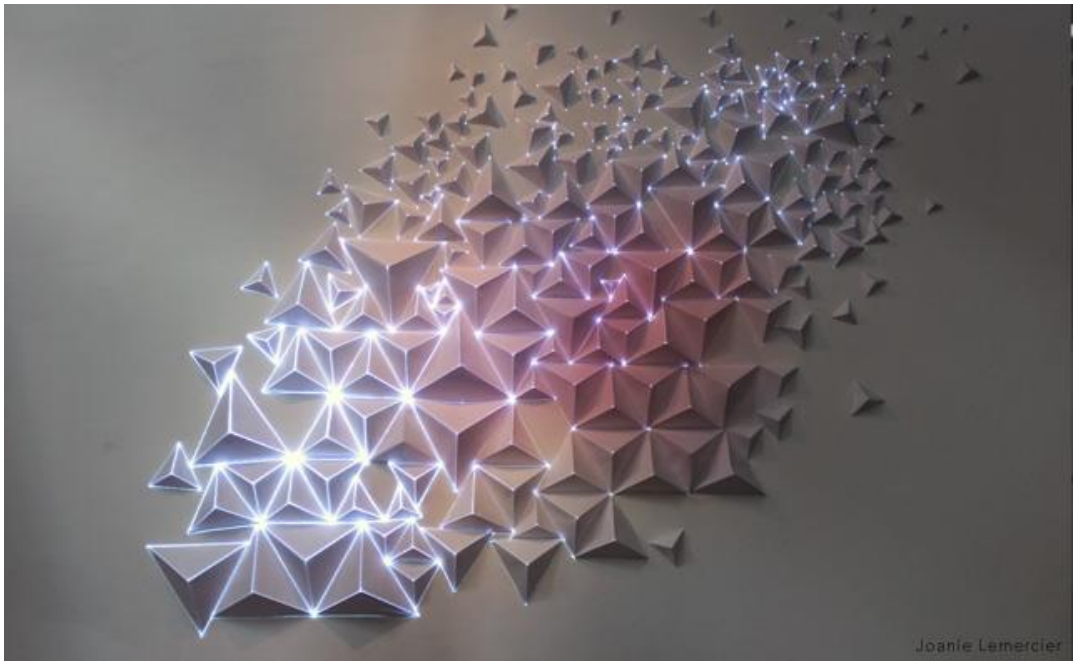

Figure 3.11. Joanie Lemercier, *Paper and Light* (2013) © Joanie Lemercier

3.4. Conclusion

In conclusion, projection mapping activates the space. As seen in Valbuena's and Lemercier's works, the 'space' encompasses architectural space and the space between objects, inside and outside, and interior and exterior. Through the notion of fold, I have investigated how projection mapping activates space, altering its dynamics and turning the static object into an object-event by incorporating temporal dimension and movement into the space. Therefore, the narrative of projection mapping cannot be separated from its projected space. Projection mapping's narrative intrinsically originates from its context-specific character (section 3.1), as well as its temporal modulation of a surface that implies a continuous variation and development of form.

As a result, projection mapping practices essentially 'respond' to the specificities of their location, whether it is formal, phenomenological, institutional, or discursive. Gillian McIver's notion of 'site-responsive' describes the type of art that occurs when the artist is engaged in an investigation of the site as part of the process when making the work.[130] Steinkamp's, Wodiczko's, Valbuena's, and Lemercier's projections cannot be reproduced or detached from their original sites or objects. If they can be moved and replaced at all, they will be changed by this process. McIver's concept of 'site-responsive' also suits projection mapping, as her notion emphasizes the ephemeral

[130] McIver, 'ART/SITE/CONTEXT', *The Cass School of Art* <http://www.sitespecificart.org.uk/6.htm> [accessed February 2017]

quality of works that incorporate a live art or performative element along with an installation. Since most site-responsive work is temporal, it exists in its original form only for the duration of its public exposure in the site.[131] As I found in my investigation, projection mapping works made for a particular site owe their existence to their relationship with the site itself, and the works exist only for the duration of the exhibition/performance—only while the projector is turned on.

In this view, the contextualised, site-responsive narrative space of projection mapping is its central difference from screen-based projected moving-image installations. I argue that this site-responsive character of projection mapping also generates a new type of narrative that is different from previous moving-image works. In Chapter 2, I detailed that cinema and video installations create their own narratives in the fictional realm that have no actual relationship with the location where the screens are installed. In addition, the screen in those works is a neutral container that has no specific context within it. Distinctively, projection mapping's narrative is generated directly from the context of the projected site. As seen in Steinkamp's and Wodiczko's works, the content of the work is intrinsically connected to its projection surface. In the sense that the narrative can embrace the cultural, social, and historical issues related to the projection surface, projection mapping is again associated with the notion of discursive site-specificity. Indeed, projection mapping involves both the literal and functional meanings of a site; to use Kwon's description, these are 'operating [in]

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[131] McIver.

overlapping ways'.[132]

However, the temporal transformation of projection mapping is not exactly same as in site-specific works of art such as Gordon Matta Clark's and Christo's. Unlike Christo's fabric membrane that conceals a building, Valbuena's installation uses projected light as a permeable membrane that cohabits with the architectural structure. In this mingling, the two mediums (space and projected moving-images) do not lose their specificities. Additionally, projection mapping does not produce physical outcomes at the material level; rather, it is perceivable only when it is projected onto the physical architectural surface. Therefore, the collision and superimposition between projected moving-images and the projection surface is thus confounding—producing a new space—rather than destructive. By temporally transforming the architectural space, the illusion of projected light serves as a palpable material that adds the event's aspect to the static space. As a result, projection mapping produces a novel type of spatial experience in which the static space coalesces with time, movement, and immateriality to activate and dramatize the space.

The making space of projection mapping thus combines linear concepts of narrative from film and video works with the surface transformation of trompe l'oeil, Op art, and the site-making of Gordon Matta-Clark and Christo. Drawing on the literature reviews in Chapters 2 and 3, I have investigated how projection mapping

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[132] Kwon, p.3.

reconfigures the notions of screen, narrative, and surrounding space of screen-based projected moving-image installation art. However, as my analysis has shown, the quantity of conceptually-driven works is still limited. Compared to the earlier projection pieces of Steinkamp and Wodiczko, the majority of projection mapping practices since the 2010s have lacked conceptual or philosophical depth, as mentioned in the introduction. Through the course of the contextual review, I realized that the review alone was insufficient to answer my main question because the work available to analyse did not engage space in a way that was adequate to address the characteristics of projection mapping.

Consequently, my thesis must involve my case-studies to respond fully to my research questions that investigate projection mapping's distinctiveness in the continuum of projected moving-image artworks; the existing literature and practice are insufficient to address my inquiries. The investigation can be fully developed only through analysing the projection mapping in my case studies. As detailed in the introduction chapter, my research is therefore fundamentally practice-based in that it emphasizes the creative process driving the original works in the course of knowledge production.

In the next chapter, I will present a detailed methodology for examining the three case studies; research setting and inquiry cycle.

Chapter 4. Research setting and inquiry cycle for my case studies

As I have shown, contextual reviews alone are insufficient for answering my central research question—**what new relationship between screen, moving image, and space does projection mapping enable in the field of artists' projected moving image works**—because of the lack of conceptually-driven projection mapping practices and formal literature and research on projection mapping. Thus, my research necessitates the use of my own projection mapping practices as case studies. In this chapter, I detail the research setting and inquiry cycle of my thesis.

4.1. Research setting: Exhibition as a site for investigation

In chapter 1, I identified practice-based research as part of my methodology. Informed by case study research and Donald Schön's model of reflective practice, this thesis employs self-reflectivity as a framing instrument to investigate projection mapping's characteristics in artistic production while maintaining critical distance throughout the inquiry process. The inquiry cycle consists of three case studies that are my original site-specific projection mapping installations. This section details the research settings of those case studies.

In chapter 1, I pointed out the small number of cases and the lack of rigor resulted by it as potential weaknesses of the case study methodology. To overcome these

weaknesses, I have used reflective methodology to construct the settings of my case studies with care, as setting is a far more important element than sample size in my research. Schön emphasizes the importance of research settings because they are the situations into which practitioners bring inquiries to experiment and discover intended results.[133] In contrast to the kind of practice-based research conducted in a studio setting, the exhibition-based dimension of my research acknowledges the place of a case study as a crucial element.

In my research, the exhibition space does not mean the traditional white cube or black box room for moving-image installations. Rather, my work takes place in a variety of spaces. In my contextual reviews, I have highlighted the connection between projection mapping and site-specific art to investigate its phenomenological and conceptual relationship with the projected site. Unlike experimental film and video installation works, which normally employ canonical screens, projection mapping's spaces are integral entities as parts of the projection surface. My case studies thus aim to produce *site-intervention* rather than *screen-installation*. From this perspective, a studio setting that lacks contextual specificity is irrelevant to my research.

I have argued that projection mapping generates a more discursive site-specificity than the institutional site-specificity of other projected moving-image works. Therefore, the context of each case study's location is a fundamental element of my case

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[133] Schön, p. 40.

studies. To answer my research questions, I utilise three different contextual locations for my case studies.

My three case studies—*Circulation* (April 2014), *Artificial Vessel* (April 2014), and *CASTING* (March 2016)—involved different exhibition venues: the CASS & Bank Space Gallery in partnership with the Whitechapel Gallery (London, UK); the Taipei Museum of Contemporary Art (Taipei MoCA) (Taipei, Taiwan); and the Victoria and Albert Museum (V&A) (London, UK), respectively. The three venues have different characteristics. The CASS & Bank Space Gallery is not a white cube gallery, but rather an alternative space—a former bank branch turned into a gallery. The interior of the former bank space was only partially renovated, and thus many of the original structures, such as the bank cabinet room, remain in the gallery space. The Taipei MoCA is a typical art museum, equipped with white cube rooms. The project in the V&A is located in one of the Cast Courts, gallery 46 A, which is a gigantic room (18m in height) filled with massive European architectural casts. I executed the three case studies in entirely different contextual sites rather than in an identical studio setting to investigate how projection mapping develops a different relationship between space, screen, and moving image than the one developed in screen-based projected moving-images art works.

4.2. Inquiry cycle

In chapter 1, I identified the steps of my methodology for the case studies:

Step 1. Definition of the Research Questions

Step 2. Documentation of the Processes

Step 3. Analysis

Step 4. Reflecttion

Therefore, at the beginning of the first case study chapter, I detail the first sub question that responds to *Circulation*. I then present the process of the case study that I documented using the active documentation methodology. As detailed in chapter 1, active documentation is necessary because projection mapping's ephemeral character leaves no physical object after the exhibition. For the analysis, active documentation is an essential stage of my research.

I identify a sub question for the second case study, *Artificial Vessel 03*, and document the practice processes. Next I detail the analysis and reflection from the first case study, *Circulation*, for the reflective cycle of investigation. I use the final case study, *CASTING*, to answer the main research question. Thus, the findings from the first and second case studies can be reflected in the discussion of the last case study to respond to the main inquiry of this thesis.

In summary, three case studies were conducted in a cyclical process in which they were developed consecutively. As detailed in chapter 1, each case study follows the four stages adapted from case study research methodology. Each was also part of a larger progressive cycle that responds to the main research question, which asks what new relationship between screen, moving image, and space projection mapping is enabled in the field of artists' projected moving-image works. The following chapters (Chapters 5, 6, and 7) will present the three case studies in detail.

Figure 4.1 Case study list

Title	**Exhibition Type / Title**	**Venue**
Circulation 13 March- 28 March 2014	Group Exhibition **AMBIVALENT**	**CASS & Bank Space Gallery,** in partnership with Whitechapel Gallery London, UK
Sub Question 1	**What type of making-process does projection mapping follow in order to integrate with its projection surface?**	
Artificial Vessel 03 19 April- 15 June 2014	Group Exhibition **K-P.O.P.** **Korean Contemporary Art:** **Process. Otherness. Play**	**Taipei Museum of Contemporary Art** Taipei, Taiwan
Sub Question 2	**What type of narrative does projection mapping generate by integrating moving image and space?**	
CASTING 12 February and 18 March 2016	Solo show **Part of V&A** **Residency programme**	**Victoria and Albert Museum** London, UK
Research Question	**What new relationship between screen, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?**	

As detailed in Chapter 1, I built the appendix website that delivers the active documentation of the three case studies of this research:

http://yiyunkang.com/phd/appendix.html

Chapter 5: Study of the projection surface of projection mapping

5.1. Definition of the Research Question and intention

In chapter 1, I presented the main research question as follows:

What new relationship between screen, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?

Through the contextual reviews, I argued that projection mapping dismantles the conventional screen and integrates with space, embracing the specificities of the site. In doing so, I discovered that projection mapping develops a 'deep surface' and activates space by incorporating moving images and the specific context of a projected space. In seeking to answer my central research question, I have also sought the origin of the distinctive features of this medium.

As detailed in Chapter 1, the fundamental perspective of my thesis aligns with Krauss' 'different specificity' that recognizes the complex relationship between different media. Like other forms of projected moving-image works, projection mapping uses moving images, projectors, projection surfaces, and space for its installation. In this view, it can be said that the making process of projection mapping works might influence the generation of a novel type of relationship between the similar constituents.

Adopting this view, I aimed to analyse projection mapping's production process not simply to examine the physicality of technical support, but to investigate its effect on the distinctive relationship between screen, moving image, and space. Building on these arguments, I developed a more specific sub question for the first case study:

How does the production process inform projection mapping's integration with its projection surface?

I assumed that the distinctive relationship between screen, moving image, and space inherent in projection mapping begins to form in the making process; in other words, that relationship is not the final outcome but is constructed throughout the course of the practice. In Chapter 1, I identified that my research does not prioritise the technological features of projection mapping but instead regards them as important constituents of this medium to examine how its form and content entwine to generate its distinctive facets. To this end, through the first case study, *Circulation*, I aimed to understand the process through which the distinctive relationship between screen, moving image, and space is generated as a first step in seeking the answer to my central research question.

Intention

Circulation was exhibited in the group show AMBIVALENT, exhibited from 13-28 March 2014. It consisted of twelve invited artists' works that represented a wide spectrum of media. The CASS Bank Space Gallery, located on the ground floor on busy Whitechapel Road, was originally a bank and later transformed into a gallery. The gallery did not renovate much of the building's original structure, so the exhibition space lacks the common features of a white cube gallery, as detailed in Chapter 4. Indeed, the CASS Bank Space Gallery is neither a white cube gallery nor a black box room.

What attracted me to this gallery as a research setting was the curatorial team's decision to keep the open structure of the gallery in its original form instead of dividing it into small, separate rooms. This decision meant that the conventional type of screen was not suitable for the exhibition space, as the space lacked both sufficient white wall area and a black box room for projection. This condition offered me a proper setting to investigate how projection mapping's making process relates to its projection surface.

In my initial meeting with the curatorial team in the gallery space, I first noticed an odd 'room within a room'—one of the bank cabinets remained in the exhibition space. This awkward yet interesting spatial object aligned with my objective for the first case study. The cabinet room's various materials, such as its wooden frame, window glass with shades, and marble and metal coverings, addressed my inquiry because they were markedly different from the flat plane of a conventional screen composed of a

single material.

I titled this case study *Circulation* because my aesthetic intention was to articulate my interpretation of the room as inspired by the historical context of the space. The bank cabinet, which was once an object that circulated money, now stood obsolete in the middle of the gallery space. I proposed that the materiality of projected light would enable me to endow a dynamic atmosphere to this useless space and reinvigorate its meaning. The transparency of projected light could superpose moving images onto the surface of the bank cabinet and thus might bring conceptual depth to the inert room, turning it into a 'deep surface'. Therefore, this exhibition space's historical context, formal characteristics, and open structure that extended beyond the white cube and black box offered an appropriate research setting.

Informed by such intentions, I opted not to disturb the original features of the room by adding or removing any materials, and instead used most of the elements of the room itself, materialising my aesthetic concept as a site-specific installation. This means that the original bank cabinet alone became the projection surface in *Circulation*, making the relationship between the creative intention and the projection surface inextricable.

5.2. Documentation of the Process

In this section, I present the documents that I collected through the making process by following the active documentation methodology I discussed in Chapter 1. These materials provide evidence for the analysis and discussion in the following section.

Because my case studies were situated in specific exhibition settings, working within constraints such as the installation conditions and technological requirements was crucial. Unlike experiments that take place in the studio, where conditions are flexible, exhibition settings demand precision and accuracy. This research setting thus necessitated that I begin documenting my inquiry process at the first stage, which was the planning phase.

As I did not intend to install a separate screen, the first step in making *Circulation* was to examine the given space to find the proper surface for my projection. As I have detailed, I chose the bank cabinet room; thus, the documenting process began with photographing the projection surface—the bank cabinet room (Figure 5.1).

Figure 5.1. Photographs of the bank cabinet room within the gallery © Yiyun Kang

Based on the photos and my observations at the venue, I then built a 3D model using Maya software (Figure 5.2). This scale model reflected the relevant details of the bank cabinet.

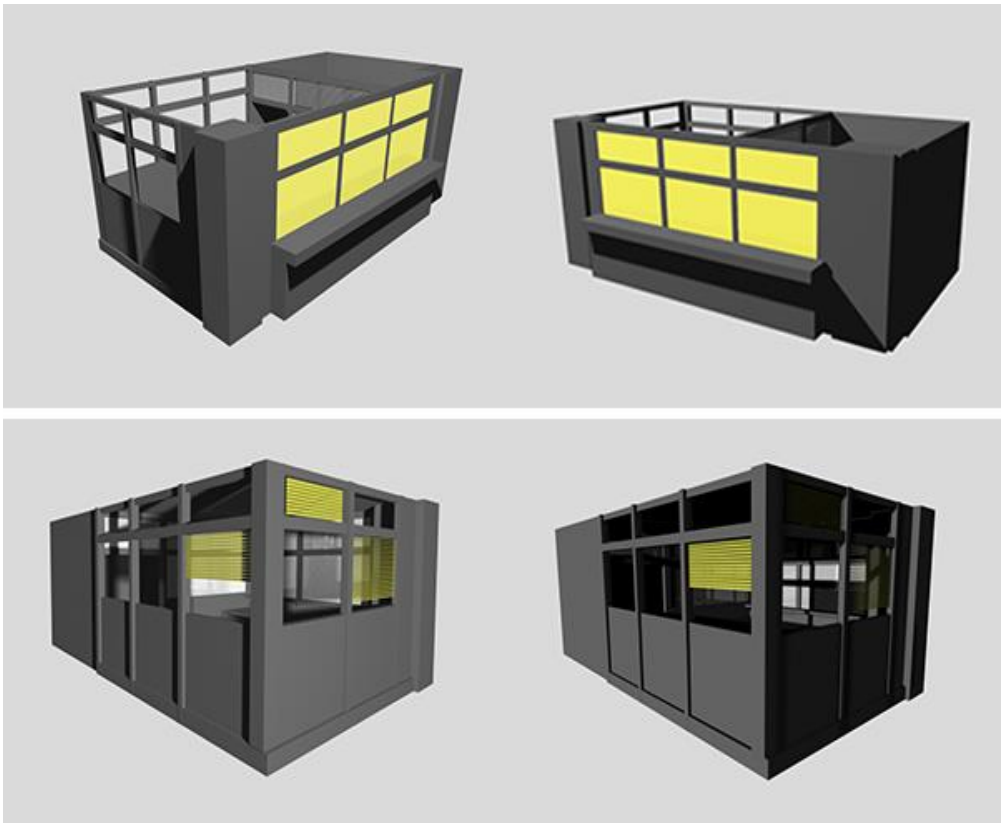

Figure 5.2. 3D model of the installation © Yiyun Kang

The next step was to experiment with virtual light to imitate the effects of projected light. Since the bank cabinet was a semi-open structure, it seemed likely that two projections from opposite sides would mix. With that in mind, I experimented with possible variations, using my virtual model to see how projections would cast light and

shadow inside and outside the structure (Figure 5.3). I explored the collective results that these surfaces would generate when they met the projected light. Through this process, I cultivated my ideas for a moving image design that would be projected onto the surfaces of the bank cabinet.

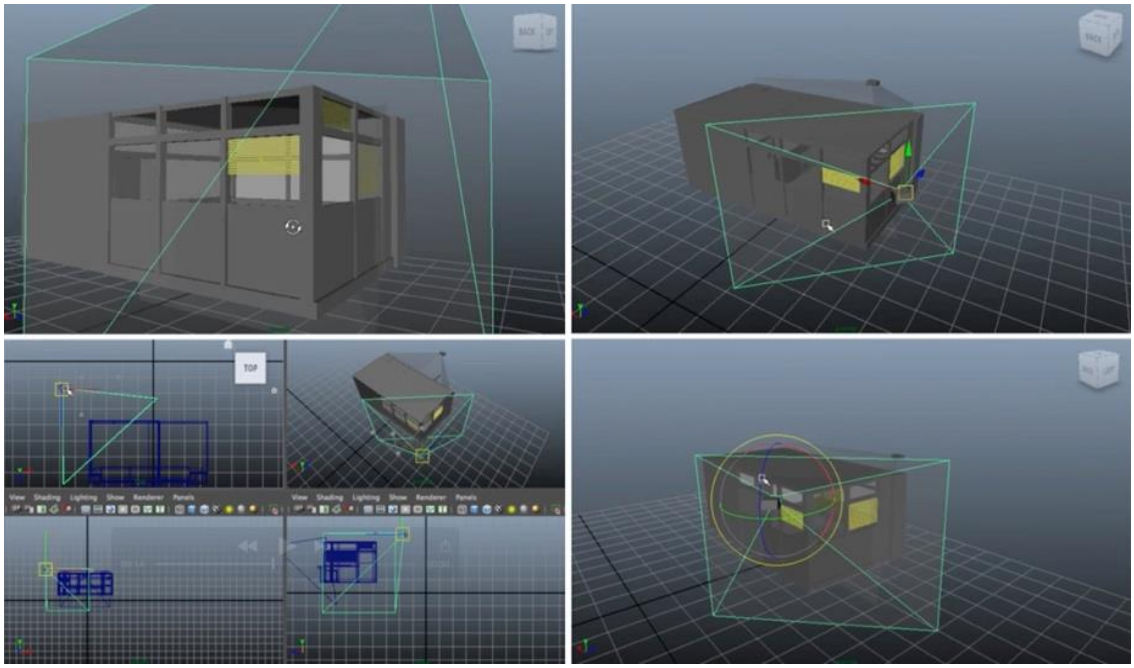

Figure 5.3. 3D model of the installation testing the effects of projected light © Yiyun Kang

Based on these virtual experiments, I then conducted several tests at the real venue (Figure 5.4). The experiments in the virtual realm provided productive possibilities for integrating the virtual and the real. I sought to exploit the semi-open structure of the bank cabinet fully to investigate how projection could dissolve the static spatiality of the room, both inside and out. To that end, I placed translucent papers on

the frontal glass windows of the room so that I could project moving imagery onto them. I left the back windows of the room transparent so the imagery from front and back would mix. The virtual models and the tests at the venue functioned as forms of experimental communication between the virtual space and the real space and informed the final installation.

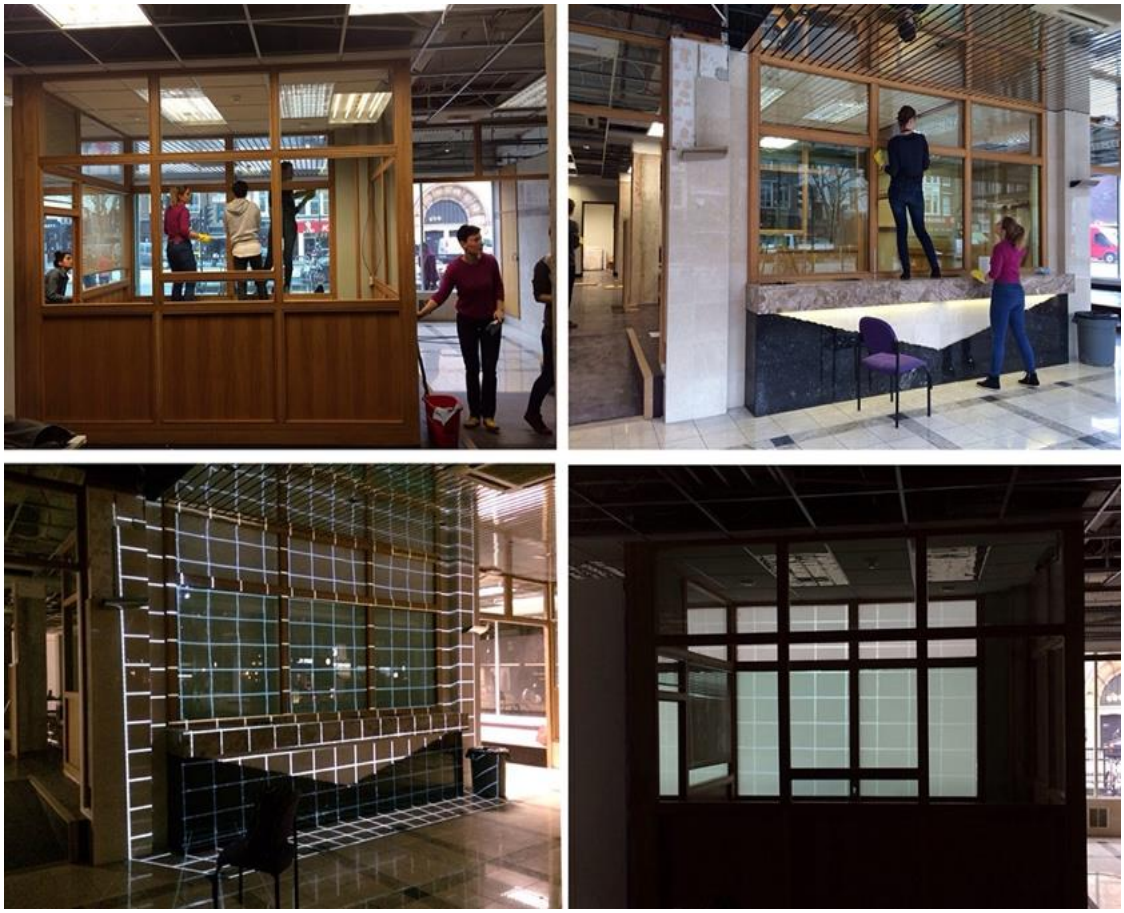

Figure 5.4. Installation process © Yiyun Kang

After securing the projectors' positions in the gallery, the next step was to map the surfaces. Mapping must occur before making the moving-image content, because the moving images need to fit the surfaces. The mapping file thus functions as a canvas onto which moving images are superimposed. As this would be a two-week exhibition in London, I had fewer concerns about the stability of the installation system than I would with a months-long exhibition. In this case, real-time mapping software MadMapper was a suitable option for securing the best result, so I used it to map the bank cabinet (Figure 5.5). I mapped every surface of the room, including window frames, shades, and columns, to map the moving images in exact positions.

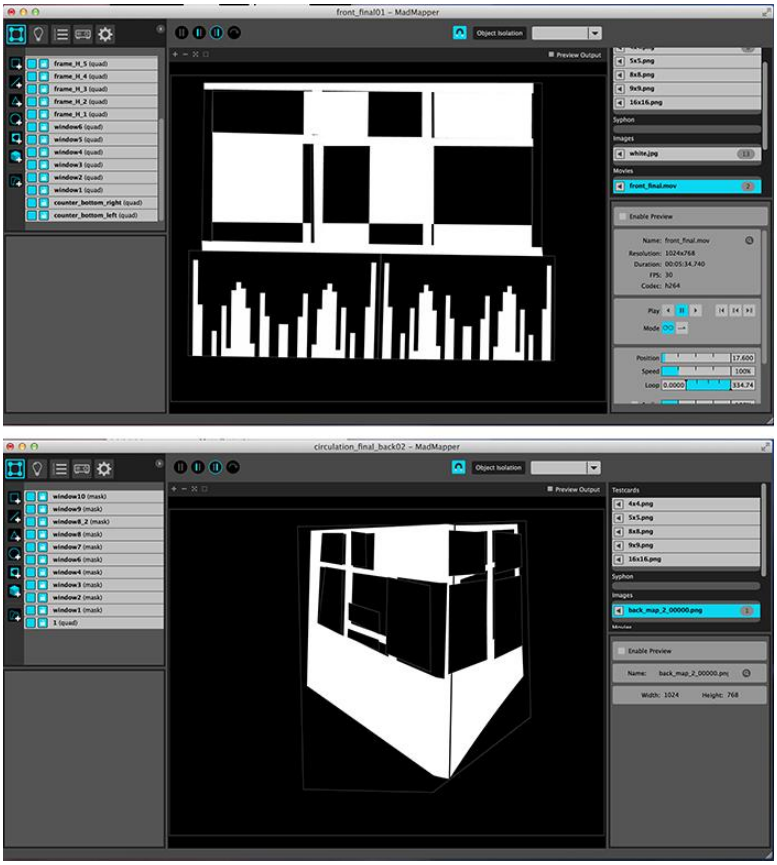

Figure 5.5. Screenshot of mapping process: MadMapper © Yiyun Kang

I then used Adobe After Effects to produce an animation (Figure 5.6). Based on the mapped file produced by MadMapper, I created moving images for each surface surrounding the bank cabinet room in 270 degrees. In this way, the partial surfaces of the bank cabinet, such as the windows, columns, and frames, were united into a single three-dimensional surface that combined images from two projectors.

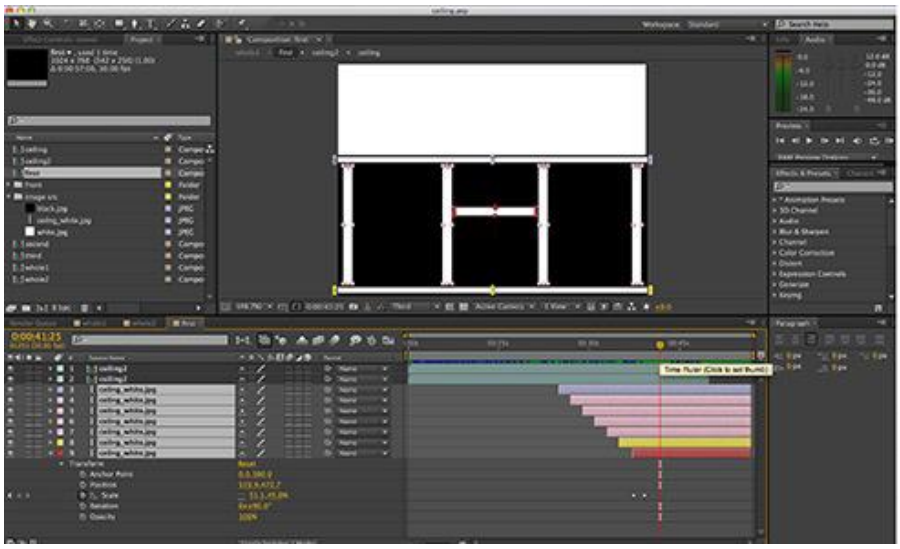

Figure 5.6. Screenshot of moving-image making process: After Effects © Yiyun Kang

As a result, the final installation covered the bank cabinet room in 270 degrees (Figure 5.7, 5.8, and 5.9).

Figure 5.7. Installation view © Yiyun Kang

Figure 5.8. Installation view © Yiyun Kang

I added sound to this installation to create a more dynamic atmosphere. Drawn to the creative intention inspired by the obsolete bank cabinet, I used diverse sounds of clinking coins to enhance the synesthetic experience, adding the soundscape to the moving-image scape. The analysis of sound is outside the scope of my research, however, as I focus on the making process of projection mapping and its relevance to transformation of the projection surface.

Video documentation of *Circulation* can be accessed through the following link:

http://yiyunkang.com/phd/01_circulation.html

As seen in the photographic and video documentations, the final installation used different sections of the bank cabinet room for projection surfaces. I fully employed the bank cabinet room's semi-open structure so the images projected onto the windows could be viewed through the back of the cabinet. As seen in Figure 5.8, the effects of light and shadow delivered by the moving images, the real shadows cast by the projected light, and the viewers' shadows, were all mixed in the final installation. This was possible because of the semi-open, three-dimensional character of the bank cabinet. With this projection surface, the notions of front and back and inside and outside thus did not apply, and the canonical notion of screen could not properly describe *Circulation*'s projection surface.

AMBIVALENT had around 700 visitors over two weeks. According to the information provided by the curatorial team, 'visitors were very impressed with the

installation, citing the piece's hypnotic visual power'.[134] Another key piece of feedback was that *Circulation* was 'one of the two pieces where audience feedback expressed likelihood to engage with the piece for a durational period of time'. This was noted by the invigilators, who stated that many audience members would spend five minutes or more viewing the installation. In an exhibition review of *Circulation*, it was noted that the piece became one of the main featured artworks in AMBIVALENT. A member of the curatorial team, Alejandro Ball, said that 'the artwork's ability to engage audience members for a durational period of time was noted as a key feature that contributed to the exhibition's success'.[135]

[134] Alejandro Ball (member of the curatorial team of AMBIVALENT), AMBIVALENT Exhibition Review, 2014.

[135] Ibid.

Figure 5.9. Installation view © Yiyun Kang

5.3. Analysis

In the previous section, I detailed the making processes and the final installation using materials collected throughout the production of *Circulation*. To respond to the first sub question—**How does the production process inform projection mapping's integration with its projection surface?**—I will now examine those materials by analysing how the making process, including the technical aspects of projection mapping, differs from that of previous forms of projected moving-image installation works, and in so doing, I will investigate the production process as the initial step in constructing the distinctive relationship between screen, moving image, and space.

First, experimentation in a 3D virtual environment is a distinctive process that is important in projection mapping practices but is not typically used in other forms of projected moving-image works. As noted, I used Maya software, which is a Non-Uniform Rational Basis Spline (NURBS) programme. NURBS is a mathematical model commonly used in computer graphics for generating and representing curves and surfaces; it offers flexibility and precision. The amount of information required for a NURBS representation of a piece of geometry is much smaller than the amount of information required by common faceted approximations. Additionally, editing NURBS curves and surfaces is highly intuitive and predictable because the programmes allow easy human interaction. Therefore, NURBS programmes are widely and rapidly used in current architecture, design, and art practices.

Alicia Imperiale points out the importance of NURBS-based programmes in contemporary art and architecture. She explains that NURBS software is based on a dynamic system in which surfaces and objects are developed in shifting relation to a surface. In a NURBS-based 3D environment, form is conceived of not as a static condition but as a set of constantly evolving and smoothly registering algorithmic parameters that continuously change through artists' interventions.[136] Therefore, she argues that the use of NURBS software enables artists to build surfaces and create objects by connecting one surface to another.

The use of Maya software in building a virtual environment for *Circulation* thus enabled me to focus on each projection surface of the bank cabinet—windows, wooden planes, holes, columns, and even the void space created by them (Figure 5.2). In so doing, I could develop my plan for employing the varied surfaces of the bank cabinet through my projections. The virtual environment was a procedural production to incorporate the installation with the real environment. Michael Heim describes a virtual environment as a scene that resembles and responds to the physical reality.[137] As such, the 3D model that I built was a virtual simulation that linked the idea of the work to the actual location.

Moreover, a virtual environment offers not only technological but also

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[136] Alicia Imperiale, 'Seminal space: Getting under digital skin', in *Re:Skin* ed. by Mary Flanagan and Austin Booth (Cambridge, MA: MIT Press, 2007), pp.#-# (p.271).

[137] Michael Heim, *The Metaphysics of Virtual Reality* (Oxford: Oxford University Press, 1993), p.160.

conceptual support for a final work. Thomas Corby suggests a more inclusive sense when analysing the virtual, opposing the idea that the term is often meant to imply an absence, copy, or simulation of the real.[138] Corby stands against current manifestations of virtual environment media and identifies alternative approaches to the medium. Pierre Lévy also claims that rather than being a caricature of the real, the virtual represents processes of becoming and constructive acts that constitute the real.[139] In line with his description of 'the virtual as a fecund mechanism that provokes the discovery of new spaces and modes of being',[140] I used a 3D virtual environment to mediate the real space and virtual space, and eventually to create a new situation.

In Chapter 3, I examined Christo's architectural wrapping works. He produced multiple types of drawings and photographic collages to accompany real installations. Those materials are not merely witnesses to or post-products of the works' existence; rather, they are formative constituents that collectively complete the works. Christo clarified that his projects have two distinct periods: the "software" period and the "hardware" period. He explained that the software period is 'exactly the moment when the project exists in the drawings' as 'an expedition in the very complicated process of making.'[141] Christo highlighted the importance of this stage by saying, 'if we would

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[138] Thomas Corby, 'The Disappearing Frame: A Practice-Based Investigation into Composing Virtual Environment Artwork' (unpublished doctoral thesis, University of the Arts London, 2000), p.73.

[139] Pierre Lévy, *Becoming Virtual: Reality in the Digital Age* (London: Plenum, 1998), p.174.

[140] Corby, p.74.

[141] Christo, Interview with Gianfranco Mantegna, 'CHRISTO & JEANNE-CLAUDE', *Journal of Contemporary Art*, 7.2 (1995): 32-44. <http://www.jca-online.com/christo.html> [accessed May 2017]

never have the process, we would never realize the object.'[142]

Even though the tool is different, the 3D experimentation of my practice similarly aims to lead an expedition to realize the installation and not simply to produce a replica of the real environment. Distinctive from Christo's "software" stage, based on drawings and photographies, the 3D software stage of my practice offers more dynamic possibilities for exploring the piece. In fact, 3D models are more widely used in contemporary architecture practices than in artworks. In architecture, 3D digital models are used for structural analysis in design development and as a source of construction information.[143] Branko Kolarevic writes that 3D digital models have become a key part of the current architecture that takes precedence over any other construction.[144] Similarly, my experimental 3D process preceded other stages in the completion of *Circulation*.

However, the 3D environment in *Circulation* was used not to build a new construction but to intervene in the real space. This intention is similar to Christo's "software" stage that attempts, to use Hogue's explanation, to merge the architecture and intervention to create a third whole (Chapter 2). For example, the experiments with light and shadow in the virtual realm (Figure 5.2) provided a focal point as I designed my moving images. The virtual 3D environment enabled me to create and control

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[142] Ibid.

[143] Architecture in the Digital Age: Design and Manufacturing, p.47.

[144] Ibid., p.92.

elements such as shapes, surfaces, light, and shadow easily and to explore multiple possibilities for turning the obsolete bank cabinet into the ‘deep-surface’.

In Chapter 2, I detailed Uroskie’s notion of ‘taken place’ and ‘represented place’ in moving-image works and argued that projection mapping dismisses this separation because the former is superimposed onto the latter. In line with this argument, the use of a 3D virtual environment in *Circulation* assists the merging of two discrete places by empowering diverse possibilities that would not have been easy to achieve in the real situation.

In terms of moving-image making, I used Adobe After Effects. This software produces ‘non-narrative, non-figurative based visuals that change over time’.[145] Lev Manovich argues that media design software applications such as After Effects and Maya have a completely different ontology than that of cinematography because they do not simulate previously filmed physical media. He claims that their working method is different; they borrow different media sources and combine and mix them to create a new composition.[146]

After Effects’ composition-based interface had an important influence on the

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[145] Lev Manovich, *After Effects, or Velvet Revolution* (part 1), Spring 2006, < http://manovich.net/index.php/projects/after-effects-part-1> [accessed June 2014]

[146] Ibid.

making process of projection mapping. Adobe describes a composition as the framework for a movie. In this software, each composition has its own timeline: a typical composition is a container that stores multiple layers that represent components such as video and audio footage items, animated text and vector graphics, still images, and lights.[147] Figure 5.6 shows the multiple compositions that I layered for a single moving-image. It contains vector and bitmap images, filmed footage, and computer-generated animations, as well as sound.

Manovich argues that unlike in the frame-based film and video editing paradigms of the twentieth century, in an After Effects' composition, each element can be individually accessed, manipulated, and animated as an independent object. He claims that composition thus references 2D media (drawing, painting, photography, design) rather than filmmaking or video editing.[148] Composition is important in the context of my research because it aligns with projection mapping's link to 2D painting media such as trompe l'oeil and Op art, as detailed in the contextual reviews.

Rather than editing based on time-based frames, I could work spatially with various visual elements independently allocated in compositions. This method thus enabled me to create several compositions to respond to different projection surfaces of the bank cabinet, respectively. This process was completely different than the process

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[147] Adobe, *Composition Basics* < https://helpx.adobe.com/after-effects/using/composition-basics.html > [accessed March 2017]

[148] Manovich.

used in screen-based film or video works. In *Circulation*, the separated sections—windows, frames, and columns—were independent surfaces for moving images, and the work was completed when they were combined to cover the bank cabinet in 270 degrees. Therefore, while working on a separate composition for each surface, I also had to consider the result when the compositions were merged.

In addition, the use of composition-based After Effects enabled me to mix varied sources. According to Manovich, the logic of After Effects and Maya lies in their deep-remixability that combines 'not only of the content of different media or simply their aesthetics, but their fundamental techniques, working methods, and assumptions'.[149] In *Circulation*, I remixed filmed footage of human bodies and computer-generated animations using vector images. To complete the moving-image piece for *Circulation*, I used Maya, After Effects, Photoshop, and Illustrator. These previously distinct techniques, methods, and disciplines were integrated to realize my concept.

In this view, I treated the collective sources of moving images produced for *Circulation* as hybrid, echoing Jihoon Kim's notion of 'hybrid moving images'. In *Between Film, Video, and the Digital*, he defines 'hybrid moving images' as 'an array of impure image forms characterized by the interrelation of the material, technical, and aesthetic components of existing moving image media-film, video and the digital'.[150]

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[149] Ibid.

[150] Jihoon Kim, *Between Film, Video and the Digital: Hybrid Moving Images in the Post-media Age* (London: Bloomsbury Academic, 2016), p. 4.

Kim explains that the term ‘hybrid’ or ‘hybridization’ emphasizes that digital media technologies put less emphasis on the total effacement of existing characters than they do on the complex interplay between the material, technical, and formal elements of pre-existing media. The use of hybrid moving images is another distinctive element of projection mapping’s production process.

Reflecting on this notion from Kim, I produced ‘hybrid moving images’ in *Circulation* that retain the characteristics of film, video, and digital moving-images simultaneously. I mixed filmed footage of human performance and black-and-white abstract digital animation to respond to my creative intention that was inspired by the obsolete bank cabinet. The real footage was necessary in the case study, as it fit my creative intention to demonstrate my interpretation of the concept of circulation that centralizes human activities. The filmed performance of human bodies behind the white fabric superimposed on the front window of the bank cabinet suggests that this space, once filled with dynamic human activities, has become obsolete (Figure 5.7). The live-action footage of human bodies was intended to evoke the confusing and uncanny feeling that someone was inside the room, performing in real time. Even if viewers realized that they were seeing pre-recorded footage, I aimed to evoke ambiguous feelings—generated between the tangible and the intangible—to reflect and then reinvigorate the obsolete bank cabinet.

To reinvigorate it, I created black-and-white abstract animation that was produced to fit the bank cabinet’s formal features, its semi-opened structure, windows, and shades (Figure 5.9). The light and shadow effects generated by the projected

animation drew viewers to take more time when looking at the details of the bank cabinet. Even though the cabinet's original function has been abolished, it now resides in the context of an art venue, invested in a new institutional context. Thus, I aimed to make the bank cabinet room stand out as an art object, as opposed to as a background. As a result, the hybrid moving images that I created fundamentally responsive not only to the formal aspects of projected surface, but also to the contextual meanings of it.

MadMapper software was used to merge the separate compositions produced in After Effects. MadMapper is real-time surface mapping software, not video editing software. The basic unit of this programme is thus a surface. Fundamentally, what MadMapper does is create virtual surfaces, assign moving-image sources to them, and project them onto the real surfaces of a space or object through a projector. In *Circulation*, MadMapper allocated the individual compositions to the relevant surfaces of the bank cabinet. Without this process, I could not have merged the separate compositions and superimposed them onto the physical surfaces of the bank cabinet. Additionally, this surface-editing process operated in real-time, which meant that I connected my computer to the projector facing the bank cabinet in the CASS gallery to map and assign the compositions to the real surfaces and adjust them to be an exact fit. Therefore, this process had to be completed in the real exhibition venue at which the projection surfaces were located. This real-time editing process at the exhibiting venue is another distinctive making process of projection mapping.

In *Circulation*, I merged two projectors to create a single projection that

covered the bank cabinet in 270 degrees. Merging is another of projection mapping's characteristic processes that is distinctive from the processes used in screen-based moving-image installation works. Video installation, for example, whether it is a single or multi-channel, does not merge several projectors to make a single huge screen. On the other hand, projection mapping may merge several projectors if necessary to integrate with a projection surface.[151]

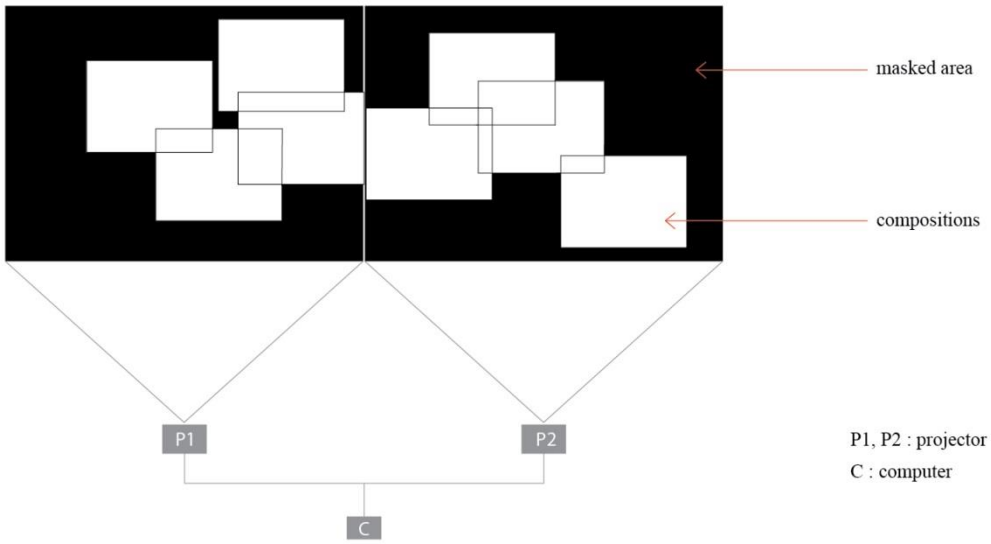

Figure 5.10. composition setting © Yiyun Kang

[151] For example, URBANSCREEN merged 24 projectors to make a single projection that covers the interior of the huge cylinder-shaped building in '320 licht.'

Figure 5.10 shows the system of projection made for *Circulation*. One computer (C) is connected to the two projectors (P1 and P2) to merge two separate projections into one. The projected moving-image contained multiple compositions that fit the respective sections of the bank cabinet. Through MadMapper, these merged compositions could be superimposed onto the real bank cabinet. Unnecessary parts were masked using MadMapper so that each composition and surface could be fit together perfectly. One computer (C) controlled the merged projections and mask areas.

In Chapter 3, I argued that projection mapping reconfigures the previous conventional notion of a flat screen into an optically and conceptually dense place, a 'deep surface'. I also examined Deleuze's notion of fold as it informs a 'deep surface' by configuring form as a connection, and thus defining the inside and outside as interdependent, not autonomously grown. Building on this, every stage of the production process of *Circulation* analysed in this section identifies how projection mapping connects moving image and surface, making their relationship inter-reliant. The 'deep surface' of *Circulation* can thus be implemented through the touch—or, to use Lavin's term, the 'kiss' (Chapter 3)—of the projected moving-image and projection surface. In this view, the production process detailed in this section is not merely a technical support, but a formative entity that generates projection mapping's distinctive characteristics, establishing the making process of projection mapping as a departure point for understanding this medium.

5.4. Conclusion

I mixed frame-based representations with composition-generated animations and used linear and non-linear editing methods to make *Circulation*. I also constructed a 3D model and conducted real-time editing in the gallery. In conclusion, projection mapping employs the use of software applications such as Maya, After Effects, and MadMapper that work through different operational systems than those used in the cinematographic making process. These software applications are not merely technical tools, but important agencies that connect the moving images that reflect my creative intentions with the projection surfaces and thereby inform an inextricable relationship. The making process enabled by these programmes is thus a conceptual support to complete the piece.

Of course, projection mapping does not remove the previous characters of the cinematographic moving-image making process. In *Circulation*, I shot and edited footage of human bodies by using those methods. Rather, Projection mapping incorporates previous procedural disciplines and features into a novel type of making process to create, to use Kim's term, a hybrid moving images. As analysed, the way the surface and moving images are inextricably connected is central to the entire making process of *Circulation*. Every making stage is conducted with close consideration of its projected space, from the selection of the projection surface to the final installation. Maya, After Effects, and MadMapper were all used to incorporate with the real space and thus to realize my creative intention that prompted *Circulation*.

As a result, the production process of projection mapping is not only sequential but also spatial. This spatio-temporal editing is a distinctive making-process of projection mapping. Projection mapping's reconfiguration of the canonical screen and integration with the projection surface can be operated through its distinctive process. Without understanding this process, projection mapping's unique relationship between screen, moving image, and space cannot be fully investigated.

Chapter 6: Study of the narrative space of projection mapping

6.1. Definition of the Research Question and intention

In chapter 5, I investigated how the making process of projection mapping builds an inextricable relationship between its projection surface and moving image. The first case study, *Circulation*, showed that projection mapping's distinctive relationship between screen, moving image, and space is not simply a result but is, rather, a character that is constructed throughout the course of the practice. From this perspective, *Circulation* was the first step in responding to my central question.

The second case study aimed to examine projection mapping's narrative aspect. Through the contextual reviews, I argued that projection mapping's narrative is different from that of screen-based moving-image installations because it cannot be detached from the context of the projected site. Building on this argument, I developed a more specific sub question for the second case study:

> **What type of narrative does projection mapping generate by integrating moving images and space?**

In this chapter, I thus detail the second case study, *Artificial Vessel 03*, with the specific intention of investigating projection mapping's distinctive type of narrative in relation to space, operating under the assumption that this question significantly relates

to my central question's investigation of the distinctive relationship between screen, moving image, and space.

Intention

Artificial Vessel 03 was an object/site-specific projection mapping installation exhibited at *K-P.O.P.* | *Contemporary Korean Art: Process, Otherness, Play* at the Museum of Contemporary Art Taipei (MoCA Taipei), from April to June 2014. The curatorial rationale was to showcase works by nineteen Korean artists and to survey contemporary Korean art as a whole. I was invited to show two projection mapping installations, one of which was *Artificial Vessel 03*.

To address the second inquiry, I decided to use only the existing elements of the exhibition space. Unlike the narratives of most film and video installations, projection mapping's narrative cannot be detached from its close relationship with the projection surface and its location. Therefore, its narrative is derived not only from the moving image but also from the projected space. To analyse this, I chose not to manipulate the original site to extract narrative from the operation.

Under this premise, I first closely examined the exhibition space allocated to me. Each artist was assigned his or her own separate room, a white cube. Compared to the bank cabinet in the previous case study, MoCA Taipei's white cube room was ahistorical. Brian O'Doherty points out that the white cube is a kind of a sacred space that detaches the artwork from any aesthetic or historical context into a 'closed system

of values,' and this institutional frame of the gallery and its laws are contexts that validate the content of the work.[152]

Compared to the bank cabinet, this room lacked any extraordinary or remarkable elements and was thus challenging given my intention to use the ephemeral projected moving-image as my only medium without producing any additional material to transform the ahistorical space. However, after a close examination of the site, I found the ceiling structure especially interesting, as my room was equipped with a lighting structure hung from it.

O'Doherty underscores the white wall of the exhibition space in understanding the properties of the white cube. He believes that the white wall on which a painting is typically hung has become an 'aesthetic force' that modifies anything shown on it, and 'artifies' the work.[153] The white cube wall is therefore not neutral but is instead an institutionally condensed area. Rather than use the white walls, I decided to employ the lighting structure, originally an infrastructural element meant to go unnoticed, as my projection surface. In so doing, I might alter the dynamic of the inert white walls beyond the light fixture by means of projected light and add a sense of the expansion of the room, lending an impression that the room had a life beyond serving as a supportive neutral background for artworks.

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[152] Brian O'Doherty, *Inside the White Cube: The Ideology of the Gallery Space* (Oakland: University of California Press; Expanded edition, 2000), pp.14-15.

[153] Ibid., p.29.

I was also attracted to this object because the lighting structure and projector were light sources; both the projection and the fluorescent tubes of the lighting fixture were sources of artificial light. Therefore, I reasoned that playing with these different sources of light would identify the difference between the two and enable me to investigate how projection mapping generates its distinctive type of narrative by means of projected moving-images, not merely projected light.

In summary, in the second case study, *Artificial Vessel 03*, I intended to use only a layer of projected moving-images and not to build any physical materials to intervene in the empty white cube room in the museum to disrupt the institutional context of the conventional exhibition space. In so doing, I aimed to investigate my second sub question that asks how projection mapping constructs its unique narrative that is integrated with its projected space.

6.2. Documentation of the Process

In this section, I provide the documented materials produced throughout the process—from making to final installation—and collected using the active documentation methodology. As the second stage of my reflective cyclical case study methodology, these materials will be used in the reflection and analysis in the following section.

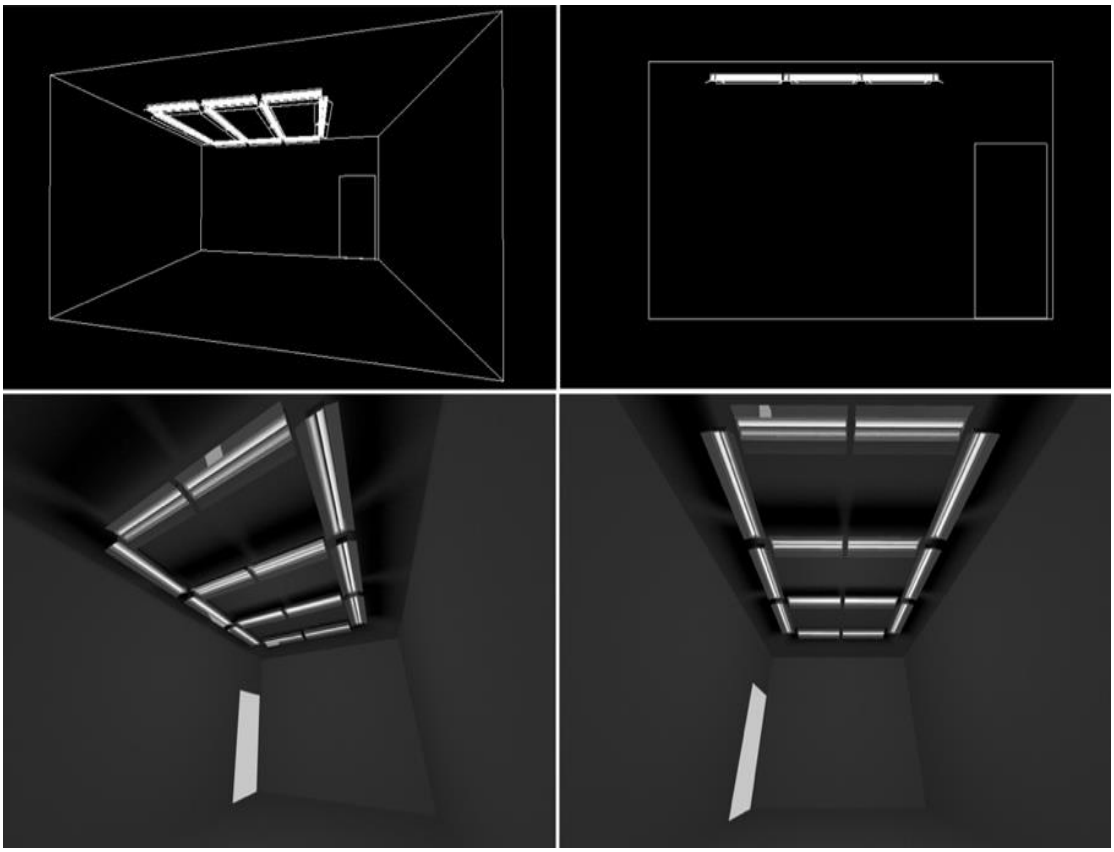

Figure 6.1. 3D model of the installation venue © Yiyun Kang

As in the first case study, I began by building a virtual model of the space using Maya software (Figure 6.1), as virtual experiments are important parts of the process of executing my concept. This time, I aimed to play with the electric light source by using projected light to create an illusion alternating between resemblance and mystery; this illusion would be part of the narrative in *Artificial Vessel 03*. Therefore, it was important to make the installation simultaneously convincing and confusing. To achieve this, I first considered how to secure the position of the projector.

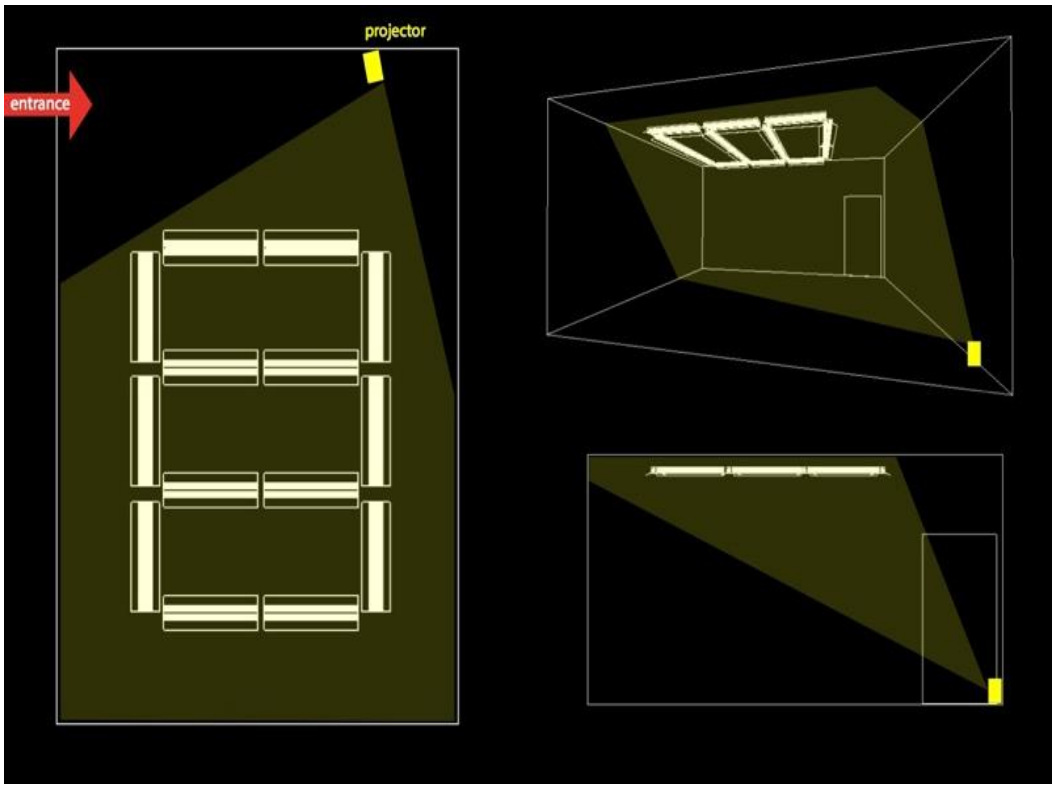

Figure 6.2. Sketch for the projector installation © Yiyun Kang

Based on the virtual test and several tests at the venue with different types of projectors, I decided to install one short-throw projector at the bottom corner of the room to cover the entire lighting structure with a single projector (Figure 6.2). I also took great care in choosing the projector's location to avoid frequent shadows from the viewers that would decrease the degree of immersion in the installation.

I experimented with the virtual model based on close observation of the real light fixture. In the virtual environment, I imitated and transformed the light fixture to explore diverse possibilities and develop my ideas on what kinds of moving imagery would suit my creative intention. As in the first case study, I used After Effects for moving-image production, but in this case study, I created only black and white computer-generated animation that was devoid of any real, filmed footage. My creative intention was to imitate and transform the electric light fixture with projected light to alter the dynamic of the ahistorical white cube space. For this narrative, I first needed to draw viewers' attention from the white wall space to the lighting structure on the ceiling. Therefore, I produced an initial sequence of moving images to imitate the light fixture, then I designed a sequence to show diverse movements of light that could not be produced by the light fixture, making viewers wonder and question the space. For this, I created various patterns of black and white abstract animations, excluding any live-action footage or figurative shapes.

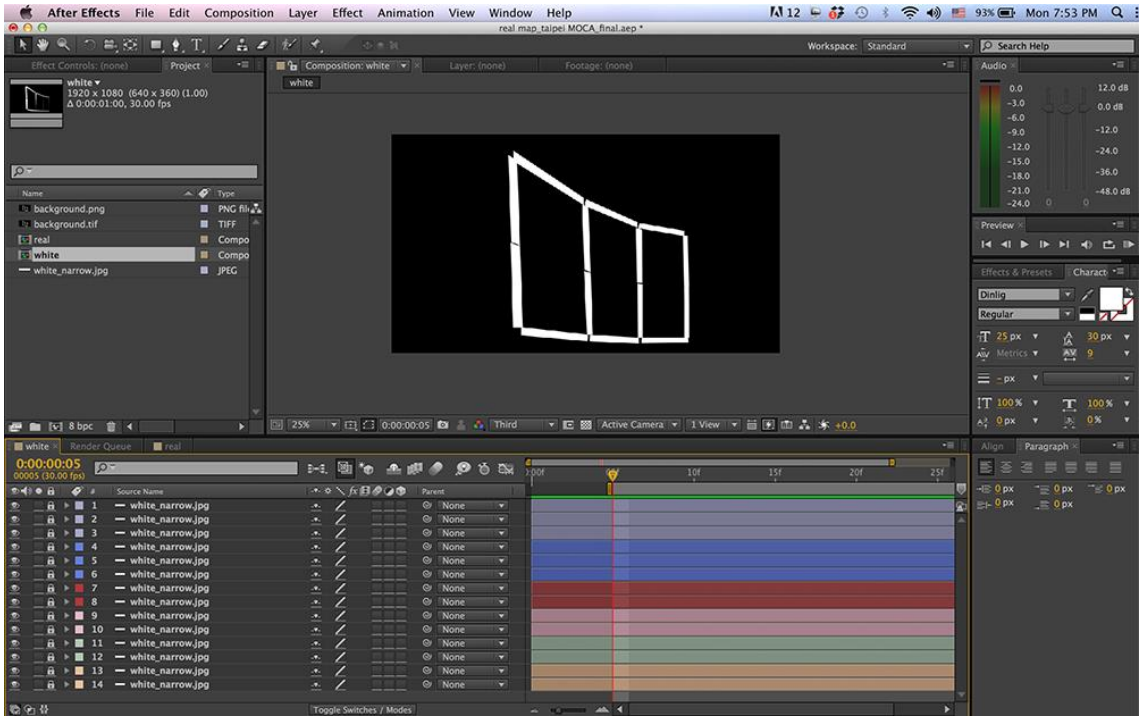

Figure 6.3. moving-image making in After Effects © Yiyun Kang

As in the first case study, moving images were created using multiple layers of compositions in After Effects (Figure 6.3); this produced separate moving-images to fit each section of the lighting fixture. To imitate the electric light and transform it through moving image, I employed various traditional methods when editing the compositions in After Effects. For example, transition techniques such as cross-transition, dissolve, wipes, and fades[154] were used to generate the impression of resemblance and mystery.

[154] These are various techniques used in the post-production process of film editing and video editing. For example, dissolve is an editorial transition overlapping a fade in and a fade out in such a way that one image gradually disappears while another simultaneously emerges. Wipe is an optical editorial transition in which an image appears to be pushed or wiped to one side of the screen to make way for the next.

Figure 6.4 presents four captured shots from the final version of the exported .mov file exported from After Effects. As seen in this figure, before being mapped onto the real space or object, the lighting fixture in this case, the moving image of projection mapping can neither demonstrate the creative intention nor deliver the narrative by itself. Expecting the narrative of the final installation before the moving-image is superimposed on the lighting fixture's surface is almost impossible based only on watching the moving-image file on a computer screen. This final moving-image file was then mapped onto the lighting structure using MadMapper.

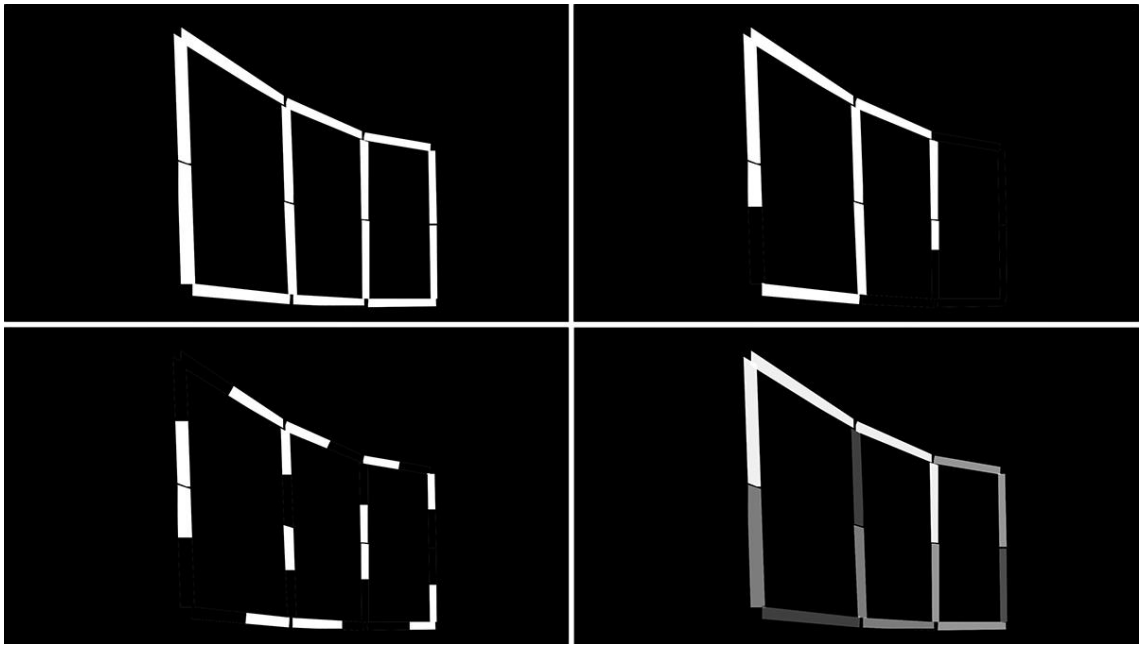

Figure 6.4. still images of the final .mov file © Yiyun Kang

I turned off power to the lighting structure and projected moving images onto it. The result was intended to be simultaneously convincing and confusing. The top

photograph in Figure 6.5 shows the original space with the lights on. The bottom photograph shows the installation view with the lights off and projection on. During the exhibition, the electricity supply to the lights was off, but in the early part of the animation, this was difficult to discern because the projection created various patterns of movement, as if the lights were being turned on and off automatically. However, these patterns became dynamic until viewers should have realized that they were seeing a projected animation elaborately mapped onto the lighting structure.

Figure 6.5. Original space (top) installation view (bottom) © Yiyun Kang

Additionally, I projected images onto the stainless-steel lampshades, creating an irregular reflection that covered the entire room, appearing intermittently and in various segments that followed the projection. As addressed, I intended to change the dynamic of the white cube room and generate narrative from it using only the light fixture on the ceiling. To achieve this, I fully employed the reflective materiality of the lighting lampshades. As a result, the projection spreads its influence over the entire room through fluid lines of reflected light (Figure 6.6).

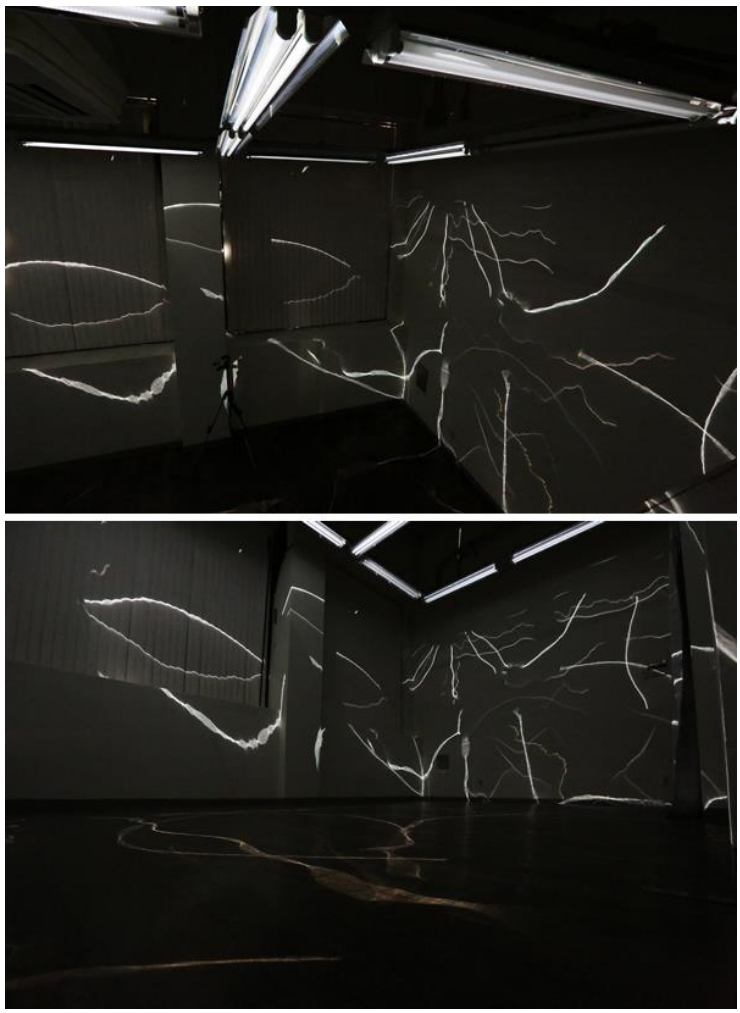

Figure 6.6. Reflected projections on the entire room © Yiyun Kang

The reflectivity of the metallic lampshades enabled me to cover the entire space, even though I had mapped only a small part of it. The liquefied lines gave an impression of blood vessels. Even though the entire process of execution was meticulously arranged using artificial hardware and software devices, it was interesting to see that the outcome unexpectedly contained such organic reflections. The title, *Artificial Vessel 03,* thus reflected my creative intention to transform the empty white cube room, a neutral and inert space, into a virtual creature.

Video documentation of *Artificial Vessel 03* can be accessed through the following link:

http://yiyunkang.com/phd/02_artificial.html

As seen in the photographic and video documentations, *Artificial Vessel 03* disrupted the canonical screen and narrative structure of cinematic production. It had neither multiple screens for viewers to walk between nor a proscenium viewing arrangement that asked the viewer to watch the same projected screen. Rather, the projected moving-images were everywhere, including the reflections; they dispersed on the ceiling, walls, and floor of the empty white cube room.

As a result, the narrative of *Artificial Vessel 03* emerged from my conceptual intention and design and was developed through the course of its making process that investigated the features of the projected space as well as the materiality of the

projection surface. Based on the materials detailed in this section, the next section will present my reflection and analysis that respond to the second sub question.

Figure 6.7. installation view and detail of the reflected projection © Yiyun Kang

6.3. Reflection and Analysis

Through *Artificial Vessel 03*, I sought the answer to the second sub question: **what type of narrative does projection mapping generate by integrating moving image and space?** To do this, I first need to unpack the notion of narrative in moving-image art. Robert Scholes defines 'narration' as telling or recounting a string of events, and explains that 'narrative' is perceived when the narration is sufficiently coherent and developed to detach itself from the linear sequence.[155] Malcolm Le Grice writes that 'narrative represents real or imaginary events in time.'[156] To create a narrative is to tell a story, either as a moment in an ongoing story or as a sequence of events unfolding over time. Traditional narrative cinema creates an illusion of something taking place before us, and the spectator needs to enter the narrative illusion to engage with the story.

This traditional form of cinematic narrative has been continuously questioned and explored in moving-image artworks, especially in experimental film and multi-channel video installations, as detailed in the contextual reviews. Experimental film's anti-narrative and video installation's multi-perspective narrative, however, pose challenges to cinematic narrative structures and thus eventually do not deviate much from cinematic references. Jesús Segura Cabañero identifies that the complex interests

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[155] Robert Scholes, 'Narration and Narrativity in Film', *Quarterly Review of Film Studies*, 1.3 (August 1976), #-# (pp.285-286).

[156] Malcolm le Grice, Time and the Spectator in the Experience of Expanded Cinema, in *Expanded cinema : Art, performance, film*, (London: Tate Publishing, 2011). p.161.

of artists working in film and video medium primarily use cinema as a cultural reference.[157] As analysed in the contextual reviews, cinema has been a strong influence on artists' film and video practices.

As Sean Cubitt claims, terms such as anti-narrative or multi-narrative define themselves through their dependency on cinematic notions that are incapable of producing a new term beyond its link to cinema.[158] Even though other media such as painting, relief sculpture, and installation art can contain narratives as defined above, these terms confine themselves to their links to the cinematic frame. Manovich argues that most moving-image art follows the dominant semiological order of cinema, and this language-like sequencing of cinema has replaced other modes of narration with a sequential narrative, an assembly line of shots which appear on the screen at a time.[159] However, the creation in *Artificial Vessel 03* is less aligned with cinematic narrative structure.

First of all, in *Artificial Vessel 03,* the site of the installation—the void of the museum room—became a primary part of the content of the work itself. It posited a critical perspective on art-making within the institution by examining the ideological

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[157] Jesús Segura Cabañero, 'Intersections Between Film and Video Art Installation: Spatial Temporary and Contexts in the Spectator', *The International Journal of the Image,* 4.1 (2014).

[158] Sean Cubitt, 'Spreadsheets, Sitemaps and Search Engines', in *New Screen Media: Cinema/Art/Narrative*, ed. by Martin Rieser and Andrea Zapp (London: British Film Institute, 2002), pp. 3-13 (p.5).

[159] Lev Manovich, 'Database as Symbolic Form', *Convergence: The International Journal of Research into New Media Technologies,* 5.2 (June 1999), p.91.

and institutional frameworks that support and exhibit works of art. Therefore, *Artificial Vessel 03*'s narrative was created from its spatial relationship with its projection surface and that surface's location: the light fixture in the white cube space. In *Space, Site, Intervention: Situating Installation Art*, Erika Suderburg claims that in site-specific installation works, 'to install becomes not a simple gesture of hanging the work or positioning sculpture, but an art practice in and of itself'.[160] Similarly, to locate projection mapping is different from installing a screen. Deciding where to project is a crucial stage that influences the body of a work, and deciding what to project arises from the site. The narrative of *Artificial Vessel 03* thus began with the selection of the surface and context for projection.

In *New Screen Media: Cinema/Art/Narrative,* Martin Rieser and Andrea Zapp demonstrate that traditional narrative has been augmented by the advent of new media.[161] In this book, Le Grice observes that in the twentieth century, narrativity entered the new equation. He argues that new media have generated the fusion of visual and auditory representation, incorporating temporality and immersive illusion—'an immersive illusion where the encounter with the representation stood in for, and was, in many of its sensory and other aspects, indistinguishable with the real.'[162] As such, the

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[160] Erika Suderburg, Introduction in *Space, Site, Intervention: Situating Installation Art*, p.5.

[161] Martin Rieser and Andrea Zapp, Foreword, *New Screen Media: Cinema/Art/Narrative*, ed. by Martin Rieser and Andrea Zapp (London: British Film Institute, 2002), p. XXV.

[162] Malcolm Le Grice, 'Virtual Reality - Tautological Oxymoron', in *New Screen Media:*

artworks by Valbuena and Lemercier discussed in Chapter 3 cannot be fully analysed using only the cinematic narrative frame. Constructing an illusionary space through moving image that parallels the real space in their works turns the narrative from 'events in time' to 'events in space time.' Consequently, the narrative of projection mapping unfolds over time in a specific space.

As detailed in the Intention section, the narrative of *Artificial Vessel 03* emerged from my creative intention as well as the production process developed through the inseparable relationship with the projection space. In the first case study, the distinctive making process of projection mapping was considered integral to understanding this medium. I argued that the use of composition- and surface-based software makes the production process of projection mapping not only sequential but also spatial. This procedural distinctiveness is also closely related to projection mapping's unique narrative structure because the use of technologies such as 3D Maya, After Effects, and MadMapper has opened up new conceptual possibilities for narrative.

As seen in Figure 6.4, moving image alone cannot complete the narrative structure of projection mapping. Most of the literature reviews on experimental film and video installation works present still images of the works, sometimes accompanied by the installation view. Even though it is impossible to describe a temporal work fully, the still images of such works are accepted as understandable materials that capture the narrative aspect of a piece when they are analysed on paper-based materials. On the

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Cinema/Art/Narrative, ed. by Martin Rieser and Andrea Zapp (London: British Film Institute, 2002), pp. 227-236 (p. 230).

other hand, still images of the moving-image file (Figure 6.4) do not enhance our understanding of *Artificial Vessel 03*. In other words, when the moving-image file is mapped onto the projection surface (Figure 6.5, 6.6, and 6.7), only installation views can provide clues for understanding the work; if presented alone, Figure 6.4 is almost incomprehensible.

In this way, the use of a 3D programme makes projection mapping differ from Jeffrey Shaw's *Legible City* (1988-91) or Cao Fei's Second Life project *RMB City* (launched in 2008). As seen in Figure 6.8, the use of 3D software or a game engine (similar to 3D software) in their work aims to produce a virtual reality or interactive interface that engages viewers in creating their own narratives in the virtual environment. Additionally, the presentation of their work is rather limited, as it is tied to the conventional screen.

Figure 6.8. top: Jeffrey Shaw, *Legible City* (1988-91) © Jeffrey Shaw
Cao Fei, *RMB City* (2008) © Courtesy of the artist and Vitamin Creative Space

On the other hand, the use of 3D programme in projection mapping does not aim to produce a separate virtual or fictional realm; rather, it makes possible integration with its projection surface, which is a real space. Projection mapping also uses 3D software or game engine software to render moving images, but the more essential and conceptual reasons for using 3D software are to integrate with the projection surface and to respond to its real-world context, thereby generating the spatial narrative that unfolds in time and space.

Consequently, *Artificial Vessel 03*'s narrative structure can be completed only when incorporated with the light fixture as well as the white cube room onto which the

reflected projections are cast. A temporal sequence of moving image alone cannot finish the work. Therefore, the screen capture shots of the 3D models (Figure 6.1 and 6.2) provide more proximate materials for understanding the work than the still shots of the moving image (Figure 6.4) do. The making process that prioritizes the relationship with the projected space thus influences the narrative character of projection mapping.

Moreover, as *Artificial Vessel 03*'s moving image consists of multiple compositions, it is also distinguished from the narrative of multi-channel video installations. Peter Weibel writes that most video art in the 1990s was shaped by an intense interest in multiple projections and the multi-perspective narrative that is generated by them.[163] Artists such as Eija-Liisa Ahtila, Shrin Neshat, and Doug Aitken broke apart the cinematic single-perspective as well as a single narrative order. Weibel notes that 'linearity and chronology, as classical parameters of narration, fall victim to a multiple perspective projected onto multiple screens. Asynchronous, non-linear, non-chronological, seemingly illogical, parallel, multiple narrative approaches from multiple perspective projected onto multiple screen are the goal'[164] of these artists' works.

On the other hand, projection mapping generates a distinctive multiple-perspective. As seen in the top image of Figure 6.9, in video installation works, one screen contains one perspective. Therefore, each screen has its own narrative and offers

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[163] Peter Weibel, 'Narrated Theory', in *New Screen Media: Cinema/Art/Narrative*, ed. by Martin Rieser and Andrea Zapp (London: British Film Institute, 2002), pp.42-53 (p.46).

[164] Weibel, p.50.

a single perspective that contributes to a multi-narrative as part of the whole narrative structure. Detailed in Chapter 2, the difference from cinema is that with multi-channel screen installation, the viewer has his/her choice of navigation to create his/her own order of viewing. Multiple-perspective is thus subordinate to multi-channel projection. Consequently, the narrative becomes multiple and asynchronous, as Weibel argues, but not spatial.

In contrast, *Artificial Vessel 03* generates a multi-perspective toward a single projection. As detailed in the first case study, a single projection consists of layers of discrete compositions with the unnecessary areas masked. That is to say, as seen in the bottom image in Figure 6.9, the lighting fixture on the ceiling is mapped by a single projection, and the viewer can watch it from any perspective within the room. Therefore, the notion of multiple-perspectives is entirely different in projection mapping. As a result, in *Artificial Vessel 03*, the multiple-perspective towards a single projection surface contributes to the spatializing of the temporal narrative of moving image, not to multiple narratives.

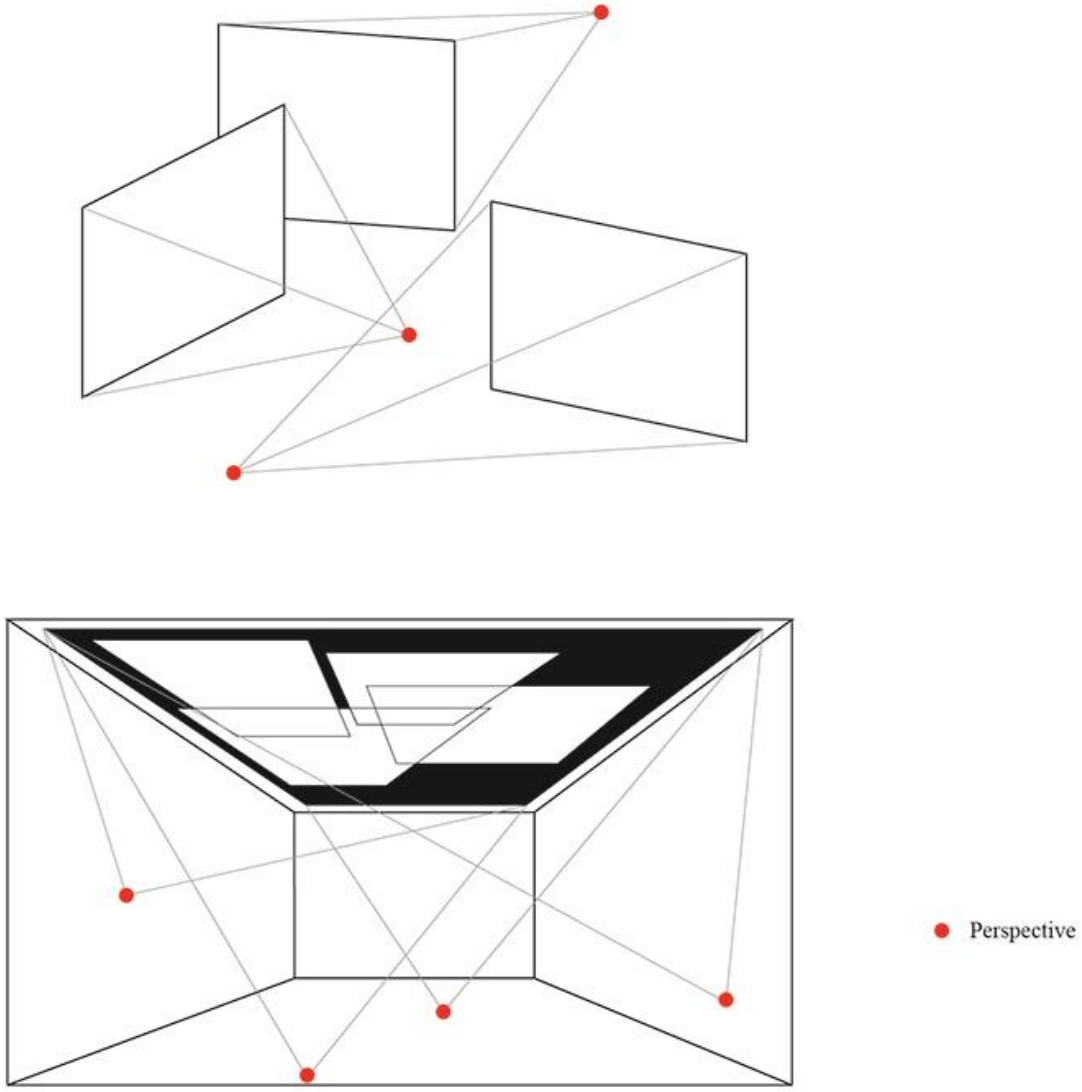

Figure 6.9. Perspective of multi-channel video installation and *Artificial Vessel 03* © Yiyun Kang

Also important to note is that the perspective in *Artificial Vessel 03* is not only toward the projection surface—the light fixture—but also toward the walls and floors on which the reflected projections appear. In this view, *Artificial Vessel 03*'s merged

projections do not separate the narrative into discrete compositions; rather, they spatialize the narrative onto the three-dimensional projected space that is a combination of multiple compositions. As a result, *Artificial Vessel 03* generates a spatial narrative.

Artificial Vessel 03's spatial narrative is thus incomprehensible using cinematic notions alone. Chrissie Iles suggests three phases of spatial practice in video and film installation works; the phenomenological phase of the 1960s, the sculptural phase of the 1970s, and the current cinematic phase.[165] Large-scale multi-channel video installations since the 1990s are thus regarded as part of the cinematic stage. Rather than this, the phenomenological and sculptural stage of experimental film more closely aligns with projection mapping's spatial narrative. Anthony McCall's work is useful in understanding this link.

Anthony McCall explains that *Line Describing a Cone* (1974) and the more recent piece *Between You and I* (2006) adopted a classical technique of narrative cinema to give sculptural forms to projected light. He used the slow "wipe" technique when he edited the animation, which is a narrative convention for a scene transition, to create three-dimensional motion of projected light.[166] As a result, McCall's works appear simultaneously sculptural and cinematic. *Line Describing a Cone* and *Between You and*

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[165] Chrissie Iles, 'Video and Film Space', in *Space, Site, Intervention: Situating Installation Art*, ed. by Erika Suderburg (City: Publisher, date), p.252.

[166] Anthony McCall in 'Interview: Anthony McCall' by Stephen Johnstone and Graham Ellard, *BOMB: Artists in Conversation*, 97 (Fall 2006) <http://bombmagazine.org/article/2841/anthony-mccall> [accessed April 2017]

I are nevertheless devoid of traditional cinematic narrative elements, although the continuous movement of opening and closing forms is 'very narrative-like', as Stephen Johnston notes.[167]

Similarly, *Artificial Vessel 03* employed various editing methods inherited from cinema when making the moving image. As detailed in Section 6.2, transition techniques such as cross-transition, wipes, and fades were used to imitate and transform the lighting fixture. Given this perspective, it is important to acknowledge that the narrative aspect of projection mapping cannot be understood without investigating moving image. Most of the literature does not distinguish the 'projected light' and 'projected moving-image' when describing moving-image installations. However, a projected beam of light alone is unable to produce *Artificial Vessel 03* or *Line Describing a Cone.* McCall's work is not a pure projected light like Nam June Paik's *Zen for Film*, but is instead an animated film of a thin, arcing line that, frame by frame, plays in a loop (Figure 6.9). It is also different from a light installation such as Turrell's that employs fluorescent light, not a projected beam of light.

[167] Stephen Johnstone in 'Interview: Anthony McCall' by Stephen Johnstone and Graham Ellard, Ibid.

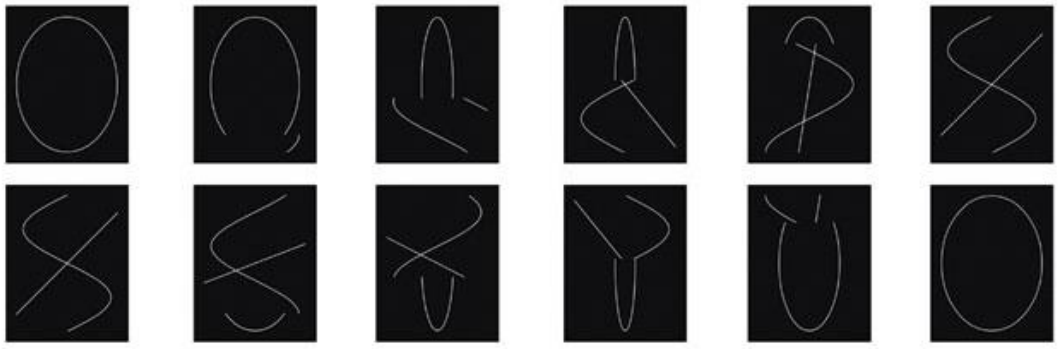

Figure 6.10. Anthony McCall, *Between You and I*, 2006, still images of animation

The ephemerality of projected light enables an artist to intervene in the space and to map any three-dimensional surface; however, the projected light alone is insufficient for understanding the narrative character of projection mapping practices. In *Artificial Vessel 03*, I aimed to imitate and transform the electric light fixture with the projected light, and as seen in the documentation materials, the play with electric light was implemented through the movements of moving images. *Artificial Vessel 03* demonstrates how moving image creates movements of light that are impossible to produce with an electronic light. Thus, to generate the spatial narrative, the ephemeral materiality of the projected beam and the contents of the moving images were equally important.

As a result, *Artificial Vessel 03* generated a temporal and spatial narrative that occurred in a projected space and unfolded through the temporal duration of the moving image. In an interview with Hollis Frampton, experimental filmmaker Paul Sharits

remarked that ‘anything that has development in time tends to have a narrative sense about it because it has the form or, at least, it has the movement of narrative.’[168] His view is useful for understanding projection mapping’s temporal and spatial narrative beyond cinematic frames. Projection mapping’s distinctive type of narrative combines cinematic narrative structure with the character of site-specific art’s narrative. Michael Asher notes that in sites-specific installation art, the sites of exhibition or display are specific situations that generate particular narratives.[169] Consequently, the ‘deep surface’ of projection mapping is generated from its spatial and temporal narrative.

In the contextual reviews, I argue that projection mapping activates the space. Through adding temporal and spatial narrative onto it, *Artificial Vessel 03* altered the original dynamic of the space and activated the static white cube room, to use Delueze’s term, to the ‘object-event’, detailed in Chapter 3. The neutral void space coalesced with time and the movement of forms through the ephemeral projected light, and this combination developed the spatial narrative of the projection mapping.

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[168] Hollis Frampton, ‘Interview with Paul Sharits’, in *Buffalo Heads: Media Study, Media Practice, Media Pioneers, 1973-1990,* ed. by Vasulka and Weibel (City: publisher, 2008) p.281.

[169] Anne Rorimer, ‘Michael Asher: Recent Work’, *Artforum* (April 1980): (p. 47). Quoted in Miwon Kwon, *One Place After Another* (Cambridge, MA : MIT Press, 2004), p.19.

6.4. Conclusion

The second case study, *Artificial Vessel 03*, was intended to respond to the second sub question: **what type of narrative does projection mapping generate by integrating moving image and space?**

To answer this, I showed how projection mapping develops distinctive type of spatial and temporal narrative. Simultaneously, I examined that projection mapping's distinguishing narrative does not radically displace or deconstruct the cinematic narrative that has had a strong influence on moving-image art in general. Rather, the spatial narrative of projection mapping is generated by inheriting cinematic notions as well as embracing other inputs such as site-specific art and new digital influences. As Manovich claims, even though digital media pose challenges to conventional narrative, narrative does exist in new media.[170]

The distinctive making process of projection mapping was considered an important contributor to the spatial narrative. Katherine Hayles argues that digital datasets fundamentally expand the linear order of narrative structure that is basically a temporal concept connected to spatial form.[171] Given this change, the use of 3D,

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[170] Lev Manovich, *The Language of New Media*, p.228.

[171] Katherine Hayles, Narrative and Databases: Natural Symbionts, *Modern Language Association*, Vol.122, No.5. (Oct, 2007) p.1606.

composition-and surface- based software and mapping programmes provides projection mapping with the instruments to expand the temporal narrative to more complex z-axis arrays and spatial forms, as discussed in Chapter 3.3.

Through this process, moving images can be superimposed onto a real space from which the stories that are central to the work of art originate. Like the narratives of site-specific installation works, projection mapping's narrative is inextricably entwined with the context of its projected site. Bound to the projected space, projection mapping thus can neither be reproduced nor have editions leaving the site. This type of narrative does not exist separately inside the conventional screen but instead develops itself in an essential relationship with the site. In this view, the narrative space of projection mapping generates rather than represents reality by temporally and spatially enacting the present and dramatizing the space. This is similar to what Hogue notes, that 'building and space intervention merge to create a third whole'. [172]

Rieser and Zapp claim that narrative is no longer the depiction of a sequence of real or imagined events.[173] New media art forms such as web, game, and interactive art have developed new types of narrative beyond the cinematic conventions,[174] and I argue

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[172] Martin Hogue, 'Buildings Cast, Carved, Wrapped: The Intervention Practices of Rachel Whiteread, Gordon Matta-Clark and Christo', 87th *ACSA ANNUAL MEETING* (Association of Collegiate Schools of Architecture), 1999. pp.195-202.

[173] Martin Rieser and Andrea Zapp, Introduction, in *New Screen Media: Cinema/Art/Narrative* (edited by Martin Rieser and Andrea Zapp), (London: British Film Institute, 2002) p.30.

[174] See *New Screen Media: Cinema/Art/Narrative* (edited by Martin Rieser and Andrea Zapp), (London: British Film Institute, 2002). The contributors to this book, such as Sean Cubitt, Peter Weibel, Lev Manovich, Malcolm Le Grice, and Jeffrey Shaw extensively discuss the diverse type of narrative that are

that projection mapping also develops its own distinctive type of narrative. In conclusion, the spatial narrative of projection mapping consisting of temporality and stories mapped on a physical space eventually activates the space.

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enabled by digital media.

Chapter 7: Study of the relationship between space, projection surface, and moving images

7.1. Define the Research Question and intention

In chapter 1, I presented the main research question as follows:

What new relationship between screen, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?

Based on the contextual reviews and previous case studies, I modify this question to;

What new relationship between *projection surface*, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?

In this chapter, I detail the third and final case study, *CASTING*, to respond to the central question. It iterates the findings from the two previous case studies in which I investigated the distinctive relationship constructed through the unique making process that centralizes the projection surface. I also determined that projection mapping develops its own spatio-temporal narratives built through an inextricable

entwinement of moving image and the projected space. Given these findings, the central question can now be investigated more fully.

Intention

In this case study, the location of *CASTING* was a core element in relation to my inquiry. The site—the Cast Courts, Gallery 46A of the V&A—was both the subject and object for my projection. First opened in 1873, the Cast Courts were built to exhibit one of the most comprehensive collections of casts of post-classical European sculpture. The gallery houses the V&A's largest objects. However, the Cast Courts have often been a source of controversy during their roughly 140-year history, including early reactions against copying original works of art. By 1928, the Museum's opinion was turning against the Cast Collection. A report by architect Sir Reginald Blomfield to the V&A's Advisory Council proposed that the Museum should dispose of the Cast Collection in its entirety. He described the collection as 'unworthy of the Museum and […] actually injurious to students'.[175] In 1934, V&A Director Sir Eric Maclagan wrote to British Museum Director Sir George Hill of his 'personal desire to get rid of it', describing it as 'a most incongruous white elephant'.[176] However, during the Second World War, some

[175] V&A Archive, MA/46/1/2 Minutes No. 36 of the Advisory Council: Memorandum '*Architectural exhibits and a note on the Cast Courts in the Museum'* by Sir Reginald Blomfield, 26th January 1928.

[176] James Sutton, 'Trajan's Column – The V&A's "Incongruous White Elephant?"' <http://www.vam.ac.uk/blog/tales-archives/trajans-column-vas-incongruous-white-elephant> [accessed

of the original pieces of art were destroyed, and in a few cases, the casts remained a unique record of lost work. Accordingly, the perception of the Cast Courts began to change. Now the collection has come to be fully appreciated, and the Cast Courts are one of the most popular galleries in the museum.

Figure 7.1. The original installation of the reproduction of Trajan's Column around its brick core in the Cast Courts, ca. 1864 © Victoria and Albert Museum, London

I adopted the architectural casts as the site of my installation for two reasons, the first of which followed from the twofold meaning of the Cast Courts. Each cast is simultaneously a standalone sculptural object and a record of a real environment. Decontextualized from their respective sites, the casts are now grouped in a single

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November 2015]

gallery at the V&A. I was attracted to the dual identity of the casts, which are reproductions yet a unique collection in the museum.

As such, a second reason for this undertaking was that the Cast Courts' collections are not originals but reproductions, prompting diverse reactions (Figure 7.1). As I detailed earlier, the dominant opinions of the Cast Courts in 1920s and 1930s were not favourable because they do not present real, authentic, original pieces. This issue of copy versus original is significant in digital media, given that the notion of originality does not strictly exist in the digital realm, as everything can be transformed into something else by editing the binary code. The copy versus original ontology was particularly relevant for my case study because the notion of originality does not strictly exist in projection mapping, which uses digital moving images. However, projection mapping entails a somewhat different ontology; despite its digital nature, it exists only when incorporated with its physical environment.

I was thus drawn to the Cast Courts because they represent historical and situational contexts simultaneously. In the first case study, I focused on the historical context of the bank cabinet, and in the second, I aimed to subvert the institutional context of the white cube space. I wanted to interrogate both types of context in this case study. The gallery was built specifically to house the casts, connecting the objects (the casts) and their environment (the Cast Courts) in an essential way. Consequently, I attempted to take in the Cast Courts' objects and the environment as a whole to investigate what type of relationship projection mapping could generate between the projection surface, moving image, and space. To do this, I focused on the surrounding

spatial situation of the casts in the Cast Courts, not the individual histories of each cast.

I titled this project *CASTING* because I intended to ‘cast the casts’ through my digital projection, both in their given sense as artificial casts of original objects, and in terms of ‘casting’ as enlisting them as actors in a moving image production. In so doing, I aimed to reinvigorate the meaning of the objects and the room by transforming it into an active environment.

In addition to these conceptual intentions that reflected my findings from the two previous case studies, the Cast Courts provided me with different formal, architectural characteristics and challenges than the ones I addressed in the earlier case studies. Fundamentally, the Bank Space Gallery and the white cube room of the MoCA Taipei were single-story exhibition spaces, each with a single entrance. In contrast, the Cast Courts are 24 meters in height, with two adjacent floors are connected by a bridge in an open structure (Figure 7.2 and 7.4). They have multiple viewpoints, with many entrances from different floors. In the previous case studies, I adopted only a single object (the bank cabinet and the lighting structure, respectively) to alter the dynamic of the original space, but in *CASTING*, I selected several objects (casts) as my projection surface to more fully engage with the space (the Cast Courts). As a result, I considered the conditions of the overall space to investigate the distinctive relationship of projection mapping much more carefully than in the two previous case studies.

7.2. Documentation of the Process

This section details the materials that I collected and documented from the production process to the final installation by following the active documentation methodology. These materials will be used in the reflection and analysis in the following section that addresses the central research question. The document process of *CASTING* began with examining the space—the Cast Court Gallery (Figure 7.2).

Figure 7.2. Photos of the Cast Court, Gallery 46A

As in the two previous studies, I began by building a virtual model of the space using Maya software, but this time I built the model of the entire gallery, including all the casts (Figure 7.3). I did not plan to map all of them, but including them in the model was necessary because I aimed to investigate the spatial dynamic between the projected objects and the space. Therefore, I had to consider the scale, the position of each cast, and the distance between them in observing the space. I also needed to examine carefully the multiple viewing points of the Cast Courts within the virtual model. By doing this, I could select the casts for my projection.

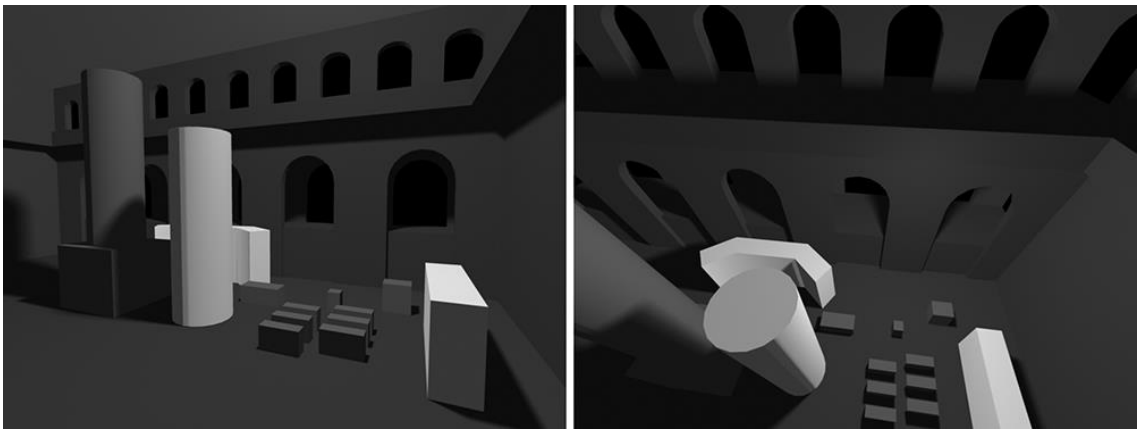

Figure 7.3. Still images from 3D model © Victoria and Albert Museum, London

This virtual test was followed by tests in the gallery to determine the required technical attributes. The gallery's glass ceiling was an extremely challenging condition for projection mapping installation, which requires a dark space. Fortunately, the exhibition dates were 12 February and 18 March, when the sun sets earlier, and the

event started at 6:00 p.m., which meant that I did not need to worry about blocking the daylight.

An additional consideration was that it was important not to damage the existing casts or compromise viewers' safety. Initially, the safety department was concerned about my intention to let the visitors come into the Cast Courts without any light besides my projections. They therefore suggested completely blocking the gallery and letting spectators watch the installation only from the bridge located on the first floor (see Figure 7.4). However, this perspective would bring a result that was entirely different from what I intended, effectively generating the kind of passive environment found in most of the screen-based moving image installations. Therefore, I needed to conduct tests to solve not only the technical problems for the best result, but also to ensure the safety of both the collections and the viewers. In doing so, I eventually gained approval from all the relevant departments, and we agreed to hire several invigilators to guide viewers on the exhibition dates.

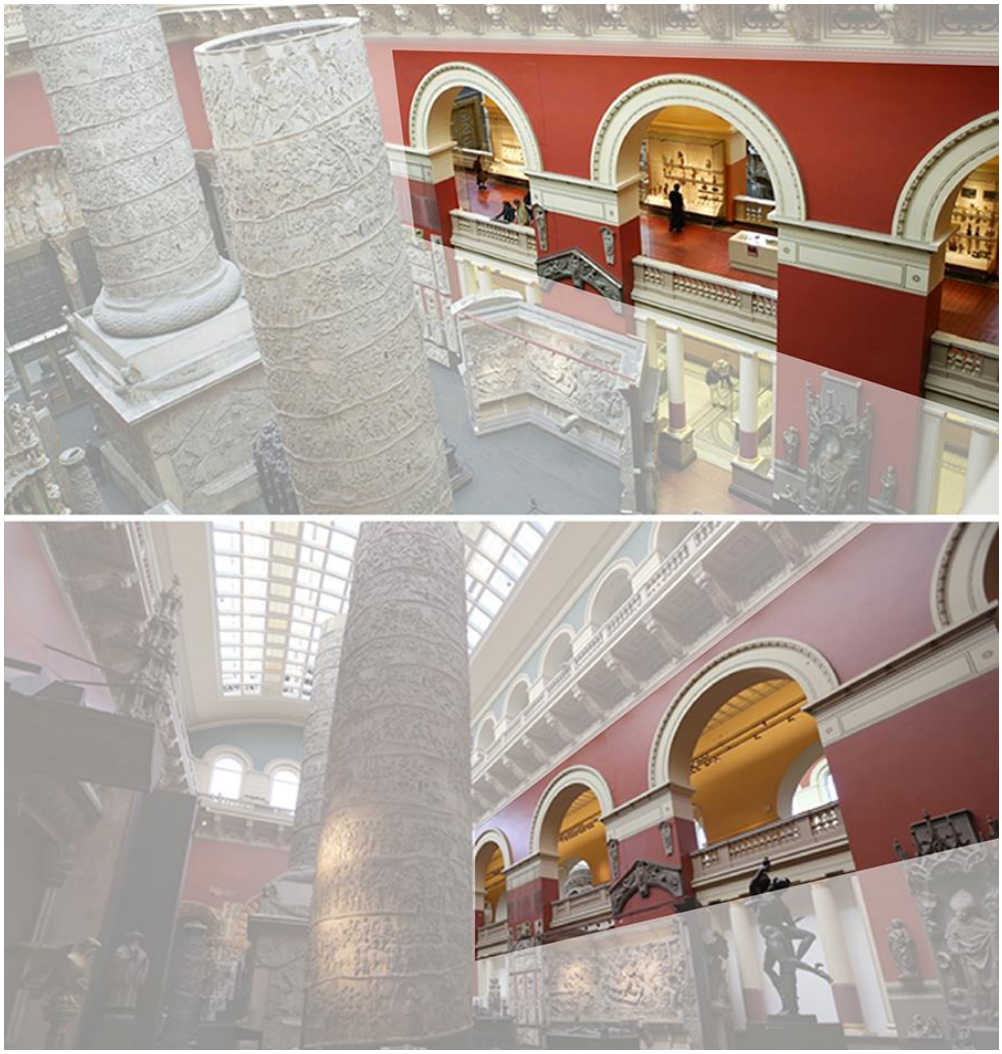

Figure 7.4. The bridge located on the first floor © Photo Yiyun Kang

Consequently, I decided to map three individual casts: Trajan's Column (Rome, Italy), the Western Portal of the Cathedral of St Sauveur (Aix-en-Provence, France), and the Shreyer-Laundauer monument from St Sebaldus (Nuremberg, Germany) (see Figure 7.5). In choosing these, I was concerned more with generating an overall environment than with the specific meaning of each cast. My primary focus was the meaning of 'cast' as situated in the Cast Courts rather than the individual historical backgrounds or

content of the selected casts. For the same reason, I chose casts with diverse origins. I intended to investigate how the individual casts, the digital moving-imagery, and the surrounding space form a distinctive relationship through the layer of digital projection that connects them.

	Photo of the cast	Name	Information
1		**Trajan's column**	Place of origin: Rome, Italy (the original , made) Paris, France (the reproduction , cast) Date: 113 (made) ca. 1864 (cast) Artist/Maker: unknown (production) Materials and Techniques: Plaster cast **Museum number: REPRO.1864-128** Gallery location: Sculpture, room 46A. Objects in 'case BWITH' are available via appointment with the Sculpture department, case FS, shelf C
2		**Western Portal of Cathedral St Sauveur** (Aix-en-Provence, France)	Place of origin: France (sculpted) Aix-en-Provence, France (cast) Date: 1477 onwards (sculpted) ca. 1892 (cast) Artist/Maker: unknown (after, production) Jean Pouzadoux (Messrs) (makers) Materials and Techniques: Plaster cast **Museum number: REPRO.1872-53** Gallery location: Sculpture, room 46A. Objects in 'case BWITH' are available via appointment with the Sculpture department, case EWAL, shelf SCR, box C
3		**Shreyer-Laundauer monument from St Sebaldus** (Nuremberg, Germany)	Place of origin: Nuremberg, Germany (sculpted) Date: 1490-1492 (sculpted) ca. 1872 (cast) Artist/Maker: Kraft, Adam (after, sculptor) Rotermundt, Jacob (maker) Materials and Techniques: Plaster cast **Museum number: REPRO.1872-53** Gallery location: Sculpture, room 46A. Objects in 'case BWITH' are available via appointment with the Sculpture department, case EWAL, shelf SCR, box C

Figure 7.5. Information on selected casts © Yiyun Kang

Figure 7.6 presents the diagram of the final installation. To map Trajan's

Column, which is 3.83 meters in diameter and 16 meters tall, a projector needed to be installed at the bridge on the first floor to secure sufficient distance. Five short-throw projectors were used, as Trajan's Column and the Shreyer-Laundauer monument required double-projections to secure sufficient brightness.

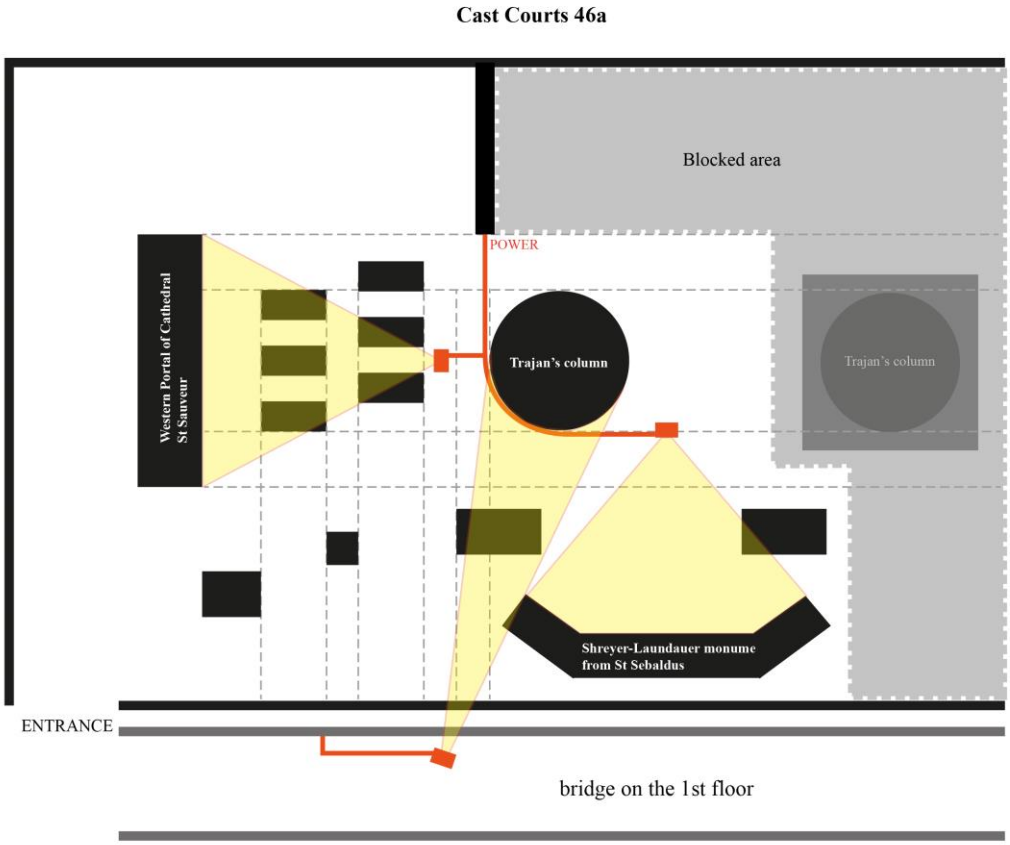

Figure 7.6. Diagram of the final installation © Victoria and Albert Museum, London

The next step was to map the objects and produce the moving image. Unlike in the previous case studies in which I used multiple software applications, I used only Maya software to render 3D digital animation for the three casts. They were black and white animations composed of dynamic movements of geometrical shapes, and I exploited virtual lights to cast shadows in order to add a dynamic atmosphere to the static, massive volumes of the casts (Figure 7.7).

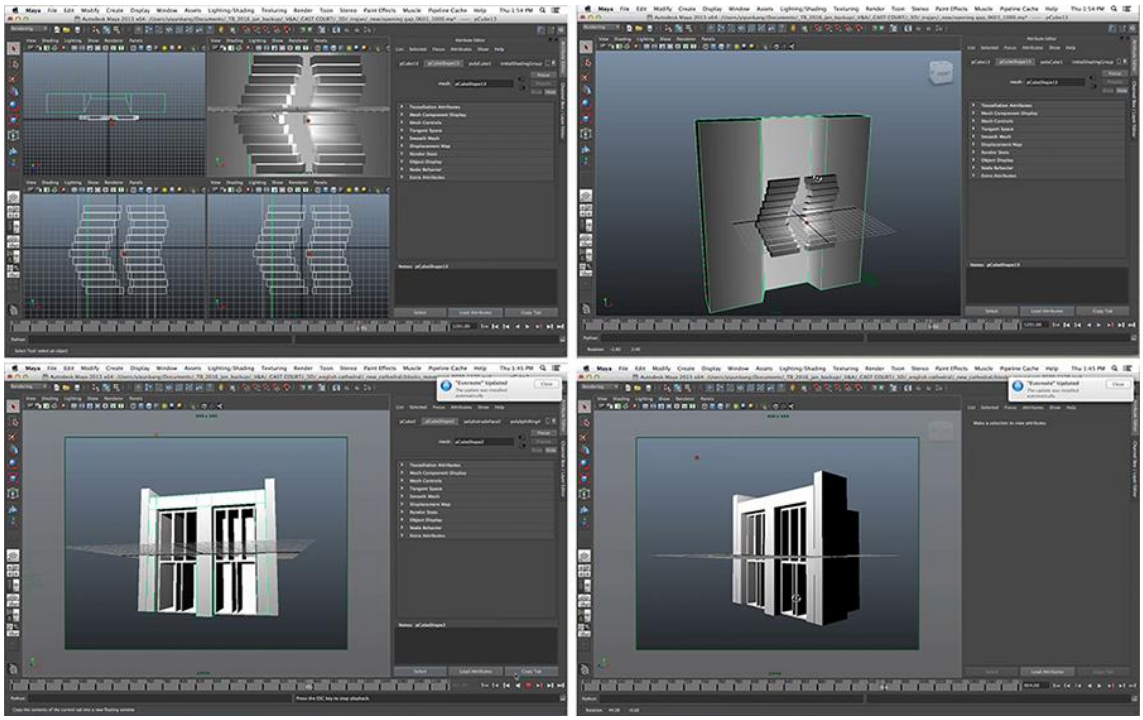

Figure 7.7. Screen shots from Maya for Trajan's Column moving-image making © Yiyun Kang

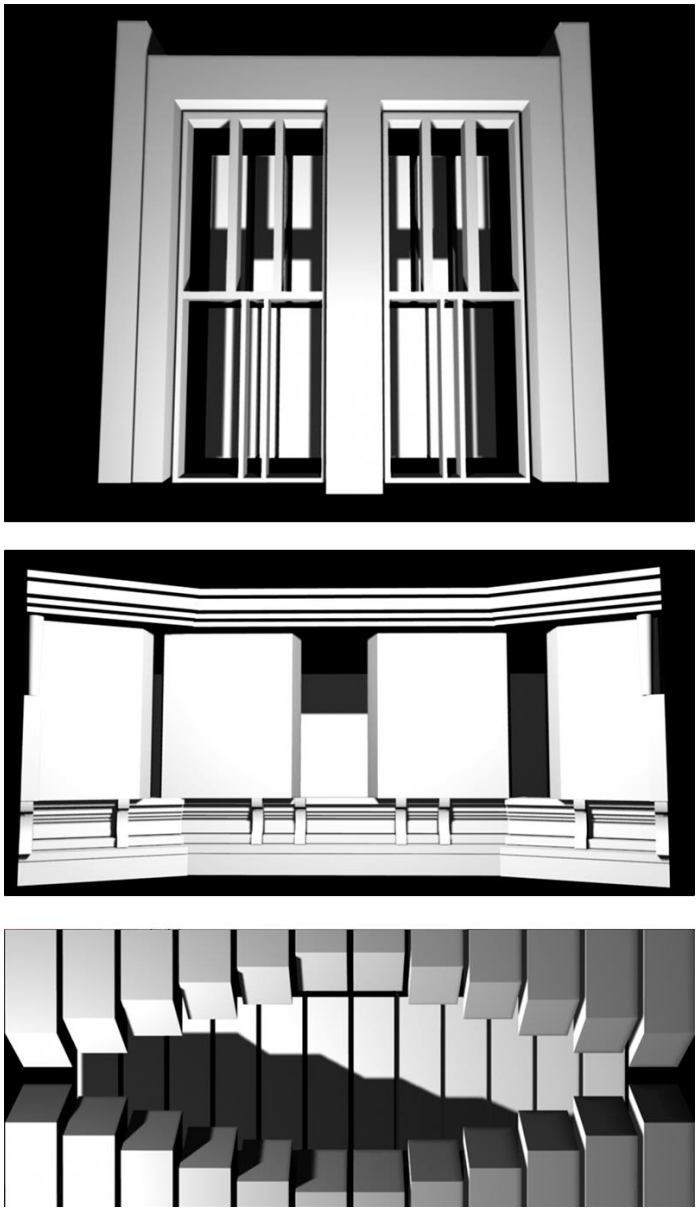

Figure 7.8. Still images of final .mov files of the three casts © Yiyun Kang

I aimed to create moving images that added sharp contrast to the low reliefs of the three casts depicting historical and religious stories. To do this, I first performed a

structural analysis of each cast by closely observing the structural features, which included a cylinder (Trajan's Column) and triptych (Shreyer-Laundauer monument). Next, I added my own structural transformations using 3D software. As seen in Figures 7.7 and 7.8, I divided each structure virtually, moved the segments, and re-assembled them. Finally, I added a virtual light to emphasize these structural sequences. Through this process, I made a 3D animation for each cast.

As Figure 7.8 that presents still images of the three animations rendered with Maya software shows, still images alone cannot capture the final installation, as in the previous case studies. These animations were connected to projection surfaces through the mapping process. I mapped them onto the three casts, respectively, using MadMapper software in the real venue: the Cast Court, Gallery 46 A (Figures 7.9 and 7.10).

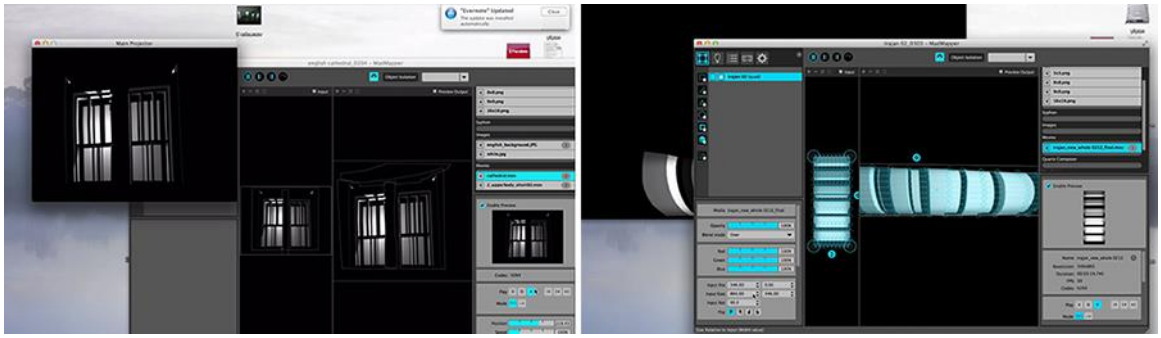

Figure 7.9. Mapping process using MadMapper © Yiyun Kang

Figure 7.10. Mapping process using MadMapper in the venue (Cast Courts, Gallery 46 A)
© Photo Yiyun Kang

In addition, I produced ambient sound that was a mixture of various sources such as wave sounds and other tranquil noises. I sought to add a more imaginative dimension through sound because my primary purpose with *CASTING* was to create a virtual portal that temporarily took viewers to another imaginative dimension. As the Cast Courts, Gallery 46A, is 24 meters in height, the sound echoed resonantly,

amplifying the immersive atmosphere of the installation. Analysis of the sound is outside the scope of my research, however, as I focus specifically on the distinctive relationship between projection surface, moving image and space.

Figure 7.11. Installation View © Victoria and Albert Museum, London

Figure 7.12. Installation View © Victoria and Albert Museum, London

Figure 7.13. Installation View © Victoria and Albert Museum, London

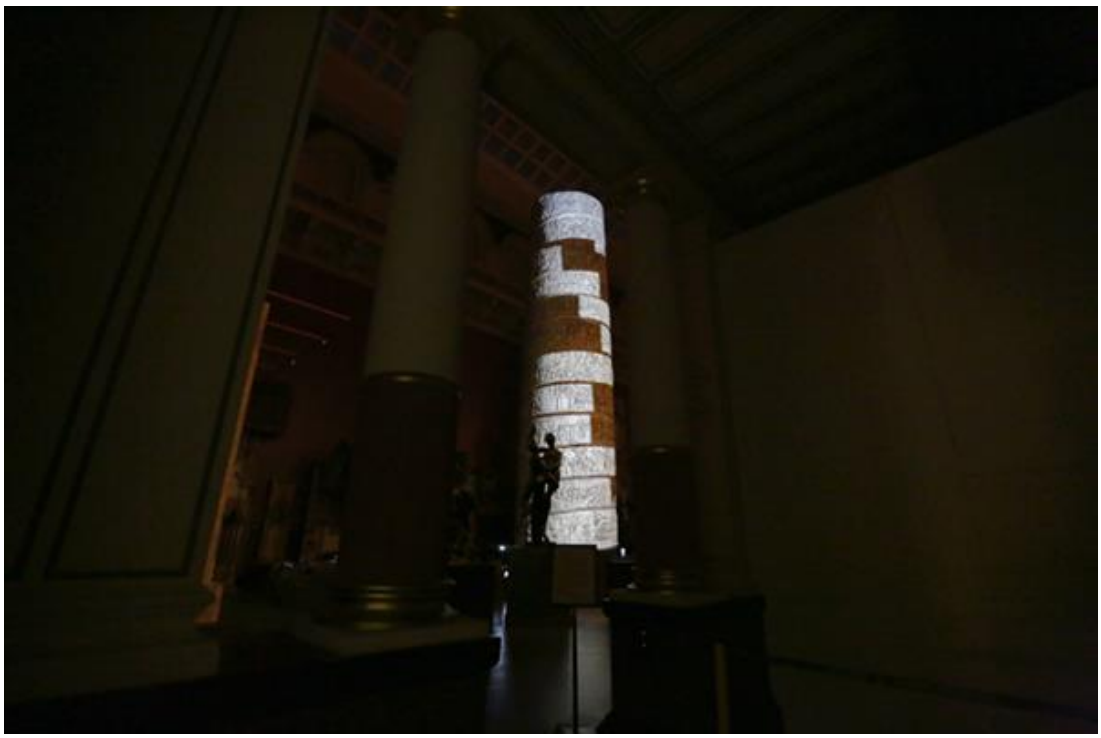

Figure 7.14. Installation View © Victoria and Albert Museum, London

Figures 7.11-7.14 detail the installation view of *CASTING*. The video documentation of *CASTING* as well as other documenting materials can be accessed through the following link:

http://yiyunkang.com/phd/03_casting.html

As seen in the photographic and video documentations, three projections intervened in the Cast Court gallery without physically altering the existing casts inside the gallery by rearranging or removing them. Figure 7.13 shows that the installation can be approached from diverse locations—from the entrance, from inside the gallery, and from on the bridge located on the first floor. Given the materials detailed in this section, the next section will offer my reflection and analysis that respond to the main research question.

7.3. Reflection and Analysis

As identified, I used *CASTING* to seek the answer to the central research question: **what new relationship between projection surface, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?**

As demonstrated in the contextual reviews and analysed through the two previous case studies, projection mapping disrupts the conventional notion of screen and integrates with the projected site through a making process that enables projection mapping to develop a temporal and spatial narrative structure.

In the previous case studies, I used multiple sources of moving images such as 3D animation, filmed footage, and vector and bitmap images for mapping. I examined Jihoon Kim's notion of hybrid moving images to emphasize how this novel type of moving image is used in projection mapping to generate a spatio-temporal narrative. In this case study, *CASTING*, I mainly employed Maya software in making 3D moving-images. As detailed in the Intention section, this was because I aimed to emphasize the volumetric shapes of the casts rather than their specific narratives to investigate the nature of reproduction, not historical content. In so doing, I attempted to 'cast' the reproductions with digital media in order to interrogate projection mapping's distinctive ontology. Building on this intention necessitated using only digital moving-imagery, devoid of any reference to the real, physical world.

The resulting animation was a dynamic structural investigation of each cast.

This structural sequence also reflected the creative intention of *CASTING*, which was to 'cast the casts' through my projection. To 'cast', by definition, is to 'shape metal or other materials by pouring it into a mould while molten'.[177] I cast the casts through the projected light and shaped them by superimposing structural moving-images onto them. The use of the NURBS programme in the virtual 3D environment thus played a crucial role in 'shaping' and 'casting' the casts.

In the physical world, a shape can be perceived through light. Light is reflected from objects to enter the eye, so initiating the process of seeing.[178] As Le Corbusier notes in In *Towards a New Architecture*, 'our eyes are made to see forms in light; light and shade reveal these forms; cubes, cones, spheres, cylinders or pyramids'.[179] Similarly, in Maya software, virtual light makes the NURBS surfaces appear and defines the relationship between the objects and surfaces by shadow. The movements of forms in the virtual environment become perceivable by virtual light and the shadow created by it. As seen in the documentation materials, I not only built a 3D model but also carefully designed the light's positions and movements that changed over time to give virtual shapes and depth to the three casts. Figure 7.15 compares the rendered images with and without the virtual light. The two images on the top row show the shots rendered without the light, and the bottom row presents the images rendered with the virtual light. Without the light, the shapes and motions are lifeless.

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[177] OED

[178] Michael T. Swanston, Nicholas J. Wade, *Visual Perception*, (Brighton: Psychology Press, 2013), p.36.

[179] Le Corbusier, *Toward a New Architecture* (New York: Dover Publication, 1931), p.29.

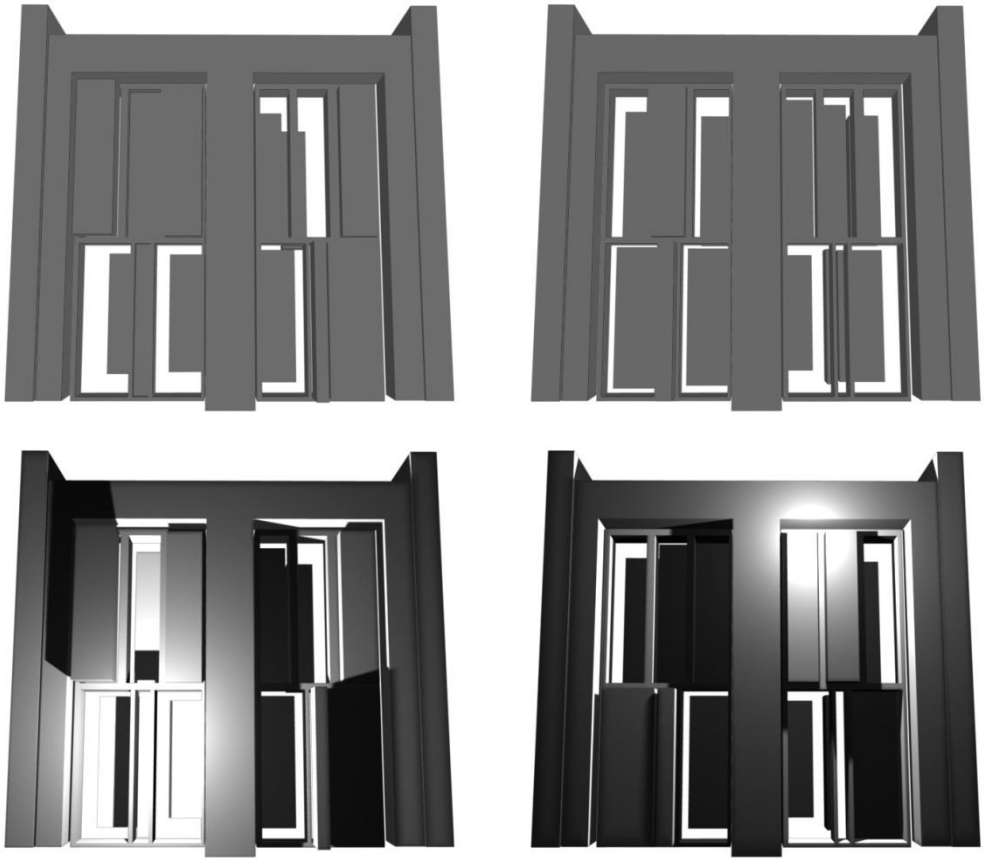

Figure 7.15. Still images from Maya © Yiyun Kang

The virtual camera was also a significant element. In Maya software, the scene for each cast was rendered through a virtual camera that was located within the environment where the light and models were located. It was critical to set the perspective of the virtual camera in relation to the real space carefully because it would affect viewers' perspective when mapped onto the real space, similar to trompe l'oeil.

Therefore, my intended installation could be realized only when the careful construction of virtual light and camera came together to integrate with the real space. The use of the 3D Maya programme thus enabled me to produce moving-image sequences in a spatial and temporal way, integrating virtual light, shadow, and movements on the real projection surfaces. By so doing, I could shape and cast the real casts in *CASTING*. The virtual depth projected onto the surfaces created the illusion that the static volumes had come to life.

As a result, this structural sequence transformed the narrative of the casts. Trajan's Column, for example, was originally a sculpted marble relief depicting a continuous narrative of the Dacian Wars with more than 2,600 figures engaged in scenes of battle, ritual, military, and civilian life carved in minute and vivid detail.[180] The pictorial narrative spirals along the column in a single frame. In addition, the Shreyer-Laundauer monument from St. Sebaldus follows the serial narrative structure of the triptych form. Adam Kraft, the sculptor of the original piece, carved the figures holding the Crown of Thorns and tools of the Crucifixion on the central panel. In a triptych formation, thematic importance rather than chronological order determines the centrality within the narrative program.[181] In contrast, *CASTING*'s structural moving-

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[180] 'An Early Study of Trajan's Column, Historia vtriusque belli Dacici a Traiano Caesare gesti: ex simulachris quae in columna eiusdem Romae visuntur collecta, Alfonso Chacón (1540–99)', Princeton University Library (2012) < http://library.princeton.edu/news/2012-03-02/early-study-trajan%E2%80%99s-column > [accessed April 2017]

[181] *Serial Narratives: The Expansion of Time and Space in Composite Formats*, Oxford University Press and the National Gallery of Art, 2017 <http://italianrenaissanceresources.com/units/unit-6/essays/serial-narratives/ > [accessed June 2017]

images transformed the continuous narrative of the casts into a spatio-temporal narrative to achieve my intention that was, again, to put the primary focus on the concept of 'cast' as situated in the Cast Court rather than on the individual historical backgrounds of the selected casts.

In the previous case studies, I examined the ways in which the narrative space of projection mapping generates rather than represents reality by temporally and spatially enacting the present and dramatizing the space. The narrative space of projection mapping can then be better framed with Turrell's notion of 'viewing chambers'. He uses this term to underscore how a viewing experience can be configured spatially, not as 'looking at' but as 'looking into'.[182] His installations enable viewers to enter an immersive space physically. Turrell's light installation on the wall, ceiling, and floor surface alters the entire dynamic of the space. Here, 'the surfaces turned into chamber, become habitable space'.[183] In the contextual reviews, I also described how viewers of projection mapping works do not walk 'in-between' the screens but, rather, move 'inside' or 'around' the projected space. Turrell's light installations used coloured lights rather than digital projected imagery, but McCall's *Line Describing a Cone* (1973) and *Between You and I* (2006) dealt with projected animation to create spatial and volumetric experiences. Bruno writes that McCall's understanding of cinema becomes

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[182] Georges Didi-Huberman, 'The Fable of the Place', in *James Turrell: The Other Horizons*, ed. Peter Noever (Vienna: MAK and Hatke Cantz, 2001), pp.45-56.

[183] Giuliana Bruno, *Surface: Matters of Aesthetics, Materiality, and Media* (Chicago, IL: University of Chicago Press, 2014), p.67.

ever more environmental as the light spectacle becomes a kind of performance in which viewers experience the depth of a surface by looking through.[184] In this way, the spatial use of animation in McCall's work aligns more closely with projection mapping.

Different from Turrell's works that used pure light as a palpable material to produce a dimensional experience of light, *CASTING* created a sense of depth through the 3D rendered moving images produced by the virtual lights, camera, shadows, and movements. The projected moving imagery on the surfaces of the casts generated an intangible (virtual) depth with an impression of volumetric transformation. The borders between real and virtual, flat and deep, tangible and intangible became fluid. Additionally, depth was added not only to each cast, but also to the Cast Courts as a whole. The digital projections on the three casts altered the static dynamic of the gallery space, generating a novel spatial and temporal dimension.

In this view, to use Bruno's description, *CASTING* engendered a 'projective environment' mediated by the surface through the projected moving image that turned 'the art of projection [into] a durational, relational experience that is materially sited.'[185] As detailed in the second case study, projected light and structural moving-images are thus equally essential in generating a 'projective environment' like the one created in *CASTING*.

As detailed in the contextual reviews, screen-based projected moving-image

[184] Ibid, p.70.

[185] Bruno, p.71.

works do not actively reconfigure the black box configuration inherited from cinema. The location of the black box has been shifted from the theatre to the white cube with artists' moving image, but the ontological cut (Friedberg, 2006) and the separation of two realities (Uroskie, 2014) have not been progressively changed.

In *The Poetics of Augmented Space*, Manovich suggests an *augmented space* that is a 'physical space overlaid with dynamically changing information'.[186] To analyse the phenomenological experience of being in a new, augmented space, he argues that multi-channel video installations actually adopt the physical interface of the cinema: a dark enclosed or semi-enclosed rectangular space with a video projector at one end and the projected image appearing on the opposite wall. Therefore, Manovich argues that a gallery space has turned into what was, for almost a century, its ideological enemy—a movie theatre that is characterized by the rigidity of its interface.[187]

In contrast, Manovich's overlapping zone— termed an augmented space—can be explained through Merleau-Ponty's notion of *entre-deux*. Merleau-Ponty emphasized this in-between-the-two, or *entre-deux*, as the core of his phenomenological philosophy. Instead of sustaining opposing consciousness and dichotomous terms, Cathryn Vasseleu argues that Merleau-Ponty attempted to address 'a tenuous and indeterminate synthesis between them'.[188] By highlighting a relational ontology that reconciles terms previously

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[186] Lev Manovich, 'The poetics of Augmented Space', *Visual Communication*, 5.2 (2006), p. 220.

[187] Ibid, p.230.

[188] Cathlyn Vasseleu, *Textures of Light: Vision and Touch in Irigaray, Levinas and Merleau Ponty*

supposed to be oppositional, Merleau-Ponty aimed to collapse dualist thought. This concept of the relational ontology of in-betweenness is especially useful in its application to projection mapping because projection mapping generates an augmented space that activates the original space and transforms it into a new one.

Many media theorists and critics have recognized the emergence of a new discursive zone—a new crossover zone—triggered by digital media. For example, David Joselit sees in this a new spatial order, a space in which the virtual and the physical are co-extensive.[189] Joselit argues that our physical environments function more and more as mediating spaces between the real and virtual. Even though his concepts emphasize digital media expansion in general, including virtual reality and augmented reality, I suggest that his notion reflects Merleau-Ponty's *entre-deux* and is thus helpful in understanding projection mapping's distinctive relationship between projection surface, moving image, and space in the augmented space.

CASTING neither produced physical objects nor altered the existing casts and gallery space. It superimposed moving images onto the surfaces through a projected beam of light. However, in so doing, it added ephemeral depth and created a fourth spatial dimension that is inter-related with the temporal. It rendered the moving images as a composition of sculptural and architectural movement. *CASTING* thereby generated

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(London: Routledge, 2002), p.21-22.

[189] David Joselit, 'Navigating the New Territory: Art, Avatars, and the Contemporary Mediascape', *Artforum* (Summer 2005), pp.276-9 (p. 277).

an ever-shifting flow between surface and depth through its temporal-spatial narrative. As a result, what the viewer might have perceived cannot be defined simply as real or virtual but must be considered augmented. Given this, Merleau-Ponty's notion of *entre-deux* and Manovich's concept of augmented space effectively address projection mapping. By disrupting the ontological cut delineated by rectangular frames and superimposing the virtual space onto the real space, *CASTING* merged real and virtual and produced new environments and visualizations where the physical and digital co-existed in real time.

In this augmented space, the three elements—projection surface (casts), moving images (structural sequences) and space (the Cast Courts, Gallery 46 A)—are symbionts rather than constituents. In *Narrative and Database: Natural Symbionts*, Katherine Hayles describes symbionts as organisms of different species that have a mutually beneficial relation.[190] German mycologist Heinrich Anton de Bary introduced the term symbiosis in 1879, defining it as 'the living together of unlike organisms'.[191] This is different from synthesis, which refers to a combination of components or elements that form a connected whole.[192] Symbiosis is more than a simple combination; it is an interdependent interaction in which the organisms in an association benefit from their mutual relationship.

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[190] N. Katherine Hayles, Narrative and Database: Natural Symbionts, p.1603.

[191] 'Die Erscheinung der Symbios', (Strasbourg, 1879).

[192] OED

As detailed in the Intention section, three casts were enlisted as active agents in a moving-image environment in which the Cast Courts gallery served as a stage. The structural sequences generated a spatio-temporal narrative in this kind of performative setting. Therefore, while the projectors were running, projection surfaces (casts), moving images (structural sequences), and space (the Cast Courts, Gallery 46 A) formed a symbiosis. The connections between them can be said to extend beyond synthesis into a degree of symbiosis. The difference between synthesis and symbiosis in the content of projection mapping is evident in *CASTING*. Each of the symbionts—three casts, structural sequences, and Cast Courts gallery—supports *CASTING* as a whole in activating the original space and transforming it into a temporally augmented space. If either of these symbionts cannot be linked, the intended installation cannot be achieved.

The relationship between screen, moving image, and space in video installations could be seen as a synthesis, wherein the elements are simply combined. It is difficult to find an inter-connected relationship between the proportioned screens installed in a black box room, the narrative spaces contained within the screens, and the distinction between the exhibited place and represented place. On the other hand, the symbionts in *CASTING* are interdependent, functioning in a mutually subordinate relationship without hierarchical order; they are inter-reliant in content, form, and meaning. In this symbiotic relationship, projection surface, moving image, and space support each other, collaborating to enhance the work's meaning.

As detailed in the three case studies, the production process also reflected this

symbiotic relationship. The projection surfaces, moving images, and spaces were not treated individually in the making process. Rather, in each step of the procedure, these symbionts were considered collectively to generate reality rather than represent reality.

As a result, the notion of interface is useful for understanding projection mapping's symbiotic relationship and the projective environment. By definition, interface refers to a point where two systems, subjects, organizations, and so forth meet and interact. In physics, it means a *surface* forming a common boundary between two portions of matter or space.[193] François Dagognet describes interface as 'an area of choice that both separates and mixes the two worlds that meet together there. It becomes a fertile nexus'.[194] Flusser calls interface a 'significant surface',[195] indicating a plane with meaning embedded in it or delivered through it. Projection mapping's 'deep surface' echoes this notion as well as the additional understanding of interface which regards it as a doorway or window. According to Galloway, 'interfaces are not simply objects or boundary points. They are autonomous zones of activity'.[196] He declared that 'an interface is not a thing; an interface is a *relation* effect'.[197] As such, interface posits a boundary where two different matters meet and interact.

From this perspective, the symbiotic relationship of projection mapping extends

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[193] OED

[194] Ibid.

[195] Alexander Galloway, 'The Unworkable Interface', *New Literary History*, 39 (2008), #-# (p. 936).

[196] Alexander Galloway, *The Interface Effect*, (Cambridge: Polity, 2012), p. 7.

[197] Galloway, 'The Unworkable Interface', p. 941.

beyond this notion of interface. As Kate Mondloch emphasizes the function of the screen as a connective interface to another space, [198] the concept of interface fundamentally perpetuates the ontological cut between discrete elements. In contrast, projection mapping dissolves the interface into the augmented space as a whole. Consequently, projection mapping generates a 'deep surface' that visually and conceptually folds and unfolds, augmenting the real and virtual spaces. Thus projection mapping does not generate an effect that mediates between two distinctive constituents; rather, it informs a symbiotic relationship between projection surface, moving image, and space.

[198] Kate Mondloch, *Screens: Viewing Media Installation Art* (Minneapolis, MN: University of Minnesota Press, 2010), p. 6.

7.4. Conclusion

Through the final case study, *CASTING*, I sought to answer the central research question: **What new relationship between projection surface, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?**

To answer this question, I have analysed how projection surface, moving image, and surrounding space become mutually inter-connected and generate a symbiotic relationship. In conclusion, projection mapping has established a new relationship between projection surface, moving image, and space in the field of projected moving-image art.

As seen in the case studies, this symbiotic relationship is more than a result; it is constructed throughout the making process in a mutual relation to its projected space. To generate a new augmented dimension, the 3D virtual environment and the real space must come together; a real space and an object, illusionary depth, structural movements of forms, and virtual light, shadow, camera, and perspective must entwine to generate the augmented space.

The invisible instrument, projected light, seamlessly interacts in the environment to produce the symbiotic relationship between the projected images and space through the 'deep surface'. Consequently, the projection surface, moving image, and surrounding space are not separate entities but an inter-reliant whole essential for

completing the work and creating visual and conceptual depth in the existing space. If any of the constituents were missed or changed, the result would not be the same work.

Thus, the augmented space of *CASTING* expands the notion of interface to the level of symbiosis that dismisses the boundary between different matters. If the relationship were not symbiotic, the resulting projection mapping work would be mere surface decoration rather than an artwork with the conceptual depth of a ‘deep surface’.

Chapter 8: Conclusion

This chapter reviews the objectives and summarizes the findings of the three case studies conducted for this thesis. It also details my contributions to the field of projection mapping artistic practice more broadly, particularly through the last case study, *CASTING*. Finally, it considers the limitations of the research and suggests paths for future research based on my findings.

8.1 Review of research objectives

The primary objective of my research was to investigate projection mapping's distinctive relationship between projection surface, moving image, and space as an artistic medium. To achieve this, I reviewed relevant literature and practice to explore projection mapping within the continuum of projected moving-image works.

I derived this objective from a practical question that I had as an artist who employs projection mapping. To me, the recent asymmetry found in projection mapping practices—most of them executed as commercial or decorative projects—and the lack of theoretical perspectives through which to analyse projection mapping practices impedes the creative potential of this art form. I discovered the same deficit in the academic realm through my teaching experience: Despite the growing demand for projection mapping training, there is a paucity of theoretical references. My main research objective was therefore constructed from my experiences as a practitioner and

a teacher.

Given this, I formulated the following research question:

What new relationship between projection surface, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?

To situate projection mapping as a continuous medium within projected moving-image art, my research focused on the common traits of projected moving-image installation works—namely screen, moving image, and surrounding space. I aimed to identify how projection mapping reconfigures these common elements in its own way. To find its distinctive relationship, I conducted a comparative investigation of art forms that employ projection in a spatial mode, including experimental film in the 1960s and 1970s, video installations since the 1990s, and projection mapping.

From the contextual review, I detailed how projection mapping dismantles the conventional (cinematic) screen and incorporates its projected space. As previous film and video studies were insufficient to investigate the distinguishing characteristics of projection mapping, I examined its distinctiveness through its links to other art media such as painting (trompe l'oeil and Op art), site-specific art, and architecture by using the notion of depth and surface.

However, I realized that I could not sufficiently address my central question through the contextual review alone because works that engage space in a way adequate to address the specificities of projection mapping are scarce. Therefore, I created three case studies that were site-specific projection mapping installations, making this research a practice-based one. These case studies were implemented using a reflective cyclical case study methodology, aided by the active documentation methodology detailed in Chapter 1.

8.2. Findings of this research

During the course of the case studies, I developed two research sub questions which responded to the first and second case studies, respectively. The third and final case study responded to the central research question, aggregating the findings and reflections from the two previous case studies. This section outlines the findings derived from the three case studies in relation to the research questions.

The first case study addressed the first sub question: **how does the production process inform projection mapping's integration with its projection surface?**

This assumes that the distinctive relationship between projection surface, moving image, and space is developed throughout the making process. In the first case study, *Circulation*, I identified how the making process of projection mapping is very different from that of screen-based film and video works. Building on this, I revealed that the distinctive relationship is formulated throughout the making process. The essential concepts of projection mapping—the notions of surface and depth, site specificity, context, and augmented space—already exist within that process. The inextricable relationship with the projected space is thus reflected in the entire implementation.

Next, I questioned what distinctive types of narrative are generated from projection mapping's inseparable relationship with the space. The second case study, *Artificial Vessel 03*, thus responded to the second sub question: **What new types of narrative does projection mapping generate by integrating moving image and**

space?

I supposed that unlike screen-based moving-image installation artworks that are generally analysed through a film studies framework, projection mapping's narrative space would be influenced by other forms of art, as I identified in the contextual reviews. Through the second case study, I verified that projection mapping's narrative structure is not only temporal but also spatial, integrating cinematic influences and other media such as painting (trompe l'oeil and Op art), site-specific art, and architecture, because it is intimately entwined with the context of the projection site. I also identified that the making process that was analysed in the first case study is reflected in generating a spatio-temporal narrative. Consequently, the second case study showed that projection mapping activates the space with projected moving-images.

Building on these findings and reflections, the last case study, *CASTING*, responded to the central research question: **What new relationship between projection surface, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?**

Through the last case study, I investigated how the projection surface, moving image, and surrounding space become mutually interconnected in projection mapping. They generate a symbiotic relationship in which the real space, illusionary depth, and movements of forms integrate to produce a 'deep surface'. The virtual light, shadow, and perspective in the 3D environment support this integration, and it engenders a new spatio-temporal dimension: augmented space. As seen in all three case studies, this symbiosis is not merely a result; it is constructed throughout the making process in a

mutual relation to its projected space.

Situational Originality

Through the case studies, I revealed that despite its digital nature, projection mapping entails a somewhat different ontology than digital media in general because it exists only when incorporated with its physical environment. To investigate this distinctive ontology, I need to visit Walter Benjamin's notion of aura.

Benjamin's *The Work of Art in the Age of Mechanical Reproduction* became famous primarily for its use of the concept of the aura of the original work of art. Since then, aura has been a controversial term, especially in the discussions of the loss of aura, which characterizes the fate of the original in the modern age. This discussion has intensified in the age of digital media.

In relation to digital art, Oliver Grau notes that the concept of an original is foreign to a computer. Considering that in computer data there is no difference between an original and a copy, there is thus no original to be protected from copying.[199] As software and its supporting hardware configuration can be reproduced without restrictions, Grau claims that no difference can be ascertained between a copy and its

[199] Oliver Grau, *Virtual Art: from Illusion to Immersion*, p.249.

original.

David Joselit argues that Benjamin's concept of the aura of the original is linked to site-specificity—that is, how an original work of art belongs to a certain time and place. Joselit explains, 'Aura is closely associated with image fundamentalism. Images are no longer and probably can never again be site specific.'[200] According to Joselit, for that reason, Benjamin's notion of aura lost its validity in the context of digital image production.

However, to put it differently, Benjamin's notion of aura and originality is not eliminated in projection mapping, but rather reconfigured as a situational originality. Benjamin notes that 'even the most perfect reproduction of a work of art is lacking in one element: its presence in time and space, its unique existence at the place where it happens to be'.[201] He argues that the specific 'here and now' of the original constitutes the concept of its originality, which means that the aura is the relationship of the artwork to the site in which it is found—the relationship to its external context. On this point, Boris Groys explains that for Benjamin, the distinction between original and copy is exclusively topological. According to Groys, 'the original has a particular site, and the copy, by contrast, is virtual, siteless, and ahistorical.'[202]

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[200] David Joselit, *Afterpart* (Princeton, NJ: Princeton University Press, 2013), p.14.

[201] Walter Benjamin, 'The Work of Art in the Age of Mechanical Reproduction', in *Illuminations*, trans. Harry Zohn (London: Fontana, 1992), pp. 214–215.

[202] Boris Groys, *Art Power* (Cambridge, MA: MIT Press, 2008), p.61.

He continues, noting that what distinguishes contemporary artwork from the art of earlier periods in this regard is the fact that the originality of a modern work is not determined by its material nature but by its context, by its situation.[203] Consequently, as Benjamin emphasizes, originality does not represent an eternal value. Rather, it has become a variable. Given this, projection mapping's symbiotic relationship lends it a 'situational originality' because it centralizes the context and underscores an inextricable interconnectedness with the real world, despite its digital nature.

Projection mapping's content, narrative, and form are specific to an object or space and thus cannot be reproduced if it is isolated from the context of the targeted object or space. The original context cannot be identical in a different location or situation; the digital source data are reproducible, but the final installation cannot produce a facsimile, as it is fundamentally specific to the projection surface and space surrounding it. Consequently, my research finds that this 'situational originality' is the result of projection mapping's symbiotic relationship between projection surface, moving images, and surrounding space.

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[203] Groys, p.63.

8.3. Contributions of this research

This section identifies the contributions of this research. First, it investigated an under-researched medium—projection mapping—and re-contextualized it by placing it in the continuum of projected-moving image art works rather than viewing it as a new technology for surface decoration. In doing so, this research produced knowledge that is embodied in the findings revealed through the contextual reviews and in the original artworks produced as case studies. Finally, it developed alternative methodological approaches to capture the distinctive features of this medium.

8.3.1. Contributions to the study of projection mapping

This thesis addresses the paucity of research on projection mapping. My research specifically investigated projection mapping's distinctive relationship between projection surface, moving image, and space in the continuum of projected moving-image art. Projection mapping should not be considered a separate medium that disregards the previous features of artistic moving image; instead, it should be seen as a new configuration that expands creative potential. Specifically, I place projection mapping within the tradition of site-specific art to emphasise the importance of context in projection mapping.

Consequently, this thesis does not limit its references to cinema or film studies;

it also draws on site-specific installation, painting, and architecture. This is mainly because the existing frames adopted from film studies are insufficient to investigate projection mapping's distinctive characteristics that are developed by integrating previous moving-image discourses with inputs from other art media and digital influences.

As a result, this research re-contextualized projection mapping in a broader framework, making new connections. This thesis therefore expands the limited research scope of projected moving-image works, which are mostly grounded in cinema and film study. Consequently, this thesis opens avenues for the analysis of not only projection mapping practices, but also current projected moving-image works situated in a digital context.

8.3.2. Significance of the practice and methodology

My inquiry was investigated through my own practice due to the lack of conceptually-driven projection mapping practices. The three case studies are thus my own creative and original projection mapping installation works that were completed in exhibition settings. The exhibition-based dimension of this research is part of my methodology that acknowledged the setting of a case study as a crucial element linked to its specific context. Designed and implemented through critical thinking and action, the case studies produced knowledge by incorporating new skills and technologies that

captured new evidence supporting the findings.

A substantial contribution of this research was made through the last case study, *CASTING*, which was exhibited at the V&A. In September 2016, *CASTING* was acquired by the museum. Since this was the V&A's first purchase of a projection mapping installation piece, there were several issues to resolve. According to V&A curator Rosalie Kim, who led the acquisition process, the primary reason for this purchase was because '*CASTING* is a projection mapping (new territory for the Museum) specifically designed for the V&A's collections, engaging the audience by its strong immersive qualities despite using complex digital techniques and logistics'.[204]

In the initial discussions, the museum was concerned with the issue of technological obsolescence in terms of hardware and software. Due to the complex technical requirements of this project, we established a detailed manual for its installation and preservation. We also considered possible alternatives to prepare for future practical and mechanical problems. Beyond the technical obsolescence, the more significant issue was the conceptual aspect of the project because the projection surfaces, which are particular casts in the Cast Court, cannot be replaced. This means that neither the three casts nor the gallery can be lent or duplicated, meaning that loaning the original *CASTING* to other institutions is impossible, as it cannot be reproduced outside of its specific context. Given this limitation, the acquisition verified

[204] Dr. Rosalie Kim, *Questionaire on the acquisition of CASTING*, 2016.

my claim of the context-specific quality of projection mapping. In addition, the course of acquisition showed that the conceptual part of the work cannot be detached from the production process including the employed technologies.

This V&A's purchase also linked to the original contribution of this research through its methodology. As the outcome of *CASTING* was an ephemeral projection mapping installation that lacked any physical materiality, another critical issue was to find the best way to preserve this non-material project. Subsequently, the V&A decided to collect the entire process of this work, from the first to the final stages. The purchased package included hand drawings, computer-drawn diagrams and sketches, virtual 3D models, physical models, final digital files for the exhibition (animation and sound files), and documentary materials such as photos and films. In this way, both the final exhibition materials and the complete developmental cycle were accepted as inseparable entities for the optimal preservation of this project. Kim explains:

> Acquiring the entire process allows a deeper insight in the thinking, designing and making process behind the artwork, showing the fine balance between drawings, writings, physical models, digital sketches and coding. As a museum of art and design, this part is of great interest for both curators and audience alike.[205]

The final form of the package collection that included the whole production

[205] Ibid.

process validates the significant role of the active documentation methodology in my research. It proves that my methodology is an effective model for capturing the essence of projection mapping practices. I asserted that the distinctive relationship between projection surface, moving image, and space is constructed throughout the entire process, and this was the fundamental reason why I developed the active documentation methodology for my case studies. Through the acquisition package, my arguments were acknowledged, and the value of the diverse documenting materials as an integral part of the project was recognized.

This acquisition demonstrates a model for future cases of archiving, preserving, and documenting projection mapping and perhaps other similar types of works. As detailed above, technical and conceptual problems were raised during the process of acquisition. Even though the V&A does not currently have all the definitive answers, its curators are confident that these questions can be resolved soon. Similar and even more challenging issues have arisen across the digital field, so this acquisition was an opportunity to face these issues properly, in a collective way, through discussion within the V&A.[206]

The acquisition is thus meaningful not only because *CASTING* is one of my case studies, but also, and more significantly, because this project was developed based on the iterated findings of this thesis, including the methodology and documenting

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[206] Ibid.

materials as a final case study. In summary, *CASTING*'s acquisition reflects and validates the findings and outcomes of this thesis and aligns with my objective of locating projection mapping in the art continuum.

8.4. Limitations of this research and future research

To constrain the scope of the investigation into projection mapping's distinctiveness from other projected moving-image works, this research focused on the screen, moving image, and narrative. As such, it did not look at other significant characteristics of projection mapping, such as its real-time production mode, performative quality, and increasingly important use of sound.

This intentionally specific research scope resulted in methodological limitations. Methodologically, this thesis included exhibitions as rigorous research settings to investigate projection mapping's context-specific properties. Thus, the cases studies needed to be located in particular contexts beyond the studio.

In addition, because I sought to analyse projection mapping's unique relationship between projection surface, moving image, and space and because most experimental film and video installation works are shown in a black box room within the white cube of the gallery or museum, I attempted to target galleries or museum spaces for my case studies. Therefore, I excluded my other projects that employ different types of spaces such as collaborative projects in performing spaces and outdoor mapping pieces in public places. Consequently, this thesis excluded venues such as performance stages or outdoor public spaces, although these are also important locations for projection mapping works.

Moreover, I decided not to create any additional materials for my case studies so

that I could investigate the inextricable relationship between projected moving-image, space, and context in projection mapping's narrative. As a result, my case studies were implemented using only the original gallery and museum spaces and did not include producing any physical objects. Subsequently, this research omitted investigations of how artists' made objects can be incorporated with projection mapping to create meanings.

Over the course of this research, I identified future work in related areas that require further study. The limitations of this thesis have also enabled me to recognize those areas.

The findings of this thesis, which are focused on the distinctive relationship between projection surface, moving image, and space, are not restricted to the use of projection mapping in exhibition settings. Rather, they offer productive conditions that can be used to integrate digital projection mapping into other emerging fields, such as live performance, theatre, or collaborative projects. Accordingly, this thesis develops prospects for further research on the use of projection mapping in other venues. Therefore, the findings of this research could inform further research merging the issues and theories of real-time performance, public art, or sound art with projection mapping.

In addition, many possibilities for further research exist in this research's intended exclusion of viewer reception. After completing my PhD, I plan to investigate further projection mapping's viewing engagement, as it differs from the engagement of other projected moving-image installation works, particularly in its immersive nature. I also plan to make my research accessible to wider audiences. Part of this thesis, mainly

Chapter 7, is currently in the process of publication. Ideally, the writing will comprise part of the book *Practices of Projection* published by New York University Press.

8.5. Summary

I have spent years observing projected moving-image installation artwork as a researcher and practitioner. In a rapidly changing technological and emerging digital context, I have identified gaps in our knowledge of earlier projected moving-image works and recent projection mapping practices. Originally identified though my personal experiences as a practitioner and educator, these gaps informed the starting point of my research. However, through this thesis, I realised how my perspective as a practitioner often challenged my position as a researcher. This recognition was followed by my effort to develop a proper methodology to produce a set of findings and outcomes that would highlight this emerging field.

My approach to answering the research question involved interweaving investigations, the contextual review, and my own practices as case studies. The knowledge was structured through the original and creative case studies in a rigorous integration of the written thesis. As a result, the findings of this practice-based research are embodied both in the artworks produced and in the knowledge revealed through the written thesis.

Informed by Donald Schön's reflective methodology and case study methodology, I developed a reflective cyclical case study methodology. In addition, I employed the active documentation methodology for my case studies to analyse this medium's temporal and spatial features. This methodology in particular can contribute

to further research and practice in projection mapping. Building on these methodologies, I refined and progressively organized the outcomes over the course of the three case studies.

In the thesis, I have argued that projection mapping is a distinctive type of moving-image medium, yet it is on the continuum of projected moving-image art. Projection surface, moving image, and space are key concepts in analysing projection mapping's distinctive characteristics to address the central research question: **What new relationship between projected surface, moving image, and space does projection mapping enable in the field of artists' projected moving-image works?**

Through the three case studies, I investigated projection mapping's production process, as it forms the foundation for the distinctive relationship between projection surface, moving image, and space. Next I identified that the integration of moving image and space generates a distinctive type of narrative in projection mapping works. The spatial and temporal narrative of projection mapping is created when the ephemeral projected light, moving image, projection surface, and specific context of space come together. Thus, the last case study investigated how the relationship between projection surface, moving image, and surrounding space becomes symbiotic.

This research is not intended to offer a single approach for investigating projection mapping artworks, as I clarified the limitations of this thesis; rather, it should initiate a debate stemming from the overlooked creative potentials of this medium. Therefore, this research into an under-researched area can prompt future studies on projection mapping, in many exciting directions.

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