INTERACTIVE INSTALLATIONS AS PERFORMANCE

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

Despite the increasing interest in interactive installations, little research has been developed to investigating theoretical approaches to their relevance and influence. Current approaches by art critics or digital media researchers do not identify interactive installations as an individual research subject for further theoretical discourse. However, contrasting with their limited research in the past, interactive installations in an art-related context are likely to expand with the development of digital technology.

This thesis clarifies the interdisciplinary field of interactive installations in digital media and digital art. As an interdisciplinary field, interactive installations emphasize three dimension; bodily interaction beyond restricted mouse clicking; physical interfaces using digital technologies that can reconfigure a space; particular forms of participants' engagement. To investigate these interactive installation artifacts in greater detail, this thesis adapts a theoretical perspective from performance studies using epistemic, critical, and constitutive qualities to investigate interactive installations as performance. First, *epistemic* qualities explore how embodied interactions prompt participants' engagement. Second, *critical* qualities encourage participants to ask questions and explore issues. Lastly, *constitutive* qualities address how participants actuate new configurations by interacting with installations.

This thesis applies the epistemic, critical, and constitutive aspects and its theoretical discourse to interactive installations. With two works, *Please Smile* (2012) and *Hooray* (2013), it probes these effects in an additional user study of both works. Using the quantitative and qualitative results of a questionnaire and participant interviews, it also analyzes how participants engage with *Please Smile* and *Hooray* and respond both emotionally and physically.

CHAPTER 1

INTRODUCTION

1.1 Necessity

Interactive installations should be considered a subject of digital media studies for two reasons. For one, as digital technology has become increasingly sophisticated, interactive installations have undergone *fundamental changes in the materials used to create works of art*. Traditional artists use physical materials and tools to create works of art. American artists Bruce Metcalf (1993) defined four identities of craft art: it should be handmade, it is created with a medium that requires specific material and tools, it can be defined by its use, and it is not subject to mass production. According to Metcalf, the medium that is used categorizes the art, and special tools are developed to manipulate the medium. For example, artists paint with pens, pencils, and acrylic colors on canvas, and they sculpt stone, wood, and marble with a carving mechanism. He mentions "Woodworking, metalsmithing, weaving, and glassblowing [as] disciplines specific to a medium and its mastery" (p. 5). In contrast to the identities of traditional art, interactive installations employ a combination of a tangible interface and the digital process. Enhanced by digital technology, the domain of digital interfaces can become flexible. Therefore, we need to understand the characteristics of interactive installations based on their own features. To understand the features of interactive installations, this thesis provides a theoretical framework that contains three key elements: *epistemic*, *critical*, and *constitutive* qualities.

Another reason why interactive installations should be considered a subject of digital media studies is that with the development of science and technology, *perspective shifts* of information processing have taken place from a controlled (i.e., a top-down approach) to situated (i.e., bottom-up approach) context. British anthropologist Lucy Suchman (2005) claims that human actions that respond to computational media can be diverse, so we must avoid categorizing binary oppositions in the relationship between human and computational media. Suchman (2002) urges to switch the perspective of digital technology as shifting "from a view of objective knowledge as a single, situated, master perspective that bases its claims to objectivity in the closure of controversy, to multiple, located, partial perspectives that find their objective character through ongoing processes of debate" (p. 92). Unlike the top-down approach, which starts from a larger framework but then breaks down into lower-leveled segments, the bottom-up approach starts from an individual' information but then traces upper-leveled systems (see Figure 1).

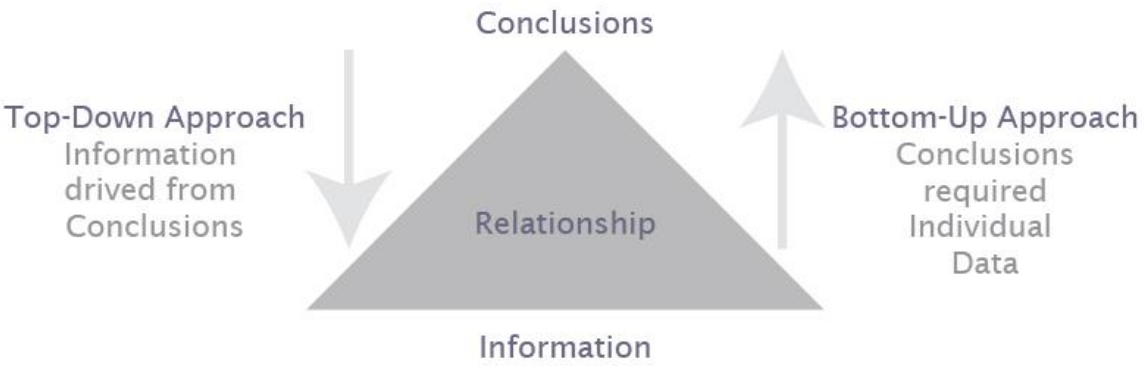


Figure 1. Top-down and bottom-up approaches

Since fundamental information can vary in its social, cultural, and historical preoccupations, the bottom-up approach can contain a large pool of individual values. Sociologists Pinch and Bijker (1984) explain a divergent and non-linear model of the

process of technological innovation and *sociology of technology*. They claim that the ways that artifacts interact with people and that the innovation of artifacts influences society follows a multi-directional model. They reference the *social construction of technology* (SCOT), which supports that idea that "the developmental process of a technological artifact is described as an alteration of variation and selection" (p. 411). They also claim that human action, not just technology, influences the innovation of technology. Another reference that they use is the *empirical programme of relativism* (EPOR), which involves a flexible interpretation of scientific findings and applies the flexibility to social-cultural cases through "closure mechanisms" (p. 409). These references reflect relevant social groups in a sequel. "Relevant social groups" can be defined as "a group of users of artifacts," and many social groups may interact with the artifact (see Figure 2). For example, relevant social groups in the development of the bicycle routine include cyclists for transport, professional cyclists for sport, novice cyclists for entertainment, and even anti-cyclists. Individuals of these groups also have unique ways of approaching an artifact constitute problems and meanings in interaction (see Figure 3). Their problems and issues with the artifacts are diverse, as the figures below show.

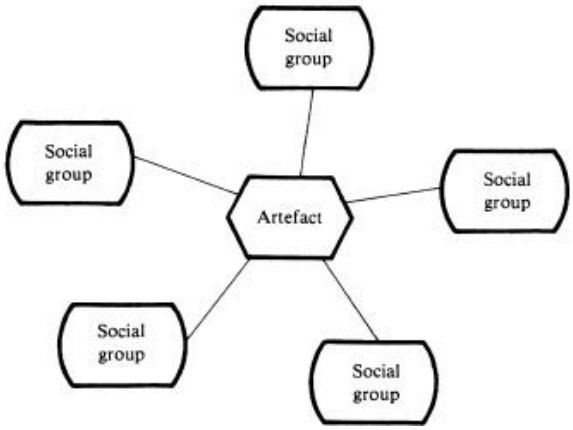


Figure 2. The relationship between an artifact and relevant social groups (Pinch & Bijker, 1984, p. 416)

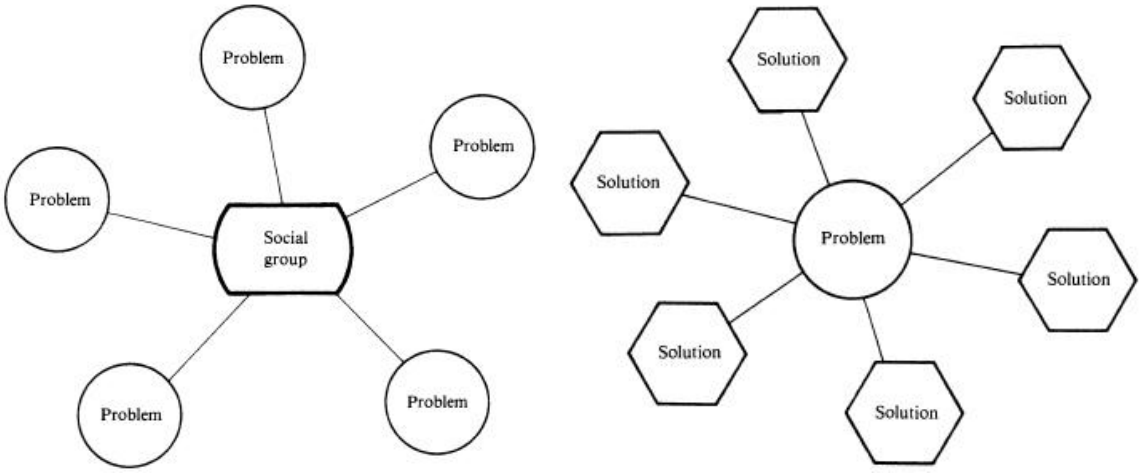


Figure 3. The relationship between one social group and perceived problems (left) and between one problem and its possible solutions (right) (Pinch & Bijker, 1984, p. 417)

Pinch and Bijker (1984) claims "a 'new wave' of social constructivist case studies was beginning to emerge" through EPOR and SCOT and the concepts of "'interpretative flexibility,' the 'closure mechanism,' and the notion of 'social group'" (p. 429). Based on their claim, we understand the dynamic relationship based on the diversity among artifacts, the social groups, and the social and cultural background, which raises the questions: How does this situation influence interactive installations?

With these transitions forming the background of interactive installations, this thesis claims that interactive installations should be re-examined as a theoretical field of a potential research subject that reflects digital material and perspective shift. The transitions can provide a springboard from which we can explore a multi-directional interpretation of digital artifact and reflect on the diverse issues in physical and emotional engagement. Traditionally, interactive installations were regarded as a type of practice in digital art. It is common to believe that digital artists who use interactive installations as

media produce art, not research. However, interactive installations have gradually found a persistent presence not only in specialized art galleries and museums but also at events such as ISEA and Prix Ars Electronica and in the art or demo tracks at academic conferences such as the Conference of Computer-Human Interaction (CHI), the Conference on Computer Graphics and Interactive Techniques (SIGGRAPH), and the Conference on Tangible, Embedded and Embodied Interaction (TEI). For example, the chair of the art and interaction interest group of the CHI conference argues that the "digital arts intersect with traditional CHI topics…CHI researchers will gain alternative insights into the interactive process…digital artists gain access to an audience familiar with their technologies…we can facilitate interdisciplinary collaboration between artists and technologies, and additional insights can be gained in turn"[1] to emphasize how digital arts can influence the human-computer interaction (HCI) community. Most often, these are works that explore social, political, and experiential boundaries of digital interfaces. Presenting an inspiring combination of art, design practice, and research implementation, they have become a strong influence on not only art but also other related communities such as design, HCI, robotics, and games. Because of their impact, relevant research and theories for interactive installations could articulate how interactive installations can inspire the breaking away from tradition, the raising of relevant questions about their social influence, and exploring other venues. The framework of this thesis will provide background to explore those impacts. This potential to inspire calls for further academic research.

[1]http://chi2014.acm.org/communities-spotlights/art-interaction

Although the interest in interactive installations is increasing, research has not been devoted to investigating theoretical approaches to their characteristics. Compared to their limited resources with digital interfaces in the past, interactive installations in an art-related context are likely to expand such interaction with the development of digital technology. This thesis engages in a debate about how artistic and humanistic approaches can inspire science and research. Within a theoretical framework, researchers can gain more insights from artists who work on interactive installations, and media artists can cultivate a field initiated by the creation of new research directions. As a result, digital media researchers can achieve alternative perspectives on interactive interfaces, and digital media artists can share their work with a wider range of audiences such as interaction designers, media theorists, performance practitioners, and art-related context. This thesis can clarify an interdisciplinary field of interactive installations in computational media, interactive art, and performance. Within this interdisciplinary field, opportunities for collaboration increase, which will contribute to this multidisciplinary field. Material changes from the development of digital technology within a narrower scope and socio-cultural transitions on a more global scale can provide an arena in which this situation can flourish.

1.2 Definition of interactive installations

This study begins by defining *interactive installation*. It also raises other pertinent questions: What form the interface can take and what interaction design can stand out for interactive installations? Is its purpose for more practical reasons such as selling and marketing a product or for educational or research purposes or for physical and emotional

engagement? Is it an extension of participatory design? Is its purpose to improve the effectiveness of interactive design or to illustrate a new wave that reflects recent transitions among science, technology, and society?

Interactive installation is an interdisciplinary subset of digital media and digital art, illustrated in Figure 4. To fully understand these overlapping areas, which contain

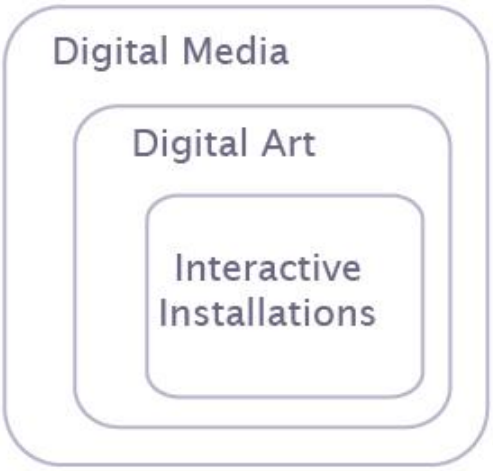


Figure 4. The relationship among digital media, digital art, and interactive installations

interactive installations, this paper provides digital media studies in Chapter 4 and the roots of interactive installation in art history in Chapter 5. However, it is important that the subject of this study be clarified in the beginning of the thesis.

According to art critic Michael Rush (2005), as examples of interactive installations, which are "beyond the 'clicking' and 'surfing' activities of the Web, which are, indeed, forms of interaction with computer technology, several contemporary artists have created works, often on a large scale, that are truly participatory" (p. 222). He articulates that the main creators, artists, are providers of both the intensity of the physical engagement, which is beyond limited and controlled interaction, and the level of emotional

engagement, which stimulates integral participation. He emphasizes the importance of both the digital process, which is the use of computational systems, and the scale of the physical interface, which usually triggers participants' whole body movements. His perspective explains the role of digital interaction and the scale of a physical interface. A large-scale physical interface and digital technologies not only influence one another but also impact participants' engagement. Although this explanation can articulate the digital and physical elements of interfaces and interactions, it does not sufficiently clarify their context.

Compare to Rush, American artist Erika Suderburg (2000) takes context into account. She defined *installation* as "the noun form of the verb to install, the functional movement of placing the work of art in the neutral void of gallery or museum. Unlike earthworks, it initially focused on institutional art spaces and public spaces that could be altered through 'installation' as an action. 'To install' is a process that must take place each time an exhibition is mounted; 'installation' is the art form that takes note of the perimeters of that space and reconfigures it" (p. 4). Like Suderburg, this thesis provides an art-related context in which a work of art can reconfigure a space. Such an art-related space could include not only an indoor museum or gallery but also an outdoor festival on a city street or a demo place—the only necessary criterion is an art-related context.

Conforming to the concept of artistic quality, an interactive installation does not need to provide a high level of usability, but it can be an important innovator and flourish in a particular context and practice. Adding to the physical scale of interaction and

configured space, contemporary art critic Claire Bishop (2005) includes engagements when she defines installation art as "a term that loosely refers to the type of art into which the viewer physically enters, and which is often described as 'theatrical,' 'immersive' or 'experimental'…Installation art therefore differs from traditional media (sculpture, painting, photography, video) in that it addresses the viewer directly as a literal presence in the space" (p. 6). Although Bishop's vision for installations does not require a digital aspect, physical installations already contain the concept of space and viewers become participants in a relation between the space and viewers. In her quotation, she not only connects installation art with viewer's engagement, but also accounts for the performance aspects of installation art.

The definitions by Rush, Suderburg, and Bishop all emphasize the following:

1. Bodily interaction beyond restricted mouse clicking
2. Physical interfaces (often on a large scale) involved in digital technologies that can reconfigure a space
3. Participants' engagement

Based on the references, this thesis defines interactive installations in terms of the scale of interaction, reconfigured space, and engagement with the help of digital technology and a physical interface. Distinct from interactive product/gadget designs for commercial purposes or a traditional art exhibit that is not integrated with digital technology, interactive installations have carved out a place and a condition of their own.

1.3 Motivation

The motivation for this research originated from an exhibit of a work created by Nam, *Please Smile*[2] (2011), displayed at the 2012 CHI conference in Austin, Texas (USA) in a typical environment for art-based interactive works. *Please Smile* consists of five interactive robotic skeleton arms that gesture in response to participants' smiles. Using computer vision, a camera recognizes the facial expressions of visitors standing in front of the robotic arms. Reacting to facial gestures of participants, the system activates 20 motors that control an array of skeletal hands that respond to particular facial expressions by altering their gestures. When no one is standing within view of the camera, the five robotic skeleton arms set their default position, bending their elbows and wrists towards the wall behind them. However, when participants step in front of *Please Smile,* it interacts with participants in three ways: first, by pointing its skeletal fingers at them; then by following their movements; and then when participants smile, by waving the hands at them. Participants may react to the installation in a variety of way, shown in Figure 5.

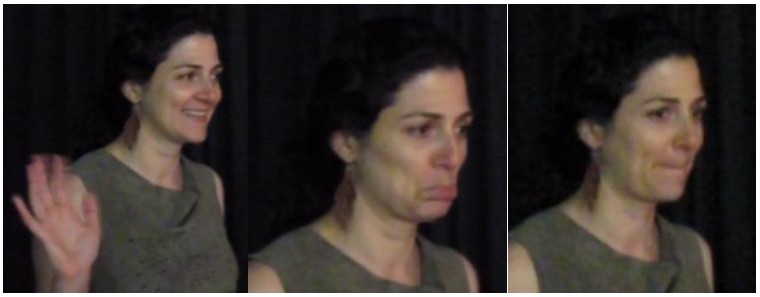


Figure 5. Participant's reactions to the interactive installation *Please Smile* (May 2012, CHI conference, Texas, USA)

During the interaction between participants and the installation, the participants primarily acted out their own expressions in collaboration with the work. Some of them

[2]http://www.hynam.org/

dramatically changed their facial expressions and actions or addressed the technological part of the installations directly through verbal communication: “Hello,” “Oh, ok. We are cool,” or “Really guys, come on,” as if the piece itself had been performing. Some interacted alone or invited others to play. Both young children and adults enjoyed the interactions as if they perceived the interactive installation as performance, indicating that they did not simply see the involvement as a goal-oriented action or task, but as a form of expression.

Please Smile is a typical example of an interactive installation. The previous section proposed definitions of interactive installation in terms of the scale of interaction, the reconfiguration of space, and engagement with participants. *Please Smile* satisfies all of these aspects of the definitions. It integrates the computer vision process into a physical robotic interface. Its interaction reaches beyond the limited monitor and mouse interaction: to experience *Please Smile*, participants must engage with body and facial movements. While the creator, as both an artist and a researcher, has been invited to a number of events and exhibitions, the primary motivation of this research has been the sense of purpose and responsibility as a digital artist to satisfy a scholarly curiosity and to contribute to the field of interactive installations. The academic curiosity has raised questions about how to configure space with *Please Smile*, how participants engage with *Please Smile*, and what kinds/levels of engagements are involved, all of which the thesis will address. Before more comprehensively exploring related theories, this section explains the initial motivation by interpreting participants’ reactions through observations by the creator in the conference demo venue in her attempt to integrate art-context into

research.

Several art researchers and curators have defined interactive installations throughout art history. For example, art critic Christiane Paul (2003) categorized digital art according to its form and media. Other scholarly approaches have concentrated on design and emotion. Interaction designer Bill Gaver (2002) introduced several works by artists who have explored multiple interpretations or provocations in design, and Steve Benford et al. (2012) used entertainment and performance art to present the uncomfortable emotions of individuals facing political and sometimes fearful situations. Nevertheless, observations of participants of *Please Smile* pointed to another domain: that of performance.

1.4 Thesis overview

The thesis is organized in the following chapters.

Chapter 1 introduces the necessity and motivation of this research. With material and perspective changes, it reconsiders interactive installations to be an independent research subject in digital media studies. In the beginning of the thesis, the definition of interactive installations requires a clarification of the scope and direction of this research.

Chapter 2 examines the current problem, proposes research questions, and summarizes the thesis of this research. The chapter begins by presenting an overview of the related approaches to digital art and digital media and addresses their problem areas. Then,

through the deficiencies of current approaches, it proposes research questions. Lastly, it presents a perspective from which these questions can be answered.

Chapter 3 introduces research methodologies. This research adapts a framework from performance studies to the analysis of interactive installations in theory and practice. It focuses on three characteristics—epistemic, critical, and constitutive aspects—to investigate participants' performative behaviors in their responses to interactive installations. In addition, it conducts traditional quantitative and qualitative user tests that support the main approach, performance studies, to examine results of user studies, then apply to the framework.

Chapter 4 discusses important affordances of digital media and their influence on interactive installations, which contain both digital and physical elements owing to the integration of computational media and physical interfaces. With fundamental changes in materials having taken place, we must reevaluate the characteristics of interactive installations.

Chapter 5 provides a review of digital art history. Because interactive installations are rooted in digital art, an understanding of foundation of interactive installations relies on an understanding of their role in art history.

Chapter 6 introduces the overview of performance studies. Beyond computational media theorist Brenda Laurel's comparison of computers to traditional drama in theater, Chapter

6 discusses how performance studies provide a theoretical backdrop from which we can analyze participants' reactions and engagements in terms of the broader concept of "as" performance. It discusses performance studies from an anthropological perspective by discussing the work of Richard Schechner and from a communication perspective by examining the work of Richard Bauman. The overview will introduce the background and connections among features in the framework.

Chapter 7 investigates the epistemic features of interactive installation as performance. As a result of the advent of digital technologies, interaction space has shifted from monitor space to dynamic space, in which physical elements can be rapidly integrated into digital elements. With reference to phenomenology, this chapter discusses how closely our mind and body are related and how audiences learn about not only themselves (i.e., the phenomenological body), but also others and the world around them (i.e., the objective body) through these embodied interactions. As Maurice Merleau-Ponty emphasizes the body as an important connection among living beings, this chapter explores how embodied interactions prompt participants' engagement.

Chapter 8 examines critical interactive installation as performance. Critical interactive installations allow audiences to articulate or identify hidden forces or ambiguities that operate beneath appearances and possibly change their perspectives. Referring to the perspectives of critical performance theorists such as Bertolt Brecht or Augusto Boal, this chapter discusses how interactive installations convey social and political roles and how they function to reflect these roles.

Chapter 9 discusses the constitutive characteristics of interactive installation as performance, which is the last aspect among the three. It addresses how audiences can transform their perspectives and their behaviors so that they reflect the previous epistemic and critical aspects. Referring to how people initiate or change their behaviors based on their situations such as anthropologist Victor Turner's liminality or gender theorist Judith Butler's performativity, this chapter explains the change in an individuals' perspectives depending on their roles and corresponding behaviors and actions.

Chapter 10 discusses the implementation of interactive installations. Through two works, *Please Smile* (2012) and *Hooray* (2013), the chapter describes the epistemic, critical, and constitutive aspects and its theoretical discourses. In addition, the quantitative and qualitative results of PANAS questionnaire and interview present how participants engage with *Please Smile* and *Hooray* and respond both emotionally and physically. The results will be evaluated within three features of the theoretical framework.

Chapter 11 summarizes and concludes the thesis and suggests directions of future research. Since the goal of the thesis is to provide a theoretical framework for encouraging further investigation of interactive installations, the thesis contributes to the body of academic knowledge by encouraging debate and conversation pertaining to interaction installations, raising thought-provoking questions, and inviting related discussions.

CHAPTER 2

THESIS STATEMENT

Chapter 1 introduced the need, the definition, and the motivation of this research and clarified the boundaries of interactive installations in a brief definition. Based on the information in Chapter 1, Chapter 2 identifies the problem space, asks research questions, and provides thesis statement. Interactive installations used to be considered a practice of digital art or new interfaces of computational media that did not fundamentally influence the theory of digital media studies. However, the development of *digital technology* has changed the fundamental material world of interactive installations, and *perspective shifts* of the information process in society have considered a situational approach to interactive art. This background calls for a redefinition of interactive installations as a research subject.

The definition of interactive installations includes bodily interactions beyond restricted mouse/keyboard inputs, physical interfaces involved in digital technologies that can reconfigure a space, and participants' involvements in terms of scale, reconfiguration, and engagement. From the definition, important features of interactive installations are selected regarding the embodiment, the combination of physical and digital platforms, and the art context. This thesis continues to illustrate how participants engage in and interact with these interfaces and conditions. Their artistic quality in the combination of physical and digital forms originates in digital media theory and new media art. However,

current approaches do not provide a sufficient theoretical framework within which we can investigate interactive installations as a subject in digital media studies.

2.1 Existing problem

As interactive installations originated in art history, the art-context is one of the foundations in the definition of interactive installations. Theorists and curators have demonstrated the influences of digital technology on digital art in various directions. Rush (2005) conceptually explains changes of the traditional triadic relationship based on the dynamic boundaries among artist, artwork, and audience. While Paul (2008) curates new media art, she stipulates the rules and guidelines of how to curate, exhibit, and maintain in a practical manner in which art exhibitions include interactive installations. These references by Rush and Paul reflect the recent impact of digital technology and suggest curating and maintaining directions of digital art based on this impact. For digital art theorists and curators, interactive installation is a practice that reflects such changes; they are not a research subject that provides a theoretical discourse.

A medium of interactive installations has become a combination of digital and physical platforms. Because of fundamental quality of this medium, this thesis covers affordances of digital media and its impact on interactive installations. Digital media scholar Lev Manovich (2001) has introduced a list that is generally accepted, but outdated as new media in the popular press: "the Internet, Web sites, computer multimedia, computer games, CD-ROMs and DVD, virtual reality" (p. 19). Most of the items on the list are new media applications in which computers host an array of data rather than a digital

process in which computers procedurally manipulate production. Since new media have both digital and physical aspects, Manovich has provided five principals of new media, which are numerical representation, modularity, automation, variability, and cultural transcoding. However, his category of digital media—"graphics, moving images, sounds, shapes, and texts that have become computable, that is, they comprise simply another set of computer data" (p. 20)— provides general concepts; it does not articulate specific perspectives of interactive installations in digital media.

Within the category of digital media, the concept of digital performance is also obscure. Performer and educator Steve Dixon (2007) includes in digital performance "live theater, dance, and performance art that incorporates projections that have been digitally created or manipulated; robotic and virtual reality performances; installations and theatrical works that use computer sensing/activating equipment or telematic techniques; and performative works and activities that are accessed through the computer screen, including cybertheater events, MUDs, MOOs, and virtual worlds, computer games, CD-ROMs, and performative net.art works" (p. 3). With these specifications, Dixon identifies digital performance as "all performance works where computer technologies play a *key* role rather than a subsidiary one in content, techniques, aesthetics or, delivery forms" (p. 3). According to Dixon, digital performance has become a loose term and has been applied to the wide range of applications both within and outside the performance arts.

Although both Manovich and Dixon's perspectives delineate the big picture of digital media and digital performance, their categories have expanded and still remain obscure. They do not identify interactive installations as an individual research subject for further theoretical discourse. To modify this issue, this thesis promotes theoretical discourse utilizing performance studies as a principal methodology as the motivation of this study indicated a relationship between the *Please Smile* interface and the performance qualities of participants' reactions to it.

This thesis is directed at both researchers and digital artists willing to contribute to interactive installations as a research subject in digital media studies. This thesis does not argue that interactive installations are a new genre or a medium of digital media studies or digital art. Interactive installations have already been acknowledged as a sub-genre of digital art and digital media. The scope of the debate about art and science or art versus science is also too wide to be covered here. Instead, this thesis concentrates on a particular sub-genre of digital media and digital art in an art-based context. This sub-genre can be termed *interactive installations*; single works live in the context of art-related venues and engage participants in full-body interaction with computational physical interfaces.

Although interactive installations share technological backgrounds and overlapping directions with current approaches, the latter appear to be insufficient. First of all, selected research in digital art does not fully cover the theoretical framework of interactive installations. Even though art and technology research centers such as

Eyebeam Art and Technology Center in New York City or the Banff New Media Institute in Banff, Canada, provide spaces in which artists, technologists, and curators collaborate and experiment while publishing books such as Euphoria & Dystopia (Buckley, 2011), conducting interdisciplinary workshops such as interactivos?[3], and providing public discussions such as dorkbot,[4] they cover only partial discourse, not full theoretical perspectives.

Secondly, digital media research does not specifically explain interactive installations. Despite the conceptual approaches to digital performance, digital games, and other entertainment related fields, they do not specifically explain interactive installations as a research subject of digital media in an art-related context; instead, they present general affordances of digital media. To complement these deficiencies, this thesis provides a theoretical framework, which interactive installations can be supported as a research topic in digital media studies.

2.2 Research questions

The current problem demonstrates the deficiency of interactive installations as a research subject in the intersection of digital media, digital art, and digital performance. Scholars, practitioners, curators, and artists sometimes share their directions and perspectives of interactive installations; however, they do not fully shape fundamental theoretical discussion. Although research pertaining to interactive installations originates in existing

[3] http://www.eyebeam.org/events/interactivoseyebeam-double-take

[4] http://dorkbot.org

research in digital media and digital art, fundamental theoretical discourse that can construct interactive installations as an independent research subject, not a mere practice, needs to be explored. To support the notion that interactive installation is an individual research topic, this thesis analyzes interactive installations from performance studies since interactive installations contain several qualities similar to those that performance provides.

Interactive installation contains both digital and physical elements. However, using performance studies as an analysis tool must clarify the interaction between these elements, raising the following fundamental question: *How does digital technology influence the performance aspects of interactive installations?* The beginning of this thesis established the need for this research: changes in fundamental media. Current research and practices of digital technology do not sufficiently and specifically provide a theoretical discourse for interactive installations, but they do provide limited descriptions that explain the results of interactivity. Satisfying curiosity about how digital technologies impact performance qualities will add to the current body of knowledge related to this study. Although current approaches of digital technology partially explain the purposes and relationships of interactive installations, this thesis seeks to articulate them through a detailed discourse.

Through his definition of interactive installations, Rush (2005) explores the scale of interaction beyond the keyboard, the mouse, and the computer monitor; Suderburg (2000) states how to reconfigure space with installations; Bishop (2005) designates viewer

participation and engagement as an important feature of installations. Even though installations invite viewers into the physical space to participate and digital interactions can trigger their interest and curiosity, *what particular forms of engagement interactive installations offer to their audience* remains unclear. In addition to the current approaches in digital art history and affordances of digital media, the goal of this thesis is to constitute a theoretical framework of interactive installations as performance. With the two research questions and their answers, scholars and digital artists can investigate interactive installation as a research topic to explain participant engagement performative behaviors.

2.3 Statement of the thesis

The relevance of digital art and digital media to research pertaining to interactive installation necessitates a framework that initiates and fosters theoretical discourse. This thesis builds such a conceptual framework, asserting that interactive installations and performance studies overlaps. One aspect of debates in media studies already includes the key fields of identity and context, body, and critical thinking. However, this thesis suggests a new perspective from which we can approach core terminology and qualities, one that originated in art history and art practice but has entered the digital media community through theory and practice in performance.

This thesis will begin by outlining the connection of the perspective to digital media theories and digital art to explain their dual nature as both technological and conceptual qualities. Then, their particular qualities will inform a framework that will be developed

as performance and traditional user tests (both quantitative and qualitative) as an additional methodology. Performance studies as a main approach will provide the *epistemic*, *critical*, and *constitutive* aspects of interactive installations. The framework, which covers both theoretical and practical work, not only incorporates other critical theories but also draws examples from the digital art pool. Hence, examples of interactive installations within the framework will be discussed. Then this thesis will examine, within the framework and user tests, two interactive installations: *Please Smile* and *Hooray.*

CHAPTER 3

METHODOLOGY

Because of the dearth of academic research pertaining to the theory of interactive installations in digital media, this thesis provides a theoretical framework that constitutes, develops, and fosters research of interactive installations. As an inclusive term, *interactive installation* consists of interdisciplinary qualities of digital media, digital art, and various computational media. Chapter 1 clarified the definition of interactive installations in terms of the scale of an interface, its reconfiguration of space, and its engagement with viewers with the help of both physical and digital qualities. This thesis adapts a theoretical perspective from performance studies using epistemic, critical, and constitutive qualities to investigate interactive installations as performance. To partially support the theory of a framework, it will employ the methodology from performance studies and traditional user tests (quantitative and qualitative methods).

3.1 Theories from performance studies

To encourage critical discussion, this thesis, through the framework, strives to provide digital media scholars and digital artists with a theoretical background they can cite in arguments about the nature of interactive installations. As mentioned above, to form this framework, this research analyzes interactive installations from epistemic, critical, constitutive aspects originating from *performance studies*.

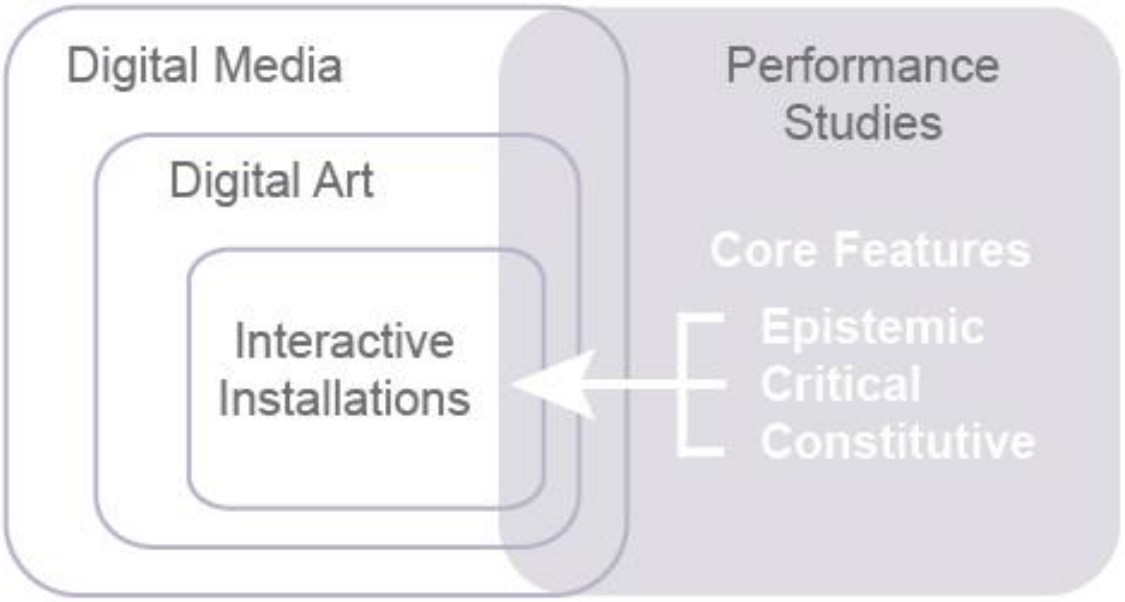


Figure 6. The relationship among digital media, digital art, interactive installations, and performance studies and the core aspects of performance studies

Summarizing multiple strands of performance, American performance theorist Elizabeth Bell (2008) refers to key terminology—constitutive, epistemic, and critical aspects of performance—that outlines the proposed argument that interactive installations can foster physical and emotional engagement, influence critical thinking, and reference their audiences' social and cultural contexts, thus constituting new directions. Applying these performance-based criteria to the field of interactive installations provides a framework within which we can outline how these particular works draw from an art background and how they can relate to performance studies.

Using the three key terms, Bell (2008) summarizes three qualities of performance across different approaches: (1) performance is *epistemic*, which refers to "performance is a way of knowing"; (2) performance is *critical*, which indicates that "performance is a way of staking claims"; and (3) performance is *constitutive*, which means that "performance creates" (p. 18-26). All three aspects apply to interactive installations, and to clarify

these qualities, this work will discuss them and provide examples that solidify the framework.

3.2 Additional quantitative and qualitative user tests

Scholars and practitioners in the traditional human and computer interaction (HCI) community have developed methods of assessing their computational interfaces. These conventional methods and strategies typically evaluate the usability of computational interfaces and seek ways to understand them and improve their productivity. HCI practitioners such as Bill Gaver, Anthony Dunne, Phoebe Sengers, and Steve Benford often adapt art projects to HCI from a variety of perspectives using alternative approaches and inspirational role models. In *Projected Realities Conceptual Design for Cultural Effect*, Gaver and Dunne (1999) claim that their conceptual design contributed to the meaningful cultural role in the local community. In *Ambiguity as a Resource for Design* and *Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation*, Gaver, Sengers, and Benford (2003) provided an obscure interpretation as an alternative solution to problems and issues in HCI. Although the ultimate goals of the HCI and art communities differ, the relationship between interactive installations and audiences in an art-related context could represent one type of HCI relationship between humans and computers. Standard HCI methodology does not assess aesthetic values through the HCI method, but instead explore overlapping areas between HCI and digital art. This thesis does not claim that traditional quantitative and qualitative user tests are suitable methods of assessing artwork. It claims that by measuring the relationship between design and emotion, interaction and preference, and body movements and

engagement, HCI mixed methods, both quantitative and qualitative, can partially support the theoretical framework.

The goal of additional user tests is to investigate how varying levels of digital technology can influence an audience's physical and emotional engagement during their experience with an interactive installation. User tests measure the positive and negative affect of participants in various circumstances and investigate their verbal (i.e., conversation) and non-verbal (i.e., body movements and facial expressions) reactions. The quantitative method consists of a questionnaire of the positive and negative affect schedule (PANAS), and qualitative methods consist of interviews and video observations. Developed by Watson, Clark, and Tellegen (1988), the PANAS contains 20 items of which participants exhibit positive or negative affect, or their mood. While positive affect (PA) is indicated by one's enthusiasm, alertness, or activity, negative affect (NA) is indicated by one's aversion or distress. Later, Watson, Clack, Vaidya, and Tellegen (1999) clarified the meaning of positive and negative affect as the activation systems. The reason why PANAS questionnaire is applied to interactive installations is to measures participants' positive and negative affect towards interactivity and to check the significant difference between interactive installation and non-interactive installation. To complement the limits of the quantitative results, this study involves qualitative methods, interviews, and video recording. As a principal methodology, performance studies provide the navigation tool for the development of the theoretical framework and related practical examples followed by additional user tests involving two interactive installations, *Please Smile* and *Hooray*. Two interactive installations will provide concrete demonstrations

that illustrate how interactive installations can employ epistemic, critical, and constitutive qualities while answering research questions as a supportive method.

CHAPTER 4

DIGITAL MEDIA THEORIES

In the background of this research, one of the fundamental changes of interactive installations has been the transition of materials from traditional to digital technology media. Because interactive installations integrate digital technology into physical interfaces, the first research question this chapter intends to answer is what the effects and results of the fundamental medium changes are. Chapter 4 explores the effects drawn from the digital technology in the process of integration and role in creating new relationships between participants and installations.

As shown in Figure 7, digital media are fundamental platforms of interactive installations. Indeed, emerging new media fundamentally influence all levels of the knowledge process, leading to debates about what the purposes and the uses of computers in the fields of technology and information sharing are and whether digital media are tools, true mediums, both, or neither. In 1968, engineer Douglas Engelbart from the Stanford Research Institute invented a computer mouse consisting of a wooden device with three buttons for direct manipulation[5] and introduced the concepts of "bitmapping" and "computer windows." The idea of navigating computer space, originally from Engelbart, was later developed in the 1970s by American computer scientist Alan Kay "computer windows." The idea of navigating computer space, originally from Engelbart, was later

[5] http://www.wired.com/wired/archive/12.01/mouse_pr.html

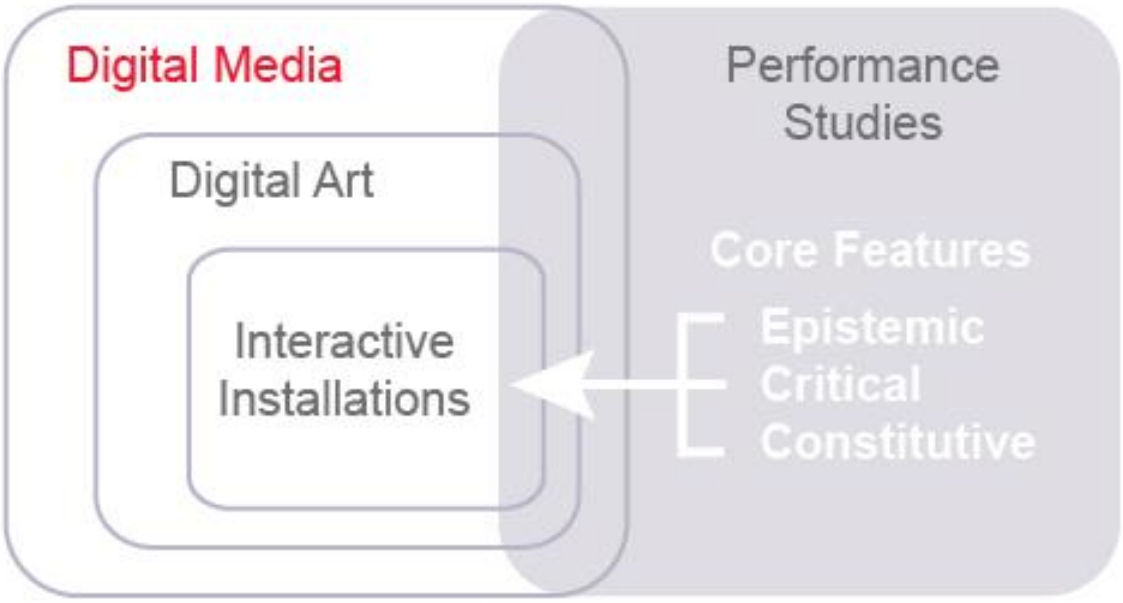


Figure 7 Effects of digital media on interactive installations

developed in the 1970s by American computer scientist Alan Kay and a research team at Xerox Palo Alto Research Center (PARC) and constructed the graphic user interface (GUI). According to Kay (1989), GUI refers to "the idea of iconic, graphical representations of computing functions—the folders, menus, and overlapping window found on the desktop—based on…research into the intuitive processes of learning and creativity" (p. 122). GUI forms an interface and helps us complete tasks with the computer as a tool. HCI researcher Brenda Laurel (1986) explains the logic of the tool metaphor in the following quote: "Regardless of what they *think* they are doing (e.g., playing a game, searching a database, or designing a cathedral), end users are *actually* using the computer as a tool to carry out commands, just like programmers" (p. 74). She also articulates the problem of this stance, which considers technology as a tool. She suggests that the tool metaphor deprives the user from the ability to perform and express. Similar to Laurel, Canadian philosopher of communication theories Marshall McLuhan (1964) states that "the medium is the message…the personal and social consequences of

any medium result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new technology…For the 'message' or any medium or technology is the change of scale of pace or pattern that it introduces into human affairs" (p. 23-24). Interchangeably using media, medium, and technology, he emphasizes that technology is a medium and humans extend themselves with that medium, that is, with the help of technology. Claiming that technology is neither a tool nor a medium, the director of the Museum of Arts and Design in London, Glenn Adamson (2013) claims "digital and analogue processes are joined together as separate stages within a making process" (p. 168). Among them, since interactive installation has digital media as its platform, this thesis interprets digital media as a medium that embeds information, not a tool to create interactive installations.

Then, through the new media, how does information change or even predict further directions? With the advent of the computer, media scholars and practitioners claimed that old mediums were being replaced by new ones and that information was being altered through the process. American media scholar Henry Jenkins (2008) stated, "Old media are not being displaced. Rather, their functions and status are shifted by the introduction of new technologies" (p. 14) and claims that new media does not destroy old media, but instead they are converged together. Educator in digital craft, Malcolm McCullough (1996), emphasizes progressive evolution from old to new forms as if they were a natural process of growth. This thesis also agrees that new media do not simply terminate the fundamental traditional elements, but instead, they facilitate their evolution

into multiple facets that provide immersive and expressive environments that contain cultural experience and create new perspectives.

4.1 Immersive and expressive environments

According to digital media scholar Janet Murray, the unique representational affordances of digital media are their procedural, participatory, spatial, and encyclopedic nature. Murray (1997) emphasizes "the first two properties make up most of what we mean by the vaguely used word *interactive*; the remaining two properties help to make digital creations seem as explorable and extensive as the actual world, making up much of what we mean when we say that cyber space is immersive" (p. 71). The procedural power of the computer is its ability to computationally execute programing language by its rules and this power induces participants' input by responding. The procedural and participatory power of the computer creates basic interactive environments. The spatial power of the computer creates navigable space and its encyclopedic capacity provides the possibility of storytelling. From Murray's perspective, the relationship between procedural digital artifacts and participants is responsive and communicative upon entering an immersed experience. She defines immersion as "a metaphorical term derived from the physical experience of being submerged in water" (p. 98). That is, she views people as capable of perceptually experiencing being surrounded by water, which is completely different from their usual reality with air. She claims that the computer is a transitional object that can also foster psychological immersive experience.

The concept of transitional objects, used by Murray, originates from a psychological term coined by psychoanalyst Donald Winnicott (1971). He introduces the concepts of transition for the "designation of the intermediate area of experience…between primary creative activity and projection of what has already been introjected" (p. 2). While Winnicott refers to the transitional experience of activity and projection, Murray (Murray 1997) applies transitional experience to computers as liminal objects "located on the threshold between external and our own minds" (p. 99). She also claims that a computer sometimes responds like an animate or expressive being such as Joe Weizenbaum's Eliza (1966), an interactive AI program pretending to be a real person when participants chat with Eliza. With Eliza's procedural algorithms, participants often emotionally engage in communication with Eliza because the procedural power of the computer induces participation.

Sociologist Sherry Turkle refers to computers as *marginal objects* that provide continuous experience between reality and representation, similar to Murray's definition of a *liminal object*. Because we interact with other community members and express ourselves as social creatures, this raises the following question: How do people express and interact with others (or other representations) in a digital space provided by digital technology that is perceived in both public and intimate space and that simulates our social interactions. Turkle investigates how computers influence individuals in *Life on the Screen* (1995). After she analyzes how individuals including children and adults encounter cyberspace through on-line computer games, she finds that their reflective selves (e.g., avatars or virtual agents) become involved in players' virtual activities.

They influence the social and psychological roles of players in their real lives, which can cause confusion between their virtual and real worlds. When participants experience interactive installations, their sensory inputs generate representations on a screen or into a scene of interactive installations, which are their digital representations. The computer continuously gives feedback about the interactions to participants. Through this process, interactive installations as liminal objects can provide an enchanted experience that can be enforced by responsive communication and participatory qualities of the digital medium.

4.2 Cultural interfaces

Murray's four principal properties of the digital environment—procedural, participatory, spatial, and encyclopedic affordances—provide the fundamental characteristics upon which we can build immersive and expressive platforms. Beyond simply controlling immersive and expressive platforms, however, we should review installations as cultural interfaces and their relationship to previous media. Murray (2011) defines a medium as "any combination of materials and cultural practices that is used by human beings to support the intentional communication of meaning" (p. 30) and participants are active participants in finding meaning. She contends that cultural practices are already imbedded in the medium. Likewise, digital media scholars Jay Bolter and Richard Grusin define a medium as a work by remediating, and it "appropriates the techniques, forms, and social significance of other media and attempts to rival or refashion them in the name of the real" (p. 65). They also assert that a medium and a culture are necessarily indispensable. Similarly, some critical scholars and practitioners claim that

digital technologies are important media that reveal social relations. Artist and engineer Natalie Jeremijenko states that "Technologies can therefore be used to make social relations tangible. Technologies create the material conditions within which we work, and imagine ourselves and our identities."[6] In her view, culture is experienced through digital technology and designers can create tangible forms a way of exposing social relationships.

Also in references to cultural interface, Manovich (2001) mentions "texts, photographs, films, music, virtual environments" (p. 69) as cultural data in evolving relationships. He claims that digital artifacts, as cultural interfaces, not only affect the production but also "all stages of communication, including acquisition, manipulation, storage, and distribution" (p. 69). This opinion suggests that digital technology influences not only the display of the final interfaces and the effectiveness of interactive installations but also the processes of programming, the ways of storing data, and distributing installations. In other words, it sheds light on the creating, storage and distribution of a machine in addition to its utilitarian purpose of productivity. In an attempt to categorize the digital characteristics, Manovich presents numerical representations, modularity, automation, variability, and transcoding and adds a "cultural layer" to the "computer layer," both layers having mutual effects. According to Manovich, all new media objects have the following characteristics (p. 49-65):

1. They are *numerical representations* followed by mathematical and algorithmic manipulation

[6]Natalie Jeremijenko from http://tech90s.walkerart.org/nj/transcript/nj_01.html

2. They can be *modular*, or composed of smaller independent structures

3. Their *automation* (e.g., creation, iteration, reaction, manipulation, access, and storage) is based on the structure of the numerical programming and modularity

4. They continuously transform into other *variable* forms that are also influenced by numerical representation and modularity

5. They represent cultural *transcoding* as their most profound quality.

Since new media represent both human culture and computer files, Manovich (2001) refers to this composite as "a new computer culture—a blend of human and computer meanings, of traditional ways in which human culture modeled the world and the computer's own means of representing it" (p. 46). When participants experience interactive installations with both cultural and computer layers, participants can reconfigure meanings of the interfaces. According to Manovich, "we are no longer interfacing to a computer but to culture encoded in digital form" (p. 69-70). The information conveyed in digital media is already imbedded in culture. Therefore, participants perceive the interaction as an experience that contains cultural data and cultural knowledge, one that involves far more than simply navigating and controlling interactive interfaces. The same aspects are applied to interactive installations as a form of digital media.

4.3 Technology as extended body

Digital media scholars Jay Bolter and Richard Grusin (2000) introduce a double logic of remediation; immediacy and hypermediacy. "Immediacy" refers to a medium should

"disappear and leave us in the presence of the thing represented" (p. 6) and "hypermediacy" can be embedded through immediacy. According to Bolter and Grusin, immediacy conveys computational interfaces as natural devices, not arbitrary ones. In this case, participants do not recognize digital technology and perceive interfaces as s transparent canvas that pursues or enhances their actions. Digital automaticity helps these functions, which is similar to Martin Heidegger's notion of technology. Heidegger (1996) considers digital technology as an extension of human body. He compares *ready-to-hand* with *present-at-hand* and claims that we shift these experiences. For example, Dourish (2004) explains Heidegger's theory in the following way: "we encounter the world and act through it" (p. 109). In this case, the device is *ready-to-hand* (zuhanden). However, when the mouse becomes a conscious device, it becomes *present-at-hand* (vorhanden). According to Bolter and Crusin's immediacy and Heidegger's *ready-to-hand*, participants can unconsciously immerse themselves in interactions when computational interfaces are transparent media and when they embody digital automaticity. As their double logic of remediation, hypermediacy can enhance performance quality.

4.4 Changing perspectives

Digital media provide immersive and expressive environments that remediate the previous content and form of a cultural experience. Performance theorist Jon McKenzie (2001) categorizes technological performance as one type of performance because "the computer not only performs, it helps produce performances of other products and materials" (p. 11). Indeed, the developers of ubiquitous computing and digital

technology envision faster calculations, more accurate graphics, and multiple connections to other forms and materials. Recently versatile mediated interfaces with tracking technology have provided responsive environments and other possibilities for a role of an agent. Murray (1997) defines agency as "the satisfying power to take meaningful action and see the results of our decisions and choices" (p. 126). By agency, she is not referring to simple activities such as controlling a mouse or a keyboard action. Instead, she is referring to meaningful intentions, participation, and its effects. Beyond representing a mere interactive interface, interactive installations can become agents that engage in meaningful participation with results. A framework within which participants experience the epistemic, critical, and constitutive qualities of interactive installations will be investigated in Chapters 7, 8, and 9. Before introducing each quality of meaningful participation and its correlations, chapter 4 identified the role of digital media: a means of shifting the ontology of interactive installations.

Postmodern literary critic N. Katherine Hayles (1999) claims that the digital media alters the traditional concepts of our body. Reflecting the title of her book, *How We Became Posthuman*, she explains how essential differences disappear in distinctions of bodily existence and computer simulation, and cybernetic mechanisms and biological organisms. Postmodernist Donna Haraway (1985) also claims in *Cyborg Manifesto*, that the notions of mind and body, and culture and nature become mixed. In the perspective of these two authors, the post-human and cyborg become an extension of human ontology. Participants of interactive installations experience immersive and expressive digital artifacts, and computers, as marginal objects, accelerate these situations. At the same

time, these experiences can influence how one perceives computers. Instead of binary definitions (e.g., computer and human), participants can perceive computational media as another subjective being: agency. Digital media can constitute, process, and accelerate agency.

CHAPTER 5

ROOTS IN ART HISTORY

Digital art is an art genre that utilizes digital media, and interactive installation is often regarded as one type of new media art. Chapter 5 is separated from chapter 4 since we need to closely examine the historical relations and transitions in the roots of art history.

As a genre of digital media, digital art subordinates the affordances of digital media. An interface of digital art could be a marginal object through which one can experience the immersive and expressive world, a vessel that carries cultural data, or a catalyst that shifts perspectives. However, to thoroughly understand the context of interactive installations, one must also acknowledge their historical background of interactive installations, which will be investigated in this chapter (see Figure 8).

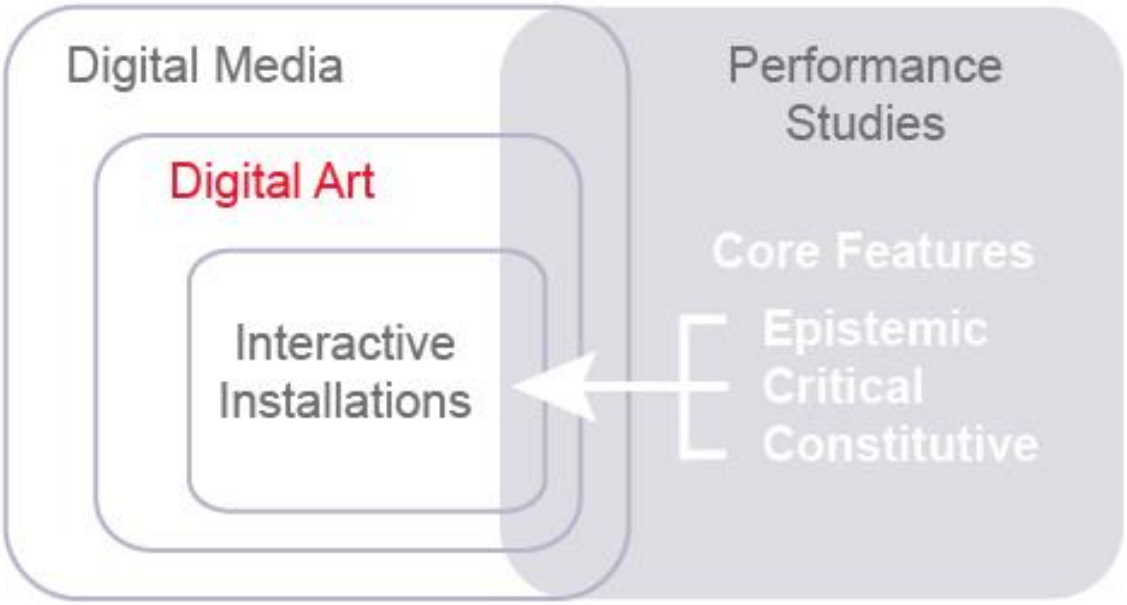


Figure 8. Interactive installations in art history

5.1 Art-related context

Digital artist Jennifer Sheridan (2007) claims that public space becomes a performance place that involves participation in digital live art. Unlike Sheridan, this thesis does not focus on public spaces in which participants and spectators coexist; instead it focuses on 1) how participants perceive interactive installations in an *art-related context* and 2) how interactive installations provide transitional environments in which they are transformed into *technological partners*. In other words, this thesis focuses on the transitional experience of how participants perceive interactive installations as technological partners in art-related contexts.

The definition and interpretation of an art-related contexts range from the physical space of an art gallery or museum to an abstract concept of life. Pioneer of the Happenings art movement, Allan Kaprow (1996), introduces the environments of a happening, which can describe the concept of art-related context broadly as follows (p. 260-266):

1) Art and life are divided by a fluid borderline.
2) The resources of concepts, materials, and their relationships relate to a place or a reference in their environments. Content and context are closely connected.
3) The concept of space where happenings take place is flexible.
4) Time is thoughtfully considered, often representing a various and discontinuous concept of time.
5) Happenings are impermanent. They perform only once.

6) All theatrical conventions, including "people, space, the particular materials and character of the environment, time," are perishable.
7) A happening is an event taking place within a certain footage of time and space.

Kaprow (1961) articulates the importance of the context of a happening as "the place of conception and enactment" (p. 85), indicating an organic, meaningful relationship between art and its environment. The importance of space is also applied to site-specific artwork. Visual artist Erica Suderburg (2000) asserts that the phrase "site specific" derives "from the delineation and examination of the site of the gallery and in relation to space unconfined by the gallery and in relationship to the spectator" (p. 4), in contrast to treating a gallery or a museum as the only site to display and appreciate artwork. The meaning of space in site-specific installations is created by spectators, not defined by the gallery/museum, because spectators understand the space with meaning of their behavior, or their interaction within the space. In site-specific work, content can become site and site can become content. Its content should be understood in its context. Interactive installations create an art-related context, which is not limited to a traditional gallery or museum but open to transitional sites: any place can be transformed into a space in which participants appreciate, interact, or experience artwork. The transitional place could include an art festival, an artwork demo space, or indoor and outdoor gallery/museum spaces, but it differs from spaces of mundane everyday life.

5.2 Definition of digital art

Art critic Christiane Paul (2003, 2008) notes that digital art is a fluid term, citing the numerous changes in the names for technological art. Since the 1970s, digital art has been referred to as "computer art" and then "multimedia art; at the end of the twentieth century, it became "digital art," and took its place under the term "media art," which curator Michael Rush (2005) refers to as digital art. Paul (2003) examines the vagueness of *newness*, which represents an ambiguous distinction between an old medium and the new one, caused by continuously changing standards regarding the definition of "new."

With a common standard of digital art based on computational systems, Paul (2008) states that digital media are usually understood as "art exploring biotechnology and genetic engineering, which often incorporates digital technology in certain stages of its production or for its presentation" (p. 3-4). She exemplifies digital art as "film/video, sound art, and various hybrid forms" (p. 3) and claims that the art has made a transition from analog to digital media. With the technological development of digital tools (the so-called "digital revolution), Paul, categorizing digital technologies as tools and media, claims that artists sometimes utilize digital technology as a tool to create traditional artwork and sometimes as a medium to integrate digital forms into artwork as digital artifacts.

As her example of digital art, in 1968, American artist Charles Csuri created a wooden sculpture driven by computational functions and repetition of its iterations (see Figure 9). Although the final art form is a wooden sculpture, the process of digital technology was

used to create it. In Paul's broad definition of digital art, traditional art objects utilizing digital technology in various processes such as digital prints, 3D-printed sculptures, and digitized photographs become digital art.

Figure 9. Charles Csuri, *Sculpture Graphic/Three Dimensional Surface* (1968)

In this case, digital technology is used as a tool to create, manipulate, and produce the digital work. However, digital technology as a medium is distinct from digital technology as a tool in that digital technology as a medium can display, interact, express, and communicate with participants.

With regard to digital technology as a tool and a medium, theorist in cultural studies David Bell et al. (2003), similar to Paul, defines "the term 'digital art' [as] the use of digital technology, such as computers, to produce or exhibit art forms, whether written, visual, aural—or, as is increasingly the case, in multimedia hybrid forms" (p. 48). Producing and exhibiting art forms includes the concept of digital technology as a tool to create artwork and as a medium to display artwork. Therefore, the perspectives of Paul and Bell render any definition comprised of a specific term for digital art obscure.

Due to the vagueness, instead of defining digital art in one specific term, scholars and practitioners often assign it to categories according to its features. In his on-line article "Why Have There Been No Great New Artists?," digital artist Steve Dietz (2000) assigns distinctive the characteristics of interactivity, connectivity, and computability to the new medium from ten categories: "new art, storytelling, socio-cultural, biographical, tools, performance, analog-hybrid, interactive art, interfaces + artificers"[7]. Compared to Dietz, founder of the Rhizome Mark Tribe, and Reena Jana (2006) categorize digital art in terms of media relations and technological novelty as an intersection of *Art and Technology* and *Media Art.* They provide examples of new media art such as interactive multimedia installations, virtual reality environments, and web-based art, all of which incorporate digital technology. In their categories, *Art and Technology* employs new technologies, but not necessarily media-related technology such as electronic art, robotic art, and genomic art. *Media art* embraces artwork utilizing media technologies commonly used in media since 1990, such as experimental film, video art, and transmission art.

As another characteristics, art theorist Michael Rush (2005) introduces the term "interactive" as "the most inclusive term to describe the type of art of the digital age" (p. 183). In his book *New Media in Art*, he categorizes digital art into digitally altered photography, art of the Internet, computer art, interactive digital art, and virtual reality. Interactive web-based art holds the concept of interactivity; however, the differences between interactive web-based art (i.e., net.art or Internet art) and interactive installations

[7] http://www.walkerart.org/gallery9/webwalker/

are their interfaces and platforms. Even though net.art or Internet art has certain levels of interactivity in their medium, the Internet, their platforms are usually confined to the World Wide Web pages and limited to the digital platform related to interactive installations.

Guided by the definitions provided by digital art theorists, this thesis summarizes digital art as successive art conventions forming a new art genre. To clarify, although the metaphor of digital technology as tool is generally accepted by other digital art theorist, this thesis excludes digital technology as a tool in which artists manipulate or re-touch a traditional art piece with a special digital technique. It also excludes digital print, digital photography, or digital sculpture in digital art. Its perspective of digital art is not as a tool, but as a digitally remediated physical medium with epistemic, critical, and constitutive features.

5.3 Background: perspective shifting from object to concept, event, experience, and participation

New media art theorist Charlie Gere (2008) examines the works of Futurists, the Surrealists, Dada, Naum Gabo, Marcel Duchamp, Alexander Calder, and Laszlo Moholy-Nagy influence new media art. Similarly, Paul (2003) claimed that digital art movements were influenced by previous art movements that focused on "concept, event, and audience participation, as opposed to unified material objects" (p. 11).

Dada emerged after World War 1 (1914-1918) with the tragic losses of human lives and the degradation of the social structure. Dadaists created poems with random words or constructed artwork with random visual elements. Later in 1961, the intersection between the literature and mathematics of Dadaism developed experimental works such as *OULIPO*. Since Allan Kaprow first coined the term "Happening," an early platform of performance arts, several happening events involved active audience participation in the 1950s and the 1960s. For example, one of the pioneers of Happenings, John Cage,

Figure 10. David Tudor performs John Cage's 4'33" (1952) in 2006

conducted his experimental sound performance, the silent piece *4'33"* (1952) (Figure 10), and Kaprow created a happening performance, *18 Happenings in 6 Parts* (1959) (Figure 11). In *4'33"*, American experimental composer John Cage does not play an

Figure 11. Allan Kaprow, *18 Happenings in 6 Part*s (1959)

instrument during his performance, but creates silence for 4 minutes and 33 seconds. His performance presents the transition from environmental sound to performance art.

Kaprow's *18 Happenings in 6 Parts* consists of three happenings in six parts and each performance piece representing a nonlinear narrative. The performance space is constructed with translucent plastic sheets covered by Kaprow's early painting, and audiences watch the performance pieces, each of which is comprised of sequences of behaviors that are not set by exact plots and time compositions, so the performance is impermanent. As seen by their definitions and examples, both Happenings and Dadaism represent the importance of concept and event.

At the similar time, the Fluxus group was involved in movements of the 1950s and the 1960s when artists not only directed their interest to experimental digital technologies such as lasers, lights, video, electronics, and digital television and their possibilities, but also focused on transitions from objects to situation such as process and interaction. The concepts of flexible time and space, events, and audience's participation continued to develop in the performance arts in the 1960s and the 1970s. In *Cut Piece* (1964), performance artist Yoko Ono wears a black suit on the stage with scissors next to her (see Figure 12). Audience members are asked to cut small pieces of her suit and take them

Figure 12. Yoko Ono, *Cut Piece* (1964)

away. The performance ends when nothing more can be cut, or when she decides that the performance has ended. By bestowing audience members with the power to control the

performance, which could lead to a dangerous or critical situation, *Cut Piece* strongly conveys the concept of participation based on mutual trust between the artist and the audience.

In another example of performance art as an experience, Chris Burden's *Shoot* (1971), Burden is shot in his left arm by an assistant from five meters away with a twenty two caliber long rifle (see Figure 13). Burden called a group of friends into a gallery to watch the performance. For him, the conceptual knowledge of being shot is not same as the physical experience, but performance. From this impermanent event, the situation of fearful tension between the performer and the shooter in this performance created a strongly tangible experience.

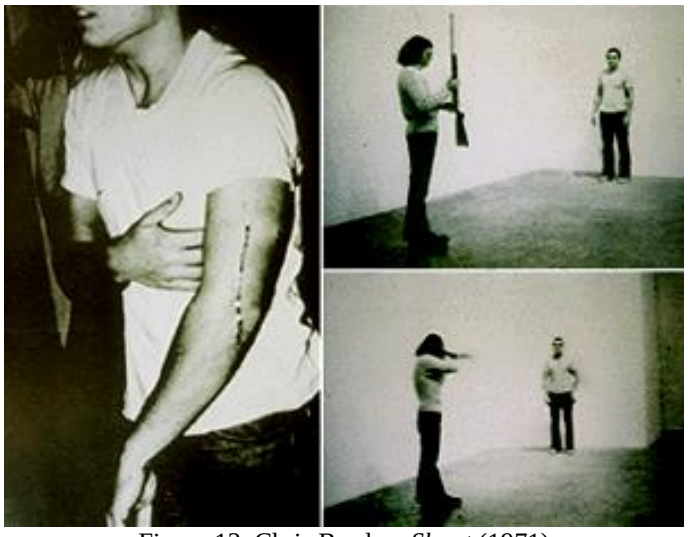


Figure 13. Chris Burden, *Shoot* (1971)

The importance of these attempts is the shift from interest in an object in an art gallery or museum to interest in the concept, the event, the experience, and participation. To demonstrate the active value of participation, art historian Grant Kester (2005) has researched interdisciplinary projects that integrate participatory properties into political

issues in an effort to foster discussion and acknowledgement of social issues among a broader audience. He discusses the participatory social project, *Intervention to Aid Drug-Addicted Women* (1994) by the Austrian arts collective *WochenKlausur*. This event gathered politicians, journalists, sex workers, and activists to discuss drug policy during a three-hour cruise on Lake Zurich. The purpose of the event was to convene related social groups with varying interests in one place to address social issues. Participation in this event becomes a process of finding solutions to society's issues. This is a shift to dynamic action or lived environment, but it does not reconfigure the space with physical and digital interfaces. Kester emphasizes the power of participation and activity for social issues, however the context between what Kester explains and what participants experience in interactive installations are distinctively different.

From a similar political perspective, artist Hans Haacke's conceptual art, *Moma Poll* asked audiences to vote on a current socio-political issue exhibited at the Museum of Modern Art (MOMA) (see Figure 14). His question was "Would the fact that Governor Rockefeller has not denounced President Nixon's Indochina Policy be a reason for your not voting for him in November?" Visitors were asked to deposit their answers in two at the transparent boxes, and when the answers were tallied at end of the exhibition, respondents cast twice as many "Yes" ballots as "No" ballots. At that time, New York

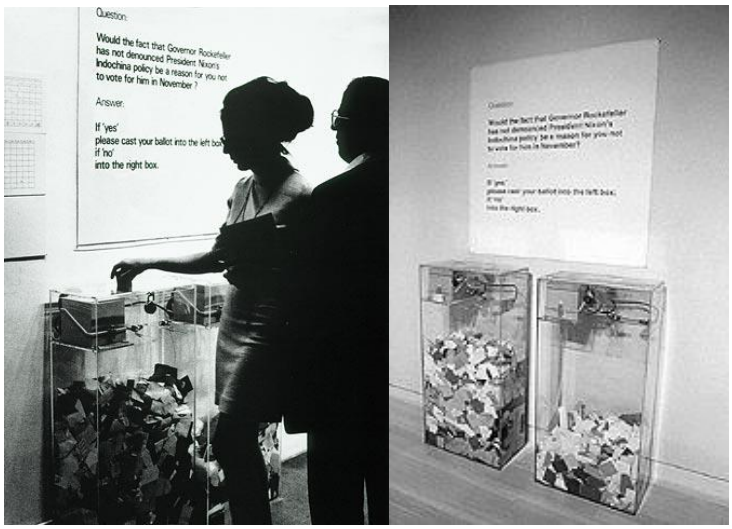


Figure 14. Hans Haacke, *Moma Poll* (1970)

Governor Nelson Rockefeller, a board member of MOMA, planned to run for the U.S. presidency. Haacke's art project urged participants to express their social and political opinions within the work of art, a project whose completion depended upon the active participation of the audience. Through this process, audiences transformed from opinion holders to opinion presenters. Dadaism, Happenings, Fluxus, and other performance art represent the impact of previous art movements as a background of interactive installations: shifting the focus from the object in a museum or gallery to the concept, the event, the experience, and audience participation.

5.4 Influence of digital technologies on digital art

With the conceptual impact of previous art movements, digital technology has directly influenced digital art. As an example of early interactive art, artist Marcel Duchamp and Man Ray created a motorized installation, *Rotary Glass Plates (Precision Optics [in motion])* (see Figure 15). After turning on the motor, a viewer needs to stand at a certain distance to see the illusions of five glass panels in a row. Although the interaction and its

technology are limited, this work shows the participants can enter an optical and enchanted experience through interaction with the installation.

Figure 15. Duchamp, Rotaty Glass Plates (Precision Optics [in motion]) (1920)

According to Duchamp, appreciating art is intrinsically interactive. Duchamp (1957) states that the "creative act is not performed by the artist alone; the spectator brings the work in contact with the external world by deciphering and interpreting its inner qualifications and thus adds his contribution to the creative act" (p. 78). Although Duchamp anticipates all artwork as an open-ended platform that viewers must complete, his notion of interaction did not denote an active meaning of physical interaction, but mostly an abstract meaning of interaction. That is, it denotes abstract and cognitive interactions such as interpreting, understanding, touching, or sympathizing. However, the term "interaction" in the thesis refers to physical interactions with body movements. The next section explains how computational interfaces execute a procedural interaction, and then it identifies how they influence the concept of time and space. Finally, it continues by examining how they change the idea of the traditional concept of the subject.

5.4.1 Computational interface

In his examination of interactive installations as expressive computational forms, educator in theatre and film studies David Saltz (1997) explains the procedures of interaction. He generally asserts that interactive work involves the following process:

1) "A sensing or input device translates certain aspects of a person's behavior into digital form that a computer can understand.
2) The computer outputs data that systematically relates to the input (i.e., the input affects the output).
3) The output data are translated back into real world phenomena that people can perceive" (Saltz 1997, p. 118).

An overview of the process reveals how interactive installation receives input data from participants and generates digital or physical outputs that integrate the physical world. Although he does not mention the scale of the interfaces, he focuses on processes of how participants can manipulate, interfere, or interact with physical interfaces that are digitally and computationally intervened.

Features of digital technology create interfaces that represent a technological partner of participants; that is, they form a partnership. Chapter 4 discussed detailed digital technology features introduced by Murray, Manoviche, and Bolter and Grousin. With regard to the features of physical interface, because of ubiquitous and physical computing technologies, we can build various computational interfaces, sometimes on a large scale,

to trigger participants' full body interactions. Instead of the Cartesian dualism of mind and body as *I think, therefore I am,* phenomenological philosopher Maurice Merleau-Ponty (1962) claims that the body is tied to the mind. From the perspective of Merleau-Ponty, full-body interactions can draw out the unique qualities of physical and emotional transitions from participants during their interactions with a work of art. In the framework of interactive installations, an epistemic quality of performance (Chapter 7) will further explain physical and emotional engagement involving body movements.

5.4.2 Perceived time and space

While expanding the concepts of movements such as Dadaism, Fluxus, and conceptual art in the early age of new media art, the movement of new media art embraced new forms in the 1970s when artists used new technology (e.g., radio, TV, video, and satellites) to experiment with live performance and interactions over the networks. Initially, in 1932, German theater practitioner Bertolt Brecht (1932) discussed radio as a communication tool when he said that the "radio would be the finest possible communication apparatus in public life, a vast network of pipes" (p. 52). In 1971, artist Douglas David produced the first participatory live telecast, *Electronic Hokkadim*, supported by the gallery and broadcast television media. Five years later, in 1976, he developed the first artwork using the satellite *Seven Thoughts*, which is limited to one-directional transmission.

In 1977 artist Keith Sonnier and Liza Bear organized a collaborative performance, *Send/Receive Satellite Network*, between artists in New York and San Francisco. The

performance introduced the first two-way directional satellite broadcast work of art (Figure 16). Indeed, two-way directional communications can change the subject of control. This movement served as motivation for painters, photographers, video/audio artists, and performance artists to incorporate digital effects throughout the 1970s and the 1980s with the development of the personal computer.

Figure 16. Dancer Nancy Lewis, left, at the Battery City Park Landfill, New York, interacting via CTS satellite with dancer Margaret Fisher in San Francisco. (1977)

Describing this situation, Paul (2003) said, "During this period, digital art evolved into multiple strands of practice, ranging from more object-oriented work to pieces that incorporated dynamic and interactive aspects and constituted a process-oriented virtual object" (p. 21). In 1994, the Netscape Corporation released the first commercial web browser, at this time cyber space became an accessible and affordable medium in which one could develop the concept of telepresence.

Network systems are also employed in surveillance technology. However, earlier artwork of surveillance was mostly based on one-directional communication using close-loop video. For example, Bruce Nauman produced *Video Surveillance Piece: Public*

Room and Private Room (1969-1970) and *Live Taped Video Corridor* (1970) (Figure 17) using a surveillance camera and video. In his work, audiences sometimes

Figure 17. Bruce Nauman, left: *Video Surveillance Piece: Public Room and Private Room* (1969-1970), right: *Live Taped Video Corridor* (1970)

observe the behaviors of people in the next room through a surveillance camera and a monitor and watch themselves at other angles. Artwork using surveillance technology enables audiences to reconsider the boundary between private and public spaces and tensions between watching and being observed. Later with digital technology, audiences can control time and space, which is not rigidly linear, but perceived as nonlinear or forking passages.

5.4.3 Traditional relationship between subject shifting and emergent systems

Through perceived time and space, various paths can emerge, converge, or influence one another. Some artists expand the boundaries of telepresence and network to include animals, plants, and robots into their telematics interaction. For example, artist Nam June Paik and Shuya Abe created the first artistic robot, Robot K456 (1965) with 20-channel radio control and a 10-channel data recorder, which is an anthropomorphic automatic

recorder. They set up performance art in which Robot K456 is hit by a taxicab in New York. Paik referred to this staged car accident as The First Accident of the 21st Century (Figure 18). Similar to work of Paik and Abe,

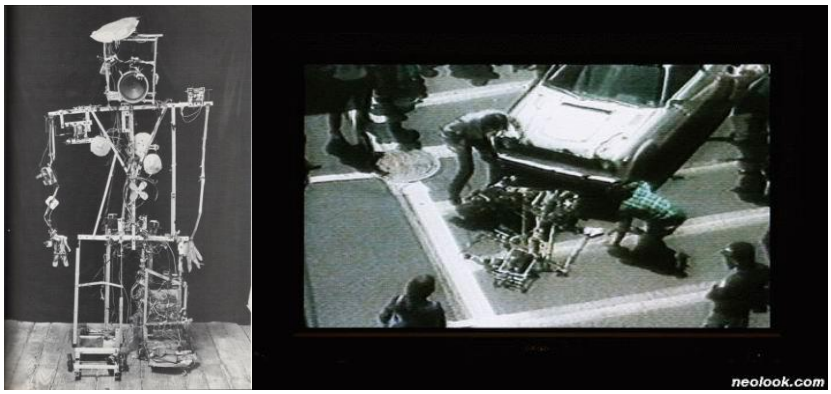


Figure 18. Nam June Paik and Shuya Abe,
left: *Robot K456* (1965), right: *The First Accident of the 21st Century* (1966)

Stelarc also uses mechanical parts in his performance; however, Stelarc typically incorporates his body into performance. He created a robotic arm, the Third Hand (1981) and a gigantic six-legged walking machine, Exoskeleton (1998) (Figure 19). Both are connected to his own body parts so that he can control it. The Third Hand is controlled by the electrical signals of his abdominal and leg muscles (EMG) and Exoskeleton by changes in his arm movements.

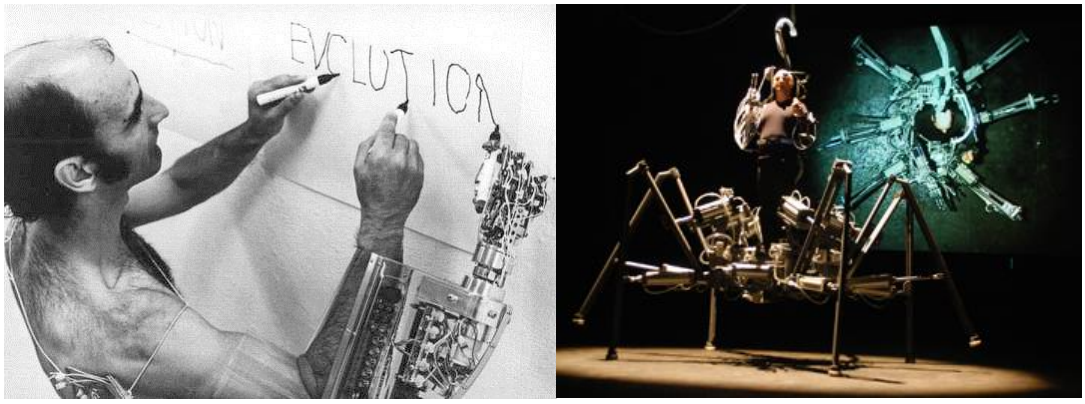


Figure 19. Stelarc, left: The Third Hand (1981), right: Exoskeleton (1998)

Another example of art that uses emergent systems on other entities is bio art. Artist Eduardo Kac experimented with several works of art using animals, insects, and bacteria. For example, Genesis (1999) is a work of bio art using live bacteria. Audience members can turn on an ultraviolet light on the installation to mutate the DNA code of the bacteria locally on the site or remotely over the Internet. One year later, he developed GFP Bunny (2000) project (Figure 20), which is a living green rabbit. He injected a rabbit zygote and a green fluorescent gene to change a rabbit's original color. With controversial questions regarding ethics and the definition of art, emergent systems from technological developments expand the boundaries of new media art. With the

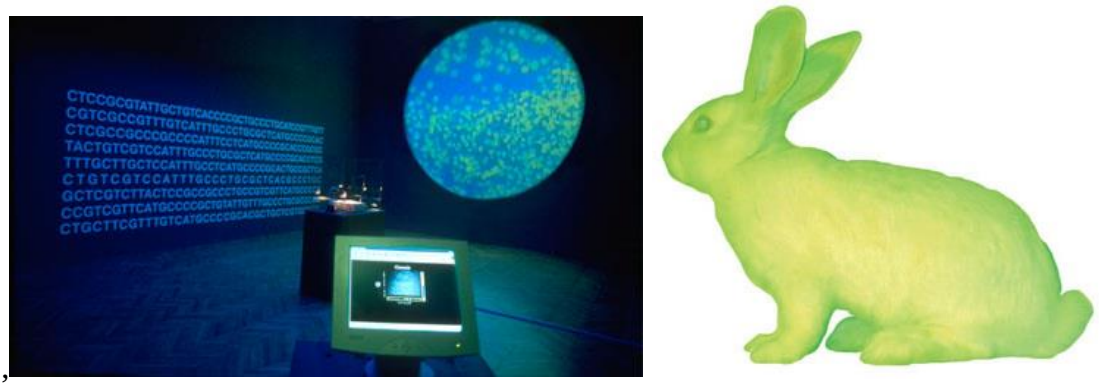


Figure 20. Eduardo Kac, left: *Genesis* (1999), right: *Bunny* (2000)

development of digital technology, all above examples have transformed an entity such as a machine, a robot, or an animal into another level of agency.

5.4.4 Relationship shift in interactive installations

From the previous chapter, we acknowledged how previous art movements and digital technology have influenced digital art. This section specifies the impact of historical digital media on interactive installations in terms of relationships among artists, audiences, and artwork. German digital media scholar Roberto Simanowski (2011)

defined interactive art as that in which "the viewer becomes some part of the work of art and participates in its creation" (p. 120). This definition differs from that in which the relationship among the classic notion of artist, viewer, and art object is one that is "viewed [as] a static object on which an artist had bestowed meaning" (p. 120). From Simanowski's perspective, when interactive art encourages or requires the audience to complete it, the classic relationship of a triad becomes blurred. Also emphasizing the impact of digital technologies and interactive media, Paul (2003) explains how both have challenged the traditional relationship among the artist, the audience, and a work of art. She explains new notions of artist, audience, and artwork in the following quote:

> Rather than being the sole 'creator' of a work of art, the artist often plays the role of a mediator or facilitator for audiences interaction with and contribution to the artwork… "The public or audience becomes a participant in the work, reassembling the textual, visual, and aural components of the project...The artwork is often transformed into an open structure in process that relies on a constant flux of information and engages the viewer/participant in the way a performance might do (Paul, 2003, p. 21-22).

Author of *New Media in Art*, Michael Rush (2005) specifically emphasizes interactivity in an art scene that produces transitions from viewers to "participants, players, and users" (p. 222). Since digital technology transforms viewers into participants who are physically involved in an interaction, the role of new media art shifts the triadic relationship to a blurred one among artist, audience, and art piece.

In Chapters 4 and 5, digital media and digital art provide fundamental platforms and contexts. Drawing from their backgrounds, Chapter 6 will introduce an overview of performance studies to examine the epistemic, critical, and constitutive features of interactive installations.

CHAPTER 6

OVERVIEW OF PERFORMANCE STUDIES

Chapter 6 presents a brief overview of performance studies. An examination of the three aspects of interactive installations as performance relies on a more thorough understanding of the historical contexts of performance studies. In the past, computational media have used theater and performance as references. HCI researcher Brenda Laurel (1993) projected Aristotle's elements of structure in drama onto computational media. She theorized that both human and computer agents interact as characters and collaborators. Such expanded performance theory presents a dramatic event as an alternative to the notion of a traditional task. Interactive installations, which step beyond Laurel's comparison of computers with traditional theater-based performances, extend cognitive and physical interaction beyond the two-dimensional computer screen into three-dimensional physical space, offering new experiences and new forms of engagement.

Influenced by Laurel, HCI researcher Giulio Jacucci (2004) adapts mixed media that employ digital and physical artifacts. He claims that mixed media can lead to the experiential, presentational, and representational interaction of participants (see Table 1). In his view, participants use body movements and mixed artifacts to reconfigure space during an expressive event. His position is relevant to the arguments presented in this thesis in terms of transition and space reconfiguration. Computational media heavily

feature various realizations of the kind of mixed-reality performances that include robotics, video games, telematic techniques, and online communication. However, the combination of performance and art-related context calls for more critical attention.

Table 1. The contribution of the performance perspective to a wider Interaction Design Program (Jacucci, 2004, p. 17)

General human-computer interaction tenets	Performance applied to physical interfaces
Task, timeless, universal, general	Event, contingent, ephemeral, unique
Recognition, accountability	Perception, sense experience
Usability, accountability	Expression
Behavior	Individual's expressivity
Supporting the creation of a product	Supporting the staging of a process
Users, consumers, administrators	Participants, directors, performers
Personalizing, view of computer artefact	Configuring, actor's view
Sensing system	Sensing humans
Measuring simulating space	Configuring performing space
Tracking movements, objects	Amplifying movements, augmenting objects
Recognizing, sensing situations	Staging, configuring situations
Eliminating secondary tasks	Amplifying action and communication

Distinct from Jacucci (2004), others focus on more situated experience. For example, HCI researchers, Benford et al. (2009), explore how the computational media field can be extended through artistic interfaces. Similarly, Reeves et al. (2005) examine public space such as museums, galleries, theaters, city streets, demo floors, and even clubs—wherever artistic, cultural, and entertainment applications are used. While Jacucci and Benford et al. envision user experiences as transitional moments, Reeves et al. focus on the transitional spectator's experience as separate from the performer's interaction and the way in which public space accelerates the transitional spectator's experience. Although all three explain the reconfiguration of subject, object, and space in interaction, the relationship between humans and artifacts still remains undefined. To clarify the relationship, this thesis identifies the relationship as performance and interactive installations as technological performers. To support this claim that performance in

digital art, particularly in interactive installations, is important, one must acknowledge the need for a fundamental examination of performance studies. This chapter traces a brief history of performance studies and narrows down the scope of performance within the claims of this thesis.

6.1 Brief overview of performance studies

Chapter 6 presents a brief overview of performance studies, a scholarly field of study that evolved out of two main perspectives: anthropological performance and communication mode. These two fields also include other versatile applications and forms that can be applied to this history. Then, the chapter continues to review other perspectives that are not included in the two main fields.

6.1.1 Anthropological perspective

Unlike the traditional perspective in Aristotle's *Poetics* in which theatrical performance does not reflect our life, the anthropological perspective respects an individual's own background and expressions. Representing the anthropological tier, performance scholar Richard Schechner (1988) describes performance as an umbrella term containing multiple spheres of rituals and dramatic expressions from shamanistic rituals to everyday life behavior. In his broad concept of performance, performance equals actions. That is, performance is regarded as a set of behaviors, not objects. He places performance within the realm of "liveness," a quality that he considers the center of performance studies. Performance scholar Philip Auslander (1999) emphasizes the parallel power of "liveness" and mediatized performance in cultural and economic values. In contrast to the

traditional assumption that "liveness" leads to mediatized performance, Auslander asserts that both contribute to cultural-economic value. Although this thesis adheres to most of Schechner's perspective of performance, the quality of "liveness" is less important than his other anthropological perspectives in the thesis. Since the main subject of this thesis is interactive installations, the level of computation in interaction installations is immediate, but the input or the outcome of interaction does not need to be produced in real time presenting the quality of "liveness."

Indeed, Schechner has played a great role in expanding performance studies, to include various human activities such as plays, rituals, sports, speech, theater, and games. As one of pioneers in performance studies, he has actively contributed to the field. He is an author of *Performance Studies: An Introduction* (2002) and an editor of *TDR: The Journal of Performance Studies*. Because of his practical and theoretical background, he claims that the relationship between performance theories and practice is indispensable. Schechner (2002) posits two broad genres of performance studies in academia: New York University (NYU) and Northwestern University (NU). Unlike performance studies at NYU, which originated in "theatre, the social sciences, feminist and queer studies, postcolonial studies, post-structuralism, and experimental performance," performance studies at NU is rooted in "oral interpretation, communications, speech-act theory, and ethnography" (p. 5). Performance theorist Barbara Kirshenblatt-Gimblett (1999) explains the differences between the directions of performance studies at NYU and NU. First, performance studies at NYU originates in a drama department, yet NU transits from oral interpretation into performance studies. Second, while Schechner (2002) regards the

various kinds of performances at NYU as horizontal relationships, he sees those at NU as vertical relationships in which the performance of literature is a precedent and others are vertical sub-units. However, the two genres influence one another and share a common belief: "an expanded vision of 'performance' and 'performativity'"(p. 5). Although Schechner does not clearly articulate the two terms of performance and performativity, in his book *Performance Studies: An Introduction,* they distinctively differ. Performativity does not mean performance-like or something similar to performance but instead conveys the initiating power of action. This thesis will investigate the terms "performativity" in Chapter 9 as it relates to Judith Butler's perspective, in which gender identity is a performative and constitutive quality. Then it will explain how interactive installations as performance constitute actions.

Schechner claims that the definition of performance is inclusive, so he visually configures the definition of performance in a fan figure and a more dynamic web figure (Figure 21). In the fan figure, he places the ethological term "ritualization" at one end, the social relations of "rites and ceremonies" at the other end, and "performance in everyday life, sports, entertainments" in the middle. In the web figure, he places his practical "contemporary environmental theater" in the middle and historical events and speculative perceptions and dramatic performances side by side. His performance

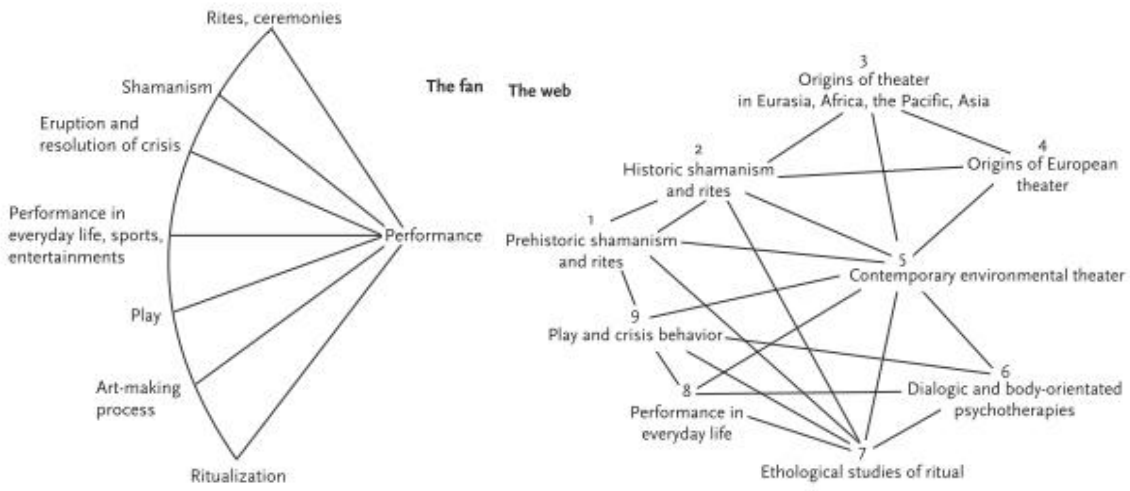


Figure 21. The fan and the web (Schechner 2003)

category includes activities related to "1) a special ordering of time; 2) a special value attached to objects; 3) non-productivity in terms of goods; and 4) rules…often special places non—ordinary places—are set aside or constructed to perform these activities in" (p. 8). Within these activities, performance includes ritual performance, plays, art making, sports, and entertainment and they are above mere theoretical performance. Although these forms of performance differ depending on their rules, the differences can create interdependent relationships within obscure borders. Kirshenblatt-Gimblett (1999) also agrees with Schechner, stating that the field of "performance studies is more than the sum of its inclusions"(p. 43). For example, unlike the play (volunteering activities), performance often has strict rules in ritual ceremonies, which are rigid because they are constructed by a community or a society within a larger context, not by individuals. Schechner places the restriction of rules in games, sports, and theater between two ends: play and ritual. Although rules are applied to these activities at difference levels, he emphasizes the context in which these activities take place; and the meaning and the degree of rules can be assimilated or altered by the context. This thesis also regards

context as an important scenario in which participants' engagement influences interfaces since both their emotional and physical involvement (the performer's side) and the meaning of interfaces (installation's side) can be affected. Therefore, the interactive installations are not mere objects, but active performers to influence interactions. These transitions will be discussed through three aspects—epistemic, critical, and constitutive—in framework.

The thesis title, interactive installations as performance, originates from Schechner's term, "as performance." Schechner (2002) states that a "performance studies scholar examines texts, architecture, visual arts, or any other item or artifact of art or culture not in themselves, but as players in ongoing relationships, that is, 'as' performances" (p. 2). Since the term "performance" in this thesis is not limited within a certain theatrical stage, but it is applied to an art-related setup, the scope of performance should embrace activities that we can acknowledge "as" performance. In Section 6.2, discussions of the scope of performance will be continued.

Schechner includes ritual ceremonies and everyday behaviors among others in performance (Figure 26). A ritual ceremony is an overlapping area between theatrical performance and anthropology. Anthropologist Victor Turner (1969) specifies social drama as an on-going flow with theatrical terminology in which people continuously experience rites of transitional passage. Turner (1979) develops the concept of liminality from the rite of passage originally used by anthropologist van Gennep. According to van Gennep's theory, liminal rites are indicators that show transitions of sociocultural states,

and they are performed upon life crises, which are important transitions in life. They occur in three stages. The first is "separation (from ordinary social life)" (p. 466), and in the middle is "margin or limen (meaning threshold), when the subjects of ritual fall into a limbo between their past and present modes of daily existence" (p. 466). The last is "re-aggregation, when [subjects] are ritually returned to secular or mundane life—either at a higher status level or in an altered state of consciousness or social being" (p. 467). Turner expands the concept of "liminality" as "literally 'being-on-a threshold,' [meaning it is] a state or process which is betwixt-and-between the normal, day-to-day cultural and social states and processes of getting and spending, preserving law and order, and registering structural status" (p. 465). In Turner's explanation, "liminality" relates to a process in which new social roles are initiated, so people fundamentally exhibit corresponding behaviors in its social stage. How people determine their behaviors from a reflection of corresponding social stages will be further discussed in Chapter 9 as a constitutive quality of performance.

Turner's liminality, which is an in-between state, can be used to explain the new roles of audience members in digital art. In contrast to traditional art, the performance stance of digital art often does not provide specific guidelines to audiences. Instead, it bestows the power of control to the audience in the form of a question. The question is rhetorical, but since the constitutive interaction is up to users who interact within an ambiguous condition, these users become both interactive creators and interpreters within their social and cultural backgrounds. Bill Gaver et al. (2003) claim that users can enjoy voluntary interaction and often obtain a deeper level of understanding of the system through

ambiguous interactions. In addition, an anthropological view of performance expands the perspective to emerging applications based on our everyday lives and beyond. For example, performance studies theorists Sheron Dailey and Dwight Conquergood (1998) add that not only can individuals' unique sociocultural backgrounds stimulate performance, but performance can also influence their sociocultural experience. Because culture is not a rigid reference but an active term in performance studies, the theoretical framework that incorporates performance studies into research can strengthen the role of researchers as cultural producers through the adaptation of a dynamic cultural framework. Expanding the theories of Dailey and Conquergood to social interactions, Goffman claims that our identity is not independent, but instead, it constantly flows while interacting with other identities.

While Turner investigates ritual ceremonies in a theatrical paradigm, anthropologist Erving Goffman has a view of dramaturgical analysis on everyday life. In his book, *The Presentation of Self in Everyday Life* (1959), Goffman claims everyday social interactions are staged settings and individuals present themselves in settings in everyday life. He uses the term "performance" for "all the activity of an individual which occurs during a period marked by his continuous presence before a particular set of observers and which has some influence on the observers" (p. 22). Goffman claims humans as active individuals performing and analyzing face-to-face social interactions from theatrical terminology. Goffman specifies his own direction of performance as everyday life; however, it still remains on the boundary of Schechner's performance (Figure 26). In his direction of performance, Goffman identifies theatrical terminologies such as

audience, setting, and stage to explain everyday social interactions.

For example, he separates the front region from the back, the front region referring to "the place where the performance is given" (p. 107) and back region to "where the suppressed facts make an appearance" (p. 112). It is similar to the concept of the theater's front stage, on which performers show off in front of audience members and privately spend time in back stage. As the front and back stage may take place side by side, individuals can play characters in front stage and briefly express true themselves in backstage. The front stage includes the term "setting," meaning "the scenery and stage props for the spate of human action played out before, within, or upon it" (p. 22). Goffman differentiates "setting" from "personal front"; "setting" refers to background items or physical layout that can be changed or altered in the front stage; "personal front" signifies facial expressions, body gestures, sex, gender, or speech patterns that performers possess. A portion of the "personal front," such as eye color, is intrinsic, or "relatively fixed." Other aspects, such as non-verbal language (e.g., gestures) are "relatively transitory." Since they can change or disguise their behaviors, they can delude audience members during their performance in front stage. In contrast to the "cynical person," who refers to the individual as having "no belief in his own act and no ultimate concern with the beliefs of his audience," the "sincere person" refers to those "who believe in the impression fostered by their own performance" (p. 18). Therefore, cynical performers can manipulate their performance and misguide audience members or other performers. In these situations, performers sometimes consider their own interest, called "self-interest," but they sometimes consider the audiences' or communities' interests.

In this thesis, the concept of the space in which participants experience interactive installations in art-related context is very specific. The "frame" signifies the context, and installations are framed as art objects by virtue of their being framed in an art-related context. A "setting" consists of interactive installations and participants with a "personal front" that interacts with them in the "front stage." Participants initiate and terminate interaction. Since participants have different levels of engagement with the "personal front," interactive installations require certain standards within a theoretical framework to categorize its qualities, which will be discussed in Chapters 7, 8, and 9.

6.1.2 Communication

Performance and communication have a history of almost two thousand years. In *The Poetics* and *The Rhetoric*, Aristotle introduced strategies that persuaded audiences through oration and poetry in both the theater and the council. Communication is a part of social interaction in a broad sense, thus Goffman's theory (everyday social interaction is performance) can be applied to models of communication. However, communication focuses on how information is altered, edited, or delivered not by the direct interpretation of a theatrical paradigm. Communication theorist James Carey (1988) separates two different models of communication: the transmission model of communication and the ritual model of communication. The former refers to "a process whereby messages are transmitted and distributed in space for the control of distance and people" (p. 16). The latter is related to the geographical distance. Carey makes an example of telegraphy as a means of communication to spread democracy over the United States to overcome geographic obstacles across a vast continent. The transmission model of communication

are described by terms such as "sending," "transmitting," or "giving information to others" (p. 15). In contrast to the transmission model of communication across the physical geographic distance, the ritual view of communication is defined by terms such as "sharing," "participation," "association," "fellowship," and "the possession of a common faith" (p. 18). The ritual model of communication does not focus on delivering messages in physical space, but instead on sharing faiths in society, which means "not the act of imparting information but the representation of shared beliefs" (18). He uses reading the newspaper as an example of the ritual model of communication:

> News reading, and writing, is a ritual act and moreover a dramatic one. What is arrayed before the reader is not pure information-but a portrayal of the contending forces in the world. Moreover, as readers make their way through the paper, they engage in a continual shift of roles or of dramatic focus…the role of presentation and involvement in the structuring of the reader's life and time…Under a ritual view, then, news is not information but drama. It does not describe the world but portrays an arena of dramatic forces and action; it exists solely in historical time; and it invites our participation on the basis of out assuming, often vicariously, social roles within it (Carey 1988, p. 20-21).

In the ritual model of communication, the term "communication" embraces the meaning of identities, cultures, and relationships. While reconstructing meaning in space and time is performance, the context of interactive installations is critical. Audiences can interpret original meanings from artists in a variety of contexts depending on space and time.

Goffman terms "setting" and "personal front" also reflect the situation that Carey mentions. In other words, the results of interactions can vary not only in different "settings" but also in "personal fronts." Projects and experiments in Chapter 10 will explain how "setting," "personal front," and individual conditions influence the results of interaction. To understand the process of such interactions, anthropologist Richard Bauman elaborates on performance as a communicative form.

On the communication-driven side of performance, Bauman (1992) has five claims about communication:

1. The most basic and definitive claim about communication is that it represents "the 'ways in which information, ideas, and attitudes pass among individuals, groups, nations, and generations'…is socially constituted" (xiii). Communication is basically exchanging information with each other, and Bauman emphasizes the social context in which people exchange information.
2. The second claim is that communication represents expressive forms of a culture; it shows a mutual relationship between communication and culture. Communication is rooted in culture, and culture fosters communication.
3. Communication constitutes social resources and social practices, "ways of speaking, dressing, dancing, playing music, and so on" (xiv). For Bauman, performance is not only a sum of activities but also a way of forming or transforming life.
4. Social resources and practices do not have equal value in, for example, high culture, elite culture, fine arts, folk arts, or popular culture. They also have

different accessibility and preference to members of society because they have different values in social and cultural contexts.

5. According to Goffman and Carey, culture is not rigid. It is continuously in influx and efflux. Therefore, communicative forms and social practices are cross-culturally fluid. Through these five claims, how individuals decontextualize and recontextualize the meaning in their social lives is a process of communication.

In his five claims, Bauman (2004) defines performance as "a mode of communicative display, in which the performer signals to an audience, in effect, 'hey, look at me! I'm on! Watch how skillfully and effectively I express myself'" (p. 9). In his notes, the background of an audience and the performer do not signify the limited theater stage, but he basically understands social life is performance between the performer and an audience, which is similar to Goffman's "frame" and "setting" in society. Individuals express themselves within a "frame" and "setting" as display. However, Bauman places the performer in the center of the social relationship while communicating, and an audience is a collaborative partner of the performer.

According to Bauman, performance is a dynamic and interactive form that involves continuously communication in and across language, order, roles, identities, and culture. Both Carey's ritual model of communication and Bauman's communicative forms support the importance of contexts such as time, space, culture, or community. In this regard, interactive installations should concern the cultural and social space and the community in which the interfaces are installed to experience. The thesis defines the

context of interactive installations as art-related context, which does not include commercial, marketing, or educational contexts. It is a space in which participants are encouraged to express emotions, interact with installations, and participate in interaction with full embodiment. Installation spaces can vary from outdoor spaces to indoor spaces such as a playground vs. a museum wall/floor and from special event places to everyday places such as the theater stage vs. the kitchen. The choice of locations is significant for two reasons.

1. Since the locations signify conceptual meanings and contexts, a combination of installations' contents and locations can extensively influence participants' interaction. For example, the connotation of a city hall is distinct from the meaning of a cemetery. As another example, an abandoned construction place and a delicately refined installation are not well matched.
2. With regard to the first reason, which suggests that locations have different signs, locations usually demand certain behaviors/manners for participants. That is, a physical space can guide participants in how to interact with installations. When participants face familiar situations, they can comfortably interact with installations without an aid.

Interactive installations represent communication between participants and interfaces. This thesis claims that interactive installation can be a technological performer, not a mere interface. Schechner, from an anthropological perspective (6.1.1) and Bauman, from communication (6.1.2), claim that performance is (above the concept of an object) action and communication, respectively. When it applies to interactive installations, with

active and physical communication, interactive installations become performance stage, expressive event, and reconfigured space, as Jacucci (2004) shows in the transition in Table 1.

6.1.3 Other perspectives

Finally, outside of the anthropological view and communicative forms or performance, performance studies theorist Jon McKenzie (2001) expands the concept of performance. As discussed above, Turner characterizes liminality as an important factor of performance. Liminality is an in-between and ambiguous state while individuals move from one condition to another. Liminality becomes a norm with the rites of passages (ritual events) and sometimes accompanied by life crises. McKenzie's term *liminal-norm* is rooted in the following:

> …the persistent use of this concept within the field has made liminality into something of a norm. That is, we have come to define the efficacy of performance and of our own research, if not exclusively, then very inclusively, in terms of liminality—that is, a mode of activity whose spatial, temporal, and symbolic 'in between-ness' allows for social norms to be suspended, challenged, played with, and perhaps even transformed . . . [It] operates where the valorization of liminal transgression or resistance itself becomes normative (McKenzie 2001, p. 50).

Beyond Turner's liminality as well as traditional Aristotle's theatrical performance, McKenzie (2001) defines three levels of performance:

1. Organizational performance, including the performance of workers in some form of the production of goods or services, usually for a company, is evaluated according to its productivity, goal-orientation, or innovation.
2. Cultural performance "the living, embodied expression of cultural traditions and transformations," usually found in the traditional performance media, such as theater, film, or TV.
3. Technological performance includes the performance of machines such as robots or computers (p. 5-12).

All three levels loosely overlap. McKenzie outlines the interconnections between different layers of performance and provides a structure in which different conditions of performance are situated with regard to one another. Among the three, this thesis focuses on the third one, technological performance. Even though the previous section claimed that interactive installations could represent a technological partner, it did not fully explain the transition. Technological performance provides a background for how computational media turn interactive installations into a technological performer. Interactive installations as performance is a subset of the expanded boundary of performance in which McKenzie delineates *technological performance* and Schechner includes action *as* performance.

McKenzie explains (1998) that gender theorist Judith Butler explores performativity as not only "marginal, transgressive, or resistant," like both Turner and Schechner, but also "a dominant and punitive form of power, one that both generates and constrains human

subjects" (p. 220). Butler claims that society members may not realize that they behave according to society's expectation. They consider themselves as independent individuals; however, they comply with society's expectations in their everyday life. Butler's term *performativity* and the influence of performance on the actions of individuals will be discussed in Chapter 9.

6.2 The scope of performance

The common view of performance is that it is the physical presentation of artistic actions such as a theatrical play. However, selected perspectives of performance studies in Chapter 6—anthropological and communicative tiers, and other opinions—have provided a background of the history of performance studies and evidence that categories of performance are not restricted to stage performance, but expand far beyond the stage. Chapter 6 has also explained how categories of performance studies have expanded and developed. Schechner expands the term *performance* to cover plays, games, sports, theater, and rituals. While Turner specifies performance as rituals or ceremonies, Goffman considers performance a set of non-theatrical behaviors that represent social interactions as performance that we act out in our everyday life.

This summary of selected theories of performance studies provides the background for a performance-driven framework of interactive installations. Informed by new media theories as well as digital art, one can develop a framework within which the connection between interactive installations and performance studies can be explored.

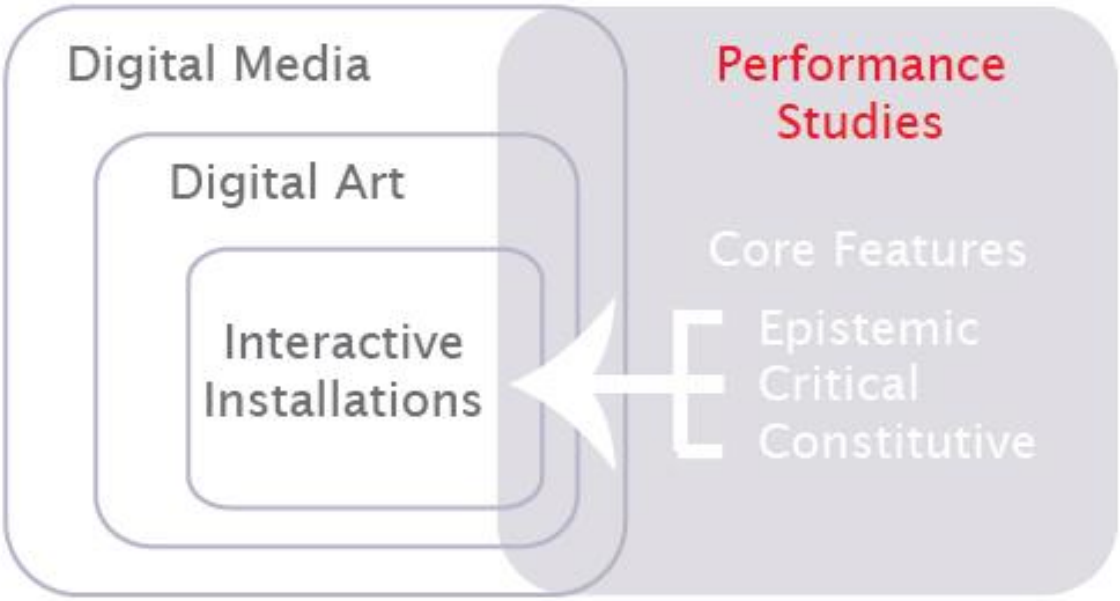


Figure 22. Interactive installations as Performance

The three core features of performance studies—epistemic, critical, and constitutive—from Bell (2008) are adapted in this thesis to analyze interactive installations. Chapters 7, 8, and 9 will discuss the core features to performance studies and exemplify them in the field of interactive installations. The epistemic features deem performance as a way of knowing through our senses from full body movements and phenomenology theory with examples in Chapter 7. The critical features of performance foster active and critical perspectives in audience members, discussed in Chapter 8. Then, it will examine how participants keep critical perspectives when they interact with installations. Chapter 9 provides theories pertaining to how people act upon their reflections of epistemic and critical perspectives. The next three chapters will connect the epistemic, critical, and constitutive features in the theoretical frameworks to the selected theories discussed in this chapter.

CHAPTER 7

FRAMEWORK: EPISTEMIC QUALITY

Theories from the anthropological and communicative perspectives discussed in Chapter 6 intersect and overlap. Among these intersections, we need to analyze the core features in order to formulate the theoretical framework. Bell (2008) introduces the constitutive, epistemic, and critical features of performance and the three core features are used in this thesis to analyze interactive installations.

The first feature in the theoretical framework is epistemic. Bell explains the origin of the epistemic feature (Figure 23), as in the word *epistemology*, from the Greek word *episteme* (knowledge) and *logos* (word or speech). The feature relates to the question of the origin of knowledge and its process. That means performance is a way of knowing. When it applies to interactive installations, interactive installations are a way of knowing ourselves and others. The knowledge we obtain from performance has been developed by several performance theorists. Among them, initial flows from speech communication and cultural text to embodied experience and somatic knowledge will be further discussed in Section 7.1 and 7.2. Then, it will specify how these performance theories apply to interactive installations in Section 7.3.

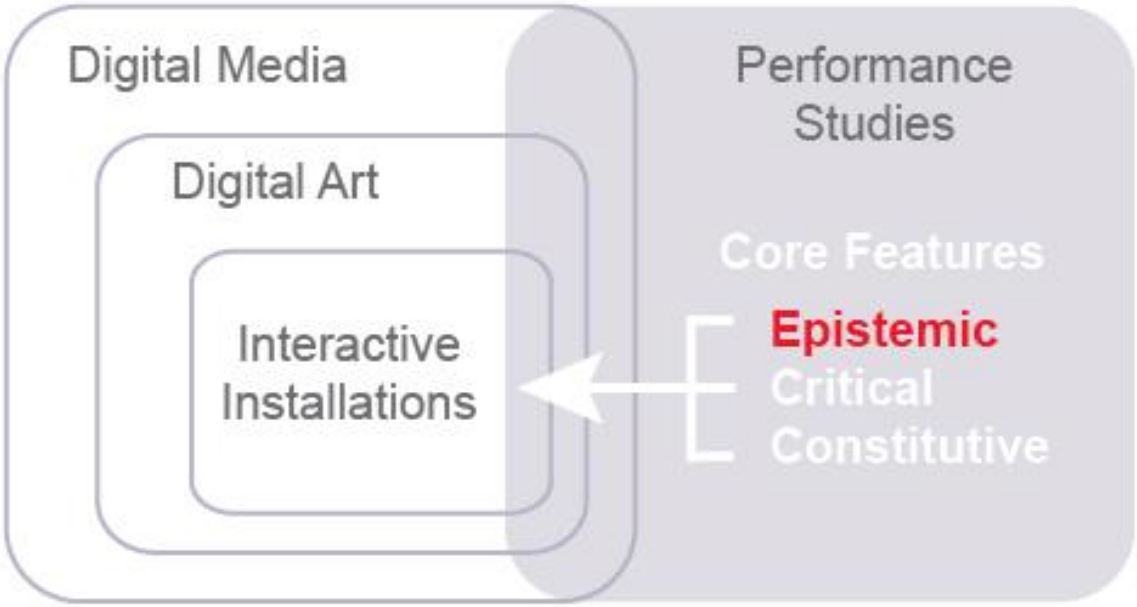


Figure 23. Epistemic feature in framework

7.1 Epistemic features of performance studies

Performance theorist in speech communication, Don Geiger, claims that reading a text is a way of knowing in his journal article, *Poetic Realizing as Knowing* (1973). In performance studies at Northwestern University, strongly influenced by literature and cultural texts, performance scholar Wallace Bacon (1984) argues that we can know others through text as "Every discipline has its 'other,'…our 'other' has always been text, whether written or oral" (p. 84). He mentions "Our center is in the interaction between readers and texts which enriches, extends, clarifies, and (yes) alters the interior and even the exterior lives of students through the power of texts" (p. 84) and emphasizes that text connects ourselves (interior) to others (exterior). Twenty years after Geiger, another performance theorist in speech communication, Ronald Pelias (1998), turned the perspective of a way of knowing into embodiment. According to Pelias, "performance is a way of knowing. This is something we learn from our daily practice. We know it somatically; we know it in our bones…performance is an embodied procedure that

provides insight" (p. 16). He focuses on knowledge through the body and refers to daily practice as embodied experience and somatic knowledge. Another theorist in performance studies at Northwestern University, Leland Roloff, the author of *The Perception and Evocation of Literature*, developed a perspective of embodied knowledge (1973) and coined the term "somatic thinking" as "thinking, intuiting, and feeling about literature with the body" (p. 3). He claims that somatic thinking can translate meanings into intuitive procedure because written or oral communication is not equivalent to the embodied experience. Embodied experience cannot be accurately translated into written words or oral communication. Epistemic qualities highlight the full-body interaction that shifts the focus to physical space and embodied experience. For example, learning sports underscores the importance of somatic knowledge. When children learn how to ride a bicycle, they could read or listen to verbal instructions, from which they learn the structure or function of bike components. Then they can memorize how to brake or accelerate. However, children rarely learn to ride a bike in this way, but instead, learn through practicing the physical movements of using brakes and pedals. During such practice of bodily movements, they acquire somatic knowledge. After they have practiced for a long period of time, they gain more skills that they use to handle more difficult riding situations. Somatic knowledge cannot be directly translated into written or verbal communication.

Dailey and Conquergood (1998) provide a background for deploying performance for resources of knowledge beyond textual paradigm:

1) Performance-sensitive ways of knowing hold forth the promise of contributing to an epistemological pluralism that will unsettle valorized paradigms and thereby extend the understanding of multiple dimensions and a wider range of meaningful action.
2) Performance is a more conceptually astute and inclusionary way of thinking about many subaltern cultural practices and intellectual-philosophical activities (p. 26).

They compare what textual paradigm leads to "distance, detachment, and disclosure as ways of knowing" to what performance paradigm pursues "immediacy, involvement, and intimacy as modes of understand" (p. 26). The comparison shows that the performance paradigm is a more direct and intuitive way of knowing than the textual paradigm, illustrated in the situation in which children learn how to ride a bicycle with their physical body. Their embodied knowledge is direct and immediate, so their body remembers how to balance on a bike seat, how to steer the bicycle, how much pressure they need to pedal a bicycle uphill or to glide downhill.

The development of epistemic knowledge has been advanced by theorists and practitioners in communication and performance studies at Northwestern University. Although such knowledge originated in the perspective of performing a text, to examine epistemic qualities in detail, we need to acknowledge their background in the

phenomenological perspective of Western philosophy, which explains why embodied experience through our senses is important for constructing knowledge and meaning.

7.2 Theoretical discourse of epistemic quality

7.2.1 Phenomenology

Western philosophy has two broad approaches to the mind and the body: one is the Cartesian body-mind dualism, in which the mind is separated from matter; the other is a phenomenological approach, which associates physical body with consciousness. Dualism originates from the philosophy of French philosopher Rene Descartes, whose notable aphorism "Cogito ergo sum," meaning "I think, therefore I am" (1965), supports his perspective of one's existence being equivalent to one's thinking. He claims that the essence of human existence is to think; that is, existence does not include material matter (i.e., body) as an important element. He contends that the mind consists of one's immaterial soul, which is superior to the material body.

In contrast to Cartesian philosophy from the school of Descartes is the phenomenological philosophy expounded by Husserl, Heidegger, and Merleau-Ponty. With a background rooted in mathematics, phenomenologist Edmund Husserl (1970) examines the position of science in the world as a phenomenon of experience. He is interested in physical world in our life through our mental perceptions. Similar to Husserl, his disciple Martin Heidegger (1996) also focuses on the relationship among objects in reality and our perception of them. However, Husserl still follows Descartes' dualism, which separates

the mind (consciousness) from the body (physical experience). In contrast to Husserl, Heidegger claims that the human being does not hold a mental perception of our existence, but instead represents existence in physical world. For Heidegger, physical actions represent existence. He claims we need our physical body to perceive mental representations of reality, which are inseparable. It rejects Cartesian's dualism and Descartes' statement *cogito ergo sum* meaning "I think, therefore I am." For Heidegger, Descartes' statement should be altered to "I exist in the physical world; therefore, I am."

Alongside Husserl and Heidegger, phenomenologist Maurice Merleau-Ponty (1962) emphasizes the body in the central position as "a nexus of living meanings" (p. 175). Merleau-Ponty (1964a) claims that the meaning is "caught up in the context of my body" (p. 168). According to this explanation, meaning is not an abstract perception in an individual's mind, but is already placed in the physical world. When an individual acts in the physical world, meaning can be found by these actions and interactions. Observations of such embodied interactions can provide particular forms of engagement or experience that reveal information about both the participants and others. Therefore, we are able to understand our own embodiment (i.e., the phenomenological body) and observe or interact with others' embodiment (i.e., the objective body) in context (i.e., the surrounding world). When epistemic quality is applied to interactive installations, we can acknowledge ourselves and others. The knowledge of context will be further articulated in the discussion of the critical qualities in Chapter 8. The process of contextualizing participants as explorers and of understanding others' expressions will be clarified in a discussion of practices in Section 7.3.

Interactive installations involve *full-body* interaction. Such engagement of the whole bodily presence breaks the dominance of the eye as the main organ for perceiving art (Dewey, 1934). In interactive installations, an interface as an event is not limited to an object one sees, but it provides a stage on which it engages the whole body. An interactive installation reconfigures not only art-related space but also the spatial presence of participants and installations. As Merleau-Ponty claims, our body is tied to the world, unlike Cartesian dualism, which separates mind and body, and embodied interaction can provide unique qualities of physical and emotional transitions for participants as it shifts them from viewer to performer. In this transition, as HCI theorist Paul Dourish (2004) notes, "Action both produces and draws upon meaning; meaning both gives rise to and arises from action" (p. 206); individuals can find meaningful experience by engaging in physical action with the aid of technological development. However, HCI does not fully explore the possibilities of embodiment in the performance context. As interactive installations make up a subset of digital media (Chapter 5), digital technology helps interactive installations provide a reconfigured space as an event that participants use their senses to experience. For example, digital artist Steve Dietz (2000) denotes three distinctive characteristics of new media: interactivity, connectivity, and computability. Of these characteristics, computability refers to a computational form and/or its process that leads to connectivity and interactivity. Likewise, theorist in theatre and film studies, David Saltz (1997), maps the triage of input, digital processing, and output onto digital art. Technological interdependencies foster a clear parallel between interactive installations and digital media development. Uniting embodied knowledge

from a background of phenomenology and computational media from the development of digital technology together enhances situations of the epistemic quality of interactive installations.

7.2.2 Performance and body

The epistemic qualities of interactive installations are based on their embodied and phenomenological nature, introduced in Section 7.2.1 in the theories of Husserl, Heidegger, and Merleau-Ponty. Since the body is one of the core features of performance, the importance of embodiment endures in performance studies. Although performance theorist Steve Dixon (2007) provides a definition of "digital performance" and mentions the "liveness" of mediatized and live performance, he does not use dramaturgical terminology to analyze the phenomenological perspective of performance. Since this thesis does not focus on mediatized experience but rather on physical interaction with installations, the difference between corporeal live performance and mediatized performance lies beyond its scope. Instead, it calls for bodily experience from performers, or audience members in the scene. The author of *Great Reckonings in Little Rooms: On The Phenomenology of Theater*, Bert States analyzes phenomenological experience on the activity of theater. He separates theater into *scene* and *actor* to examine how theater is phenomenological. States (1987) explains that this perspective originates from the view of French actor Jean-Bapiste Poquelln (whose stage name was Moliere) and categorizes "the theater as consisting of a platform (a scene) and a couple of passions (actors)" (p. 13). States emphasizes Moliere's claim that "signs in the stage" can achieve vitality "not simply by signifying the world but by being of it" (p. 20), which

means the scene is neither an illusion nor a reference. The scene is important as it is. Similar to the scene, an actor does not simply imitate representation of the world as illusion but presents a "certain kind of *actual*, of having something before one's vision—and in the theater one's hearing—to which we join our being" (p. 46). By comparing semiotics and phenomenology, States claims that semiotics fails to analyze the activity of theater because the whole precedes the parts in perception as phenomenologist Merleau-Ponty (1964b) mentions, "it is impossible…to decompose a perception, to make it into a collection of sensations, because in it the whole is prior to the parts" (p. 15). However, States claims that the semiotic value is complementary to, not exclusive of the phenomenological value. His stance, that theater is phenomenological, clearly emphasizes the importance of being in the world with a metaphor of the theater: *scene* and *actor*.

Performance studies also emphasize technological development. Communication studies scholar Jonathan Sterne (2006) emphasizes the influence of technology on embodiment: "…techne is embodied knowledge, not formal or logical knowledge…A concept of communication as techne also requires us to rethink the relationships we posit between bodies and technologies" (p. 92-94). Similarly, performance practitioner Susan Broadhurst (2011) stresses that "Instead of being separate from the body, technology becomes part of that body, at the same time altering and recreating the body's experience in the world" (p. 111). In her work, participants control sound, light, and projected images with digital technology through physical movement. Perspectives from Sterne and Broadhurst support the notion that digital technology of interactive installations

provides a new form of experience through engagement of the performing bodies of the audience. The next section will illustrate such engagements involving participants and audiences.

7.3 Practices of epistemic quality

Section 7.2.2 introduced how the phenomenological body creates meaning. How performers critically use their bodies to create meaning is similar to how participants employ their bodies as an important medium to express, engage, and experience interactive installations. Some interactive installations overlap with a narrative/ storytelling in a context of improvised performance.

As an example of both a digital performance piece and an interactive installation, *Deep Walls*[8] (2003) is an interactive installation created by artist Scot Snibbe. When participants walk into its projection beam, *Deep Walls* starts recording their shadows for a short time. When participants leave the frame, the recordings of the shadows replay in one of the sixteen infinitely looping small units. Participants leave their silhouettes and temporarily reside in the work, which consists of *Deep Walls*, until it is filled by other participant' silhouettes (Figure 24).

[8] http://www.snibbe.com/projects/interactive/deepwalls

Figure 24. Scott Snibbe, *Deep Walls* (2003)

Another example of Scot Snibbe's works, *Visceral Cinema: Chien*[9] (2005), is similar to *Deep Walls*, but it contains more interactions between viewers and the virtual performer on the screen. Snibbe reinterprets the movie *Un Chien Andalou*, originally created by surrealist Salvador Dali and Luis Bunuel, and on the screen, viewers see their shadows overlap with a virtual man pulling a grand piano towards them (Figure 25). When viewers walk on screen, their shadows influence the virtual man's actions. The viewer

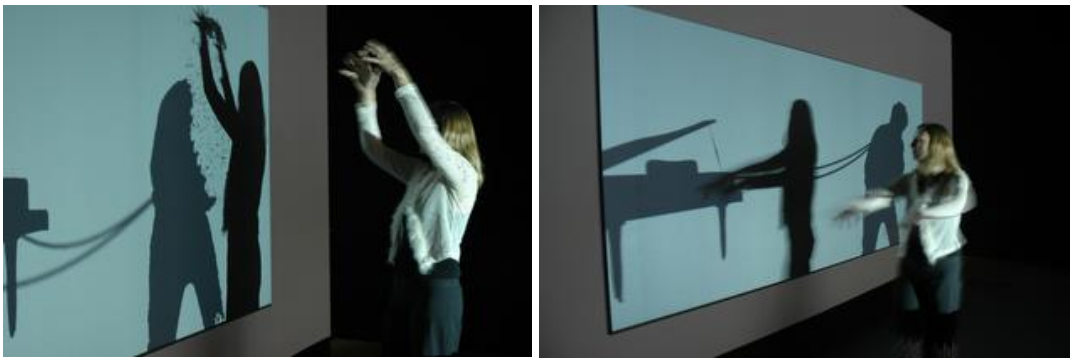


Figure 25. Scott Snibbe, *Visceral Cinema: Chien* (2005)

can cause the man to strain harder or loosen his grip, and when touching the man, they cause him to transform into dust that gradually spreads across the screen. In contrast to *Deep Wall*, in which participants present themselves on the screen, participants in *Visceral Cinema: Chien* interact with the virtual performer. Reflecting the notion of embodiment by phenomenologists Husserl, Heidegger, and Merleau-Ponty, both

[9] http://www.snibbe.com/projects/interactive/chien

interactive installations illustrate how the participant's body is a core feature that interacts and creates improvised stories.

Different from the examples of Schott Snibbe, which remain in the improvised performance context, Sester's *Access*[10] (2003) transforms a public space into a dramatic performance space through both physical and digital interaction. To connect physical and virtual interaction, *Access* uses surveillance and network technology. In her work, a bright robotic spotlight shines on a person (Figure 26) selected by online users through a surveillance camera system (Figure 27).

Figure 26. Marie Sester, *Access* (2003)

Figure 27. Marie Sester, *Access* (2003)

[10]http://www.sester.net/

The spotlight singles out a person from the surrounding audience; that is, a single person among all other audience members was targeted. The installation is not a simple object such as a light or a lamp, but it unfolds in a reconfigured performance space that alters the bodily presence of the participants, including the selected individuals and the surrounding audience members. The interactive spotlight transforms a single spectator into a main character on the performance stage and often triggers new behaviors by surrounding onlookers in response. *Access*' spotlighting space becomes States' *scene*, which can achieve vitality by *being*, and a spotlighted person becomes States' *actor,* which can convey a sense of being *actual*. Both the spotlighted space and actor carry a phenomenological value.

While the surveillance part of *Access* remains partially obscured, body is a key component of artist Camille Utterback and Romy Achituv's work, *Text Rain* (1999). The installation uses a camera to detect the presence of visitors and their interactive movements. In *Text Rain* (1999), a small virtual text resembling raindrops falls from the top of the screen and interact with the image of participants. The falling pieces of text stop when they reaches the boundary of the participants' silhouettes; they can then be lifted by the participants, but then they fall again (Figure 28).

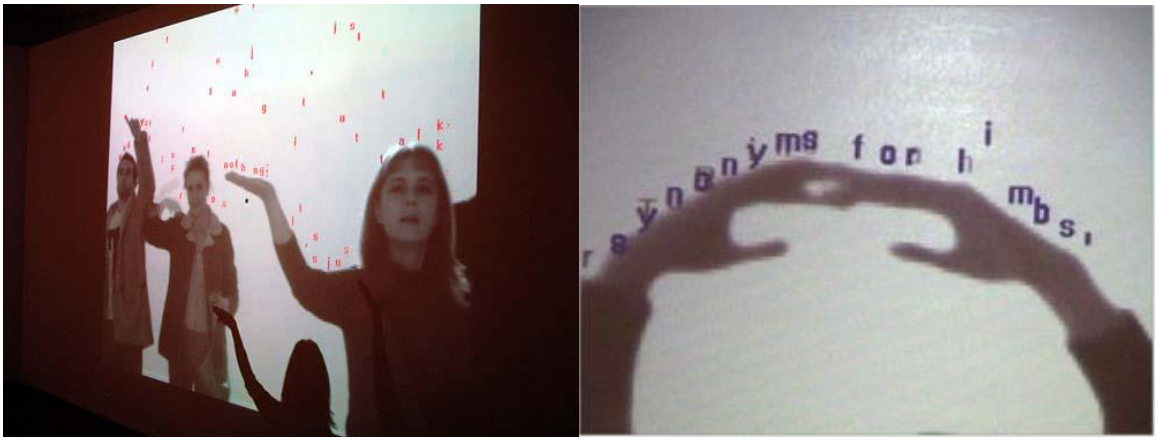


Figure 28. Camille Utterback, Romy Achituv, *Text Rain* (1999)

Participants sometimes use their bodies to gather a series of texts to read while they see their representation on the screen. Technology helps the participants seamlessly present themselves with texts in the virtual space while they are immersed in the interaction.

As in *Text Rain*, participants' presence and movements control Daniel Rozin's *Wooden Mirror*[11] (1999). Both *Text Rain* and *Wooden Mirror* use computer vision technology, but their way of presentation and their mediums differ. The output of the interactions in *Wooden Mirror* is the kinetic wooden parts, not the virtual representation. The installation consists of 830 servomotors, a video camera, wooden panels, and a computer that detects participants. Camera detection activates motors that control the angles of wooden panels reflecting participants' black and white images (Figure 29).

[11] http://www.smoothware.com/danny/

Figure 29. Daniel Rozin, *Wooden Mirror* (1999)

In *Wooden Mirror*, participants' body movements directly control the installation. Participants' bodies are a main source of control, initiating and creating interactions. Although *Text Rain* and *Wooden Mirror* demonstrate simple interactions, they illustrate the important role of the physical body as being in the world, and as phenomenologists assert, a role in which bodies experience and explore interactions while expressing themselves.

Compared to *Text Rain* and *Wooden Mirror*, large-scale installations can present a different level of impression. They can reinforce the spectacle and spatial environment of a large-scale performance stage where a number of participants can experience and express themselves at the same time. For example, Artist Golan Levin's *Double-Taker*[12] (2008), an eight-foot giant robotic arm with one eyeball, follows participants' movements with its gaze (Figure 30), emphasizing surveillance similar to *Access*. However *Double-Taker* provides a direct view, which is hidden in *Access*. From the museum roof, the

[12]http://www.flong.com/

Figure 30. Golan Levin, *Double-Taker* (2008)

interactive giant eyeball following the participant's movement creates a large performance stage. Since participants interact with installations in a large space, body movements often become enlarged, or exaggerated. Another example of a large-scale interactive installation is Rafael Lozano-Hemmer's *Body Movies*[13] (2001), which projects large-scale photographic images (between 400-1,800 square meters), mostly human figure portraits (Figure 31). Images are taken prior to the showing of *Body Movies* in the

Figure 31. Rafael Lozano-Hemmer, *Body Movies* (2001)

same space where *Body Movies* is being exhibited. Then, the images are projected on the wall of a building. Passersby on the street become participants. They create shadows from 2 to 25 meters wide, depending on the distance from the strong light source on the ground. The shadows overlap the projected images, setting up a clear contrast. After all of the sequenced images appear, the images shift to the next sequenced images.

[13]http://www.lozano-hemmer.com

Participants project a various proportions of shadows in the large-scale installation. They sometimes interact with others.

1) Phenomenology of which body is tightly coupled with mind by Husserl, Heidegger, and Merleau-Ponty and 2) States' emphasis of physical embodiment in *scene* and *actor* draw the boundary of interactive installations with the full-body movements. As art critic Michael Rush (2005) defined, the scale of interaction is not as restricted to mouse clicking or Web browsing, but involved in physical full-body participation with the aid of computational media. Based on Rush's definition, Chapter 7 supports Rush's scale of interactions with regard to interactive installations.

Although the above examples exhibit various levels of immersion and configurations from direct projection to manipulated space and from small- to large-scale installations, these works resonate with participants by demanding their bodies' roles in space and evoking new behavior within the dynamic contexts of the installations. Such reconfiguration of space is a fundamental element of interactive installation. The emphasis on performance connects the spatial reconfiguration to the embodied interaction design, achieved through a form of interactive installation that is not an object to view or to use but a technological performer communicating with a human performer's body. The embodiment in this encounter elevates artwork into a co-performance position beyond passive object-ness.

Chapter 7 examined the importance of body as a way of knowing. As performance theorist States (1987) claims that embodiment and semiotic values should be complemented in performance, Chapter 8 introduces critical aspects of interactive installations as performance. The critical meanings and processes will be further discussed in Chapter 8 with theories about performance resistance and critical aspects.

CHAPTER 8

FRAMEWORK: CRITICAL QUALITY

Chapter 7 explained the first characteristic of the framework, the epistemic feature, which is fundamental and explicit. It posited that the way of knowing is rooted in and closely related to the body. As the feature that provides the underpinning of the critical (Chapter 8) and constitutive (Chapter 9) features, the epistemic (Chapter 7) features provide the background of interactive installations as performance. Chapter 8 introduces a critical aspect of performance (Figure 32) in Section 8.1 and 8.2 and explores how it adapts to interactive installations in Section 8.3.

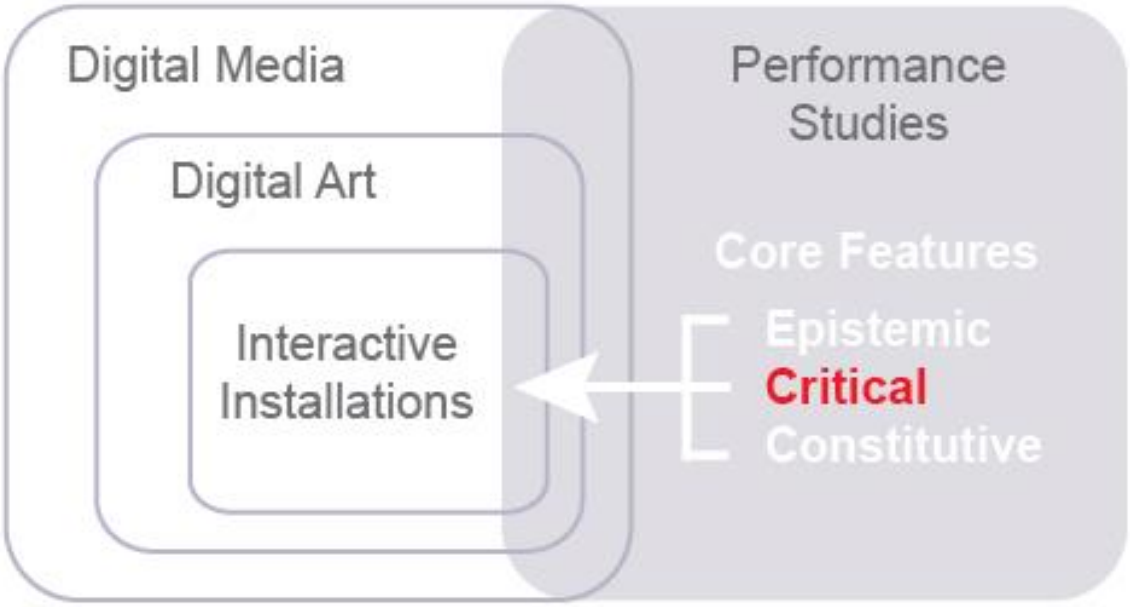


Figure 32. Critical feature in the framework

8.1 Critical features of performance studies

In the previous chapter, performance theorist States (1987) mentions the importance of the balance between phenomenological and semiotic values in theatrical performance. Although epistemic quality is of fundamental importance, the critical aspect, claiming that performance has semiotic meaning, is also important to performance studies; performing is a way of endorsing such meaning. The author of *Doing Critical Ethnography* (1992), Jim Thomas examines critical thinking as challenging "'truth' in ways that subvert taken-for-granted ways of thinking" (p. 18). It emphasizes the power of interpretation by active participants.

When the critical thinking takes on importance in performance, we wish to understand the purposes of critical qualities in performance. Performance theorist Soyini Madison (2005) examines the six purposes of critical performance:

1) To articulate and identify hidden forces and ambiguities that operate beneath appearances
2) To guide judgments and evaluations emanating from our discontent
3) To direct our attention to the critical expressions within different interpretive communities relative to their unique symbol systems, customs, and codes
4) To demystify the ubiquity and magnitude of power
5) To provide insight and inspire acts of justice
6) To name and analyze what is intuitively felt (p. 13)

She examines ethnography as an analytical tool of qualitative research for critical theory, which suggests that ethnography as a cultural study becomes "the 'doing'—or, better, the performance—of critical theory" (p. 13). According to Madison, critical performance not only reveals reflected meaning but also analyzes it, creates a dialogue between ourselves and others, and considers its contribution to the community, which includes the social interactions above the individual boundary. When it is applied to interactive installations, the interactions should not be limited to embodied interactions but include critical processes. As States (1987) mentions, the balance between phenomenological and semiotic values, and embodied and critical interactions of interactive installations should be linked and ideally complementary.

Section 8.2 will explore the critical qualities of performance stated by references of theorists and practitioners Bertolt Brecht and Augusto Boal, both of whom approach performance as a critical stage in which the world is subverted and changed by the act of critique. The critical qualities of performance represent a stepping stone between the epistemic quality as a fundamental element and the constitutive quality as a relevant outcome of epistemic and critical qualities. The three features that lie within the framework generally overlap and reinforce one another.

8.2 Theoretical discourse of critical quality

8.2.1 Critical distance

German playwright and theater director Bertolt Brecht (1964) explores the critical role of

the audience in its dialectic relationship with performance. Within this dialectic relationship, audiences are not immersed in drama in a cathartic Aristotelian way, but distanced from it so that they can criticize the events on stage as interrogators. He claims that theater can be a forum that subverts the current social and political ideology in the *epic* theater as opposed to the *dramatic* theater. Brecht (1964) exemplifies what spectators of *dramatic* theater and *epic* theater may say in the following:

> Spectators of dramatic theater may say, "Yes, I have felt like that too—Just like me—It's only natural—It'll never change—The sufferings of this man appall me, because they are inescapable."
> Spectators of epic theater may say, "I'd never have thought it—That's not the way—That's extraordinary, hardly believable—It's got to stop—The sufferings of this man appall me, because they are unnecessary" (p. 71)

In *dramatic* theater, an audience's emotion is linked to an actor's emotion, and what an actor feels is what an audience feels. In *epic* theater, the audience and the actor are separated. Then, the audience identifies an action on stage as one that represents reality, but it is not reality itself. For example, the audience sees the action of someone being shot, hurt, or even killed; however, after a play ends, the audience and actors return to reality. Brazilian performance practitioner Augusto Boal developed Brecht's *dramatic* and *epic* theater and summarizes the main features of both (Table 2).

Table 2. Boal's quotation about the differences between the "dramatic" and "epic" forms of theater, according to Brecht. (Boal, 1985, p. 95)

The "Dramatic Form" according to Brecht. (Idealist Poetics).	The "Epic Form" according to Brecht. (Marxist Poetics)
1. Thought determines being. (Character-subject).	1. Social being determines thought. (Character-object).
2. Man is something given, fixed, inalterable, immanent, considered as known.	2. Man is alterable, an object of inquiry, and is "in process."
3. The conflict of free wills impels the dramatic action; the structure of the work is a scheme of wills in conflict.	3. Contradictions of economic, social, or political forces impel the dramatic action; the work is based on a structure of these contradictions.
4. It creates empathy, which consists of the emotional compromise of the spectator, depriving him of the possibility of acting.	4. It "historicizes" the dramatic action, transforming the spectator into observer, arousing his critical consciousness and capacity for action.
5. At the end, catharsis "purifies" the spectator.	5. Thought knowledge, it drives the spectators to action.
6. It represents emotion.	6. It represents reason.
7. At the end, the conflict is resolved, and a new scheme of wills is created.	7. The conflict is left unresolved, and the fundamental contradiction emerges with greater clarity.
8. Hamartia prevents the character's adaptation to society, which is the fundamental cause of dramatic action.	8. The personal faults that the character may have are never the direct, fundamental cause of the dramatic action.
9. Anagnorisis justifies the society.	9. The knowledge acquired reveals faults of the society.
10. It is action in the present.	10. It is narration.
11. It represents experience.	11. It represents a vision of the world.
12. It arouses feelings.	12. It demands decisions.

In contrast to the arising emotion of *dramatic* theater (Table 2, #12), the critical distance of *epic* theater provides audiences with an objective view of the performance while separating performer, audience, and the context. Likewise, the audience identifies a character as an empathetic subject in *dramatic* theater; however, the audience in *epic* theater understands a character as an object in a distance (Table 2, #1).

In *epic* theater, to create critical distance, Brecht proposes new artistic techniques such as

a fourth wall that cuts off audiences from performers or separating performers from characters through the *alienation effect (Verfremdungseffekt).* According to him, *alienation effect* (A-effect) is "a representation that alienates is one which allows us to recognize its subject, but at the same time makes it seem unfamiliar. The classical and medieval theatre alienated its characters by making them wear human or animal masks; the Asiatic theatre even today uses musical and pantomimic A-effects" (p. 192). He specifies new techniques of acting to produce the *alienation effect* as follows:

1) Transposition into the third person
2) Transposition into the past
3) Speaking the stage directions out loud (Brecht, 1964, p. 138)

He claims actors can detach themselves from the character when they refer to characters in the third person, use the past tense, or speak comments loud at rehearsal. The *alienation effect* as a method was originally used in traditional Chinese acting. However, the difference between the *alienation effect* in *epic* theater and that in Chinese theater seeks to "underline the historical aspect of a specific social condition" (p. 98). *Epic* theater embraces social and political context. Brecht's critical perspective of theater, *epic* theater, provides a distance that separates audiences, actors, and the surrounding world with several techniques through the *alienation effect*; therefore, people can develop an objective view of applying the critical perspective to political and social issues. With regard to interactive installations, participants can maintain a critical distance from them to seek coded meanings or contexts that the artists of the installations intend.

8.2.2 Direct participation

While Brecht's *epic* theater examines social and political issues in terms of awareness, Brazilian theater director and political activist Augusto Boal radically develops Brecht's idea into action. Boal (1985) urges spectators to change because "the spectator no longer delegates power to the characters either to think or to act in his place. The spectator frees himself; he thinks and acts for himself! Theater is action!" (p. 155). He even radically mentions that theater is a *rehearsal of revolution* that transcends the meaning of a mere action. His book, *The Theater of the Oppressed*, depicts a participatory theater or a rehearsal theater as a means of discussing social change through dynamic roles. He attempts to bridge the gap between actor and spectator, coining the term *spect-actor*. He claims that spectators transform into *spect-actor*; that is, they convert from "passive beings in the theatrical phenomenon—into subjects, into actors, transformers of the dramatic action" (p. 122).

He suggests four stages in the process of transformation from spectator into actor. He explains that the first and second stages are preliminary, and then the third and fourth stages transform passive spectators into active participants.

a) The first stage begins from *knowing the body*, the importance of embodiment, mentioned in Chapter 7—the epistemic quality of performance studies.
b) The second stage continues to embodiment and explores its expressive feature: *making the body expressive*.
c) The third stage refers to spectators' direct participation in a performance: *the theater as language*. During this stage, theater is introduced as an

interchangeable and transforming product, not a final product. It categorizes three separate degrees of theater, each of which depends on the extent of direct participation by spectators in the following:

a. First degree: *Simultaneous dramaturgy*

   Spectators intervene in the performance with writing, so they do not need to be on stage. Actors simultaneously perform on stage based on what the spectators suggest upon the given situation.

b. Second degree: *Image theater*

   Spectators create body images that represent the concept. Through this process, their ideas become visible.

c. Third degree: *Forum theater*

   Without discriminating actors from spectators, spectators directly participate in the performance with dramatic action. They perform while discussing issues and seeking solutions. As they disagree about solutions, the forum theater continues. He claims that theater itself may not be revolutionary, but "these theatrical forms are without a doubt a *rehearsal of revolution*" (Boal, 1985, 141).

In theaters of three degrees, participation becomes more direct from the first to the third degree.

d) The last stage: *The theater as discourse* is cooperation between spectator and actor to create the spectacles in examples of *newspaper theater*, *invisible theater*, *photo-romance theater*, the *breaking of repression*, *myth theater*, *trial theater*, and *masks and rituals*. In their discourse, spectators are encouraged to start dialogue,

ask questions, intervene in the performance, and discuss social or political issues.

Unlike Brecht, who creates a critical distance that separates the audience, actors, and the surrounding world so that participants become aware of context from an objective view, Boal emphasizes direct participation in which audience actively intervene in a performance through the four stages. However, both Brecht's and Boal's approaches connect levels of engagement to social issues and delineate the critical features of performance. To foster active audience engagement, participation, and critical consciousness, they use several techniques that adapt their references to interactive installations. Introducing practices by Canadian-based Mexican artist Rafael Lozano-Hemmer, Section 8.3 will investigate how performance techniques are practiced in interactive installations and how audiences become actively engaged in them, that is, how they participate in and criticize the interactions.

8.3 Practices of critical quality

Originally born in Mexico City, Lozano-Hemmer explores critical perspective in his interactive installations. His early large-scale interactive installation, *Vectorial Elevation*[14] (1999), which he initially created to celebrate the year 2000 in Mexico City, was later exhibited in several other countries, including Spain, France, Ireland, and Canada. This installation, consisting of 18 bright and gigantic light sources, was originally installed in Zocalo Square, a large outdoor space in Mexico City. The directions of the light sources are controlled by on-line participants (Figure 33). When

[14] http://www.lozano-hemmer.com/

Figure 33. Rafael Lozano-Hemmer, *Vectorial Elevation* (1999)

participants access the website, they can leave messages without any censorship while controlling the direction of the light sources installed in Zocalo Square. Mexico is a country that allows only partial freedom is allowed on the Internet. Between May 2012 and April 2013, Freedom House (2013) assessed the extent of freedom on the Internet in more than 60 countries, and Mexico scored 38. As a result of the complex political situation in Mexico, freedom on the Internet has not always been guaranteed. Through *Vectorial Elevation*, Lozano-Hemmer encourages participant to express themselves by directly controlling lights and messages without censorship. Since participants control the light sources on the Net, they may not be observing the pattern of outside light sources that they are creating. Lozano-Hemmer prepared images with their information,

including messages posted on the website. At the end of the two- week exhibition, more than 800,000 people in 89 countries had participated in and left various messages, including 27 marriage proposals, several love stories, their daily conversations.

During the display of *Vectorial Elevation*, people may not literally witness the physical light work, but they initiate, control, and intervene in the performance as active participants. Through their interaction with *Vectorial Elevation*, they experience Boal's direct participation. In the case of *Vectorial Elevation*, participants use an interface (i.e., the Internet website) to control the installations (i.e., the lights). If we think of the outdoor interactive installation as a performance stage, participants become spectators who intervene in and control the performance with an interface, which closely resembles simultaneous dramaturgy in Boal's third stage: the theater as language.

Another interactive installation created by Lozano-Hemmer, *Standards and Double Standards*[15] (2004), consists of fifty belts with buckles suspended from the ceiling on motor-controlled strings. The buckles react to the movements of approaching visitors. When the members of the audience step within a certain distance, the buckles turn towards them (Figure 34). This interactive installation clearly uses artifice while the buckles are a coded iconic message representing political power. Through interaction, Lozano-Hemmer attempts to convey surveillance issues in the interactive elements of his work. With the subtle use of interaction, he transforms the empty buckles hanging in the ceiling into a critical viewpoint. Part of realizing this inherent critique is the act of

[15]http://www.lozano-hemmer.com/

engagement. The extent of engagement, however, is limited by the critical distance from the installation interfaces, or the technological performers, that the audience maintains. As Brecht claimed, audiences are separated from the actors so that they can examine the surrounding world, which is context. Audiences view the interaction of buckles rotating

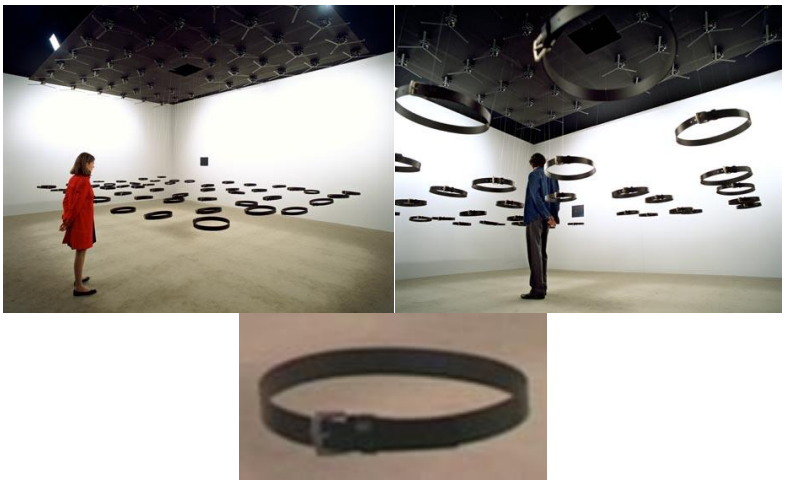


Figure 34. Rafael Lozano-Hemmer, *Standards and Double Standards* (2004)

towards them as a political icon that signifies power. The theatrical technique of retaining a critical distance by Brecht can be employed to investigate interactive installation, *Stands and Double Standards*.

In their critical aspects of performance studies, Brecht and Boal use different techniques such as critical distance or direct participation. However, both encourage spectators to actively criticize the play, or performance. When it comes to interactive installations, participants also use different techniques to experience the critical perspective. In Lozano-Hemmer's *Stands and Double Standards*, participants create a critical distance to experience and criticize coded context through the alienation effect, which resembles Brecht's epic theater. Instead of fully empathizing in *dramatic* theater, participants maintain an objective view. From the critical distance between the participants and

installations, which are interactive belts, participants can interpret a context as surveillance and patriarchal society. *Vectorial Elevation*, requires a different degree of intervention and control by participants who experience it. As stated above, participants use a website to control installations. Although both installations utilize different techniques, both encourage participants to ask questions and explore issues. In this process, interactive installations become critical interfaces that influence participants' perspectives. Furthermore, these perspectives eventually influence action. Thomas (1992) explains the critical perspective as including activity and ideology. Chapter 9 will identify the process of how participants act upon the perspective from embodied knowledge (Chapter 7) and a critical view (Chapter 8).

CHAPTER 9

FRAMEWORK: CONSTITUTIVE QUALITY

Chapter 9 identifies the constitutive feature (Figure 35), the last in the theoretical

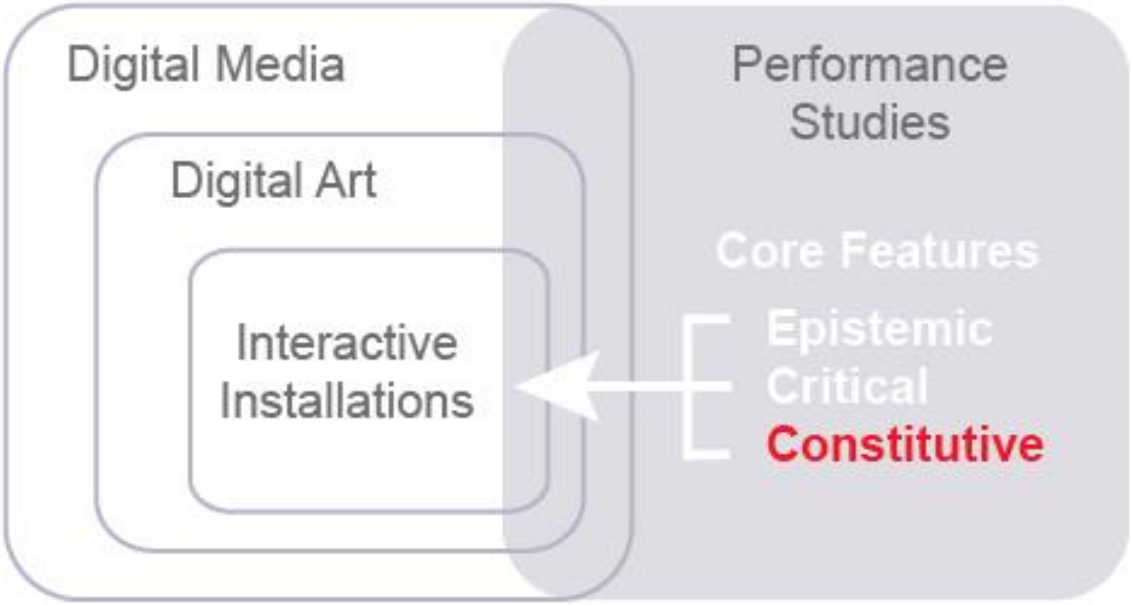


Figure 35. Constitutive feature in the framework

framework of interactive installations. Bell (2008) defines something constituted as being "established, created, and given form" (p. 19). The constitutive feature employs not only imitating or faking reality but also creating (often breaking and remaking) an actual configuration as Schechner (1988) mentions in his performance theory. In an interview by Schechner, Kaprow (1968) specifies that events in the extension of time and place reconfirm the connection between events and physical environments that actuate configuration. For example, participants built huge ice structures 30 feet long, 10 feet wide, and 8 feet tall in Kaprow's Fluids (Figure 36). This took place for three days in multiple locations in Los Angeles and visitors can reconfigure the locations with Fluids. Kaprow (1968) introduced these structures are "a mystery of sorts" (p. 154) taking

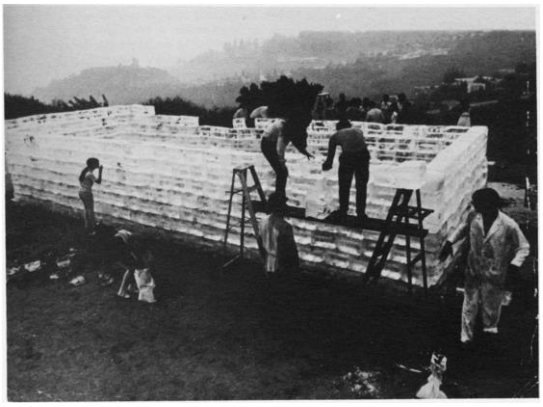


Figure 36. Kaprow, *Fluids: Beverly Hills* (1967)

space in the city. Schechner (1988) redefines this mystery, which Kaprow says "is the simple but altogether upsetting idea of art as an event" (p. 28) as actual in the context of performance in terms of the constitutive qualities. The epistemic qualities of the physical body and the critical qualities of the critical mind, introduced in Chapters 7 and 8, can influence while participants are actuating a configuration.

In the practices of critical qualities in Section 8.3, participants criticized situations in which power generates conflicts, preferences, and disparities and oppresses society. As performance practitioner and activist Boal (1985) claims, performance can be a *rehearsal of revolution*, and it can be radical and fearful because it can constitute action. Performance theorist Bauman (1975) examines performance as a subject of aspiration and fear: performance is admired for its "artistic skill and power and for the enhancement of experience [it] provide" (p. 305), and at the same time, it is fearful because of "the potential [it represents] for subverting and transforming the status quo" (p. 305). Performance can be a circulation of representation, subverting, and recreation. The constitutive quality is a main connection to explain this circulation.

The author of *Doing Critical Ethnography* (1992), contextualizes the act of critique, implying that "by thinking about and acting upon the world, we are able to change both our subjective interpretations and objective conditions" (p. 18). He claims that the act of critique already embraces action. To explain the transition, Section 9.1 and 9.2 will specify theories of the constitutive quality of performance, and Section 9.3 will examine theories of the practice of interactive installations.

9.1 Constitutive quality of performance studies

Constitutive qualities in which performance creates action derive from both the anthropological and communication modes of performance studies, introduced in Chapter 6. With regard to the first, the anthropological perspective of performance studies, anthropologist Turner (1982) claims that performance constitutes culture when he describes performance not as "the structuralist implication of manifesting *form*, but rather the processual sense of 'bringing to completion' or 'accomplishing'"(p. 91). The development of technology enables these transactions to take place in interactive installations and strengthens their performativity within a border between physical and computation domains. During this process, participants are continuously encouraged not only to reference their experience based on their individual social and cultural background but also to act upon it. In the previous chapter, Boal (1985) and Thomas (1992) mentioned how critical perspective is called to action. With regard to the above statement of how critical perspective and action are connected, Chapter 9 examines the details of the transition.

With the anthropological tier (Section 6.1.1) of performance studies, another influencing tier is the ritual mode of communication (Section 6.1.2). In the brief overview of performance studies in Chapter 6, Carey (1988) emphasized that culture could be constituted, interacted, developed, and transformed in and through performance through the ritual model of communication. In the ritual model of communication, people establish, discuss, and maintain faith though communication. From this perspective, interactive installations can ask questions, initiate issues, are share faith. Everyone tends to have a different background, so participants' heterogeneous social and cultural backgrounds can influence interaction and the sociocultural experience inflicts on participants and their self-expression through performance with the interactive pieces. Although participants interact with the same installations, they explore them in unique ways that lead to different actions. With regard to the simple connection between critical awareness and action, Section 9.2 investigates constitutive qualities from the theories of Turner and Butler and continues to explore theoretical discourses of constitution.

9.2 Theoretical discourse of constitutive quality

9.2.1 Reflexivity

Anthropologist Victor Turner posits that performance is an on-going dynamic flow in which participants conceptually reflect and physically act upon their reflection. To connect reflection and action is similar to critical perspective of Boal (1985) and Thomas (1992). However, Turner (1979) articulates the means of reflection and claims the use of reflexivity rather than reflectivity, stating that reflection is "at least *one* of the things one

does with one's solitude" (p. 465). Among the slight differences between reflectivity and reflexivity, Turner, as an anthropologist, emphasizes relationships in context. Since art-related context is the principal background of interactive installations, reflection should be understood in context. He notes that "an anthropologist tends to think in terms not of solitary but of plural reflection, or, much better, plural reflexivity, the ways in which a group or community seeks to portray, understand, and then act on itself" (p. 465). In theater and cinema, the definitions of self-consciousness are based on the relationship between audiences and actors. Author of *Reflexivity in Film and Culture: From Don Quixote to Jean-Luc Godard*, Robert Stam (1992) explains that "[r]eflexivity… points to its own mask and invites the public to examine its design and texture" (p. 1). In his opinion, spectators interpret and criticize plays and stories in their own contexts. Similarly, Turner (1980) defines "social or plural reflexivity" as "the way in which a group tries to scrutinize, portray, understand, and then act on itself" (p. 156). As a means of reflexivity conveys both action and awareness simultaneously, his definition of reflexivity is related to the critical perspective discussed in Chapter 8. However, Turner posits the definition of reflexivity in the emphasis of context and uses a term *liminality* to examine the transition from one status to another with reflexivity.

As briefly introduced in Chapter 6, the term *liminality* was coined by ethnographer van Gennep and developed by Turner. Turner explained *liminality* as a process of how people transfer from one status to another and how they perform initiated social roles in stages. Liminality sometimes accompanies a life crisis when people go through these processes. To explain rites and life crisis situations using theatrical terminology, Turner

investigates social drama. Schechner (1988) explains Turner's theory about rites of passage as a type of social drama "because participants not only do things, they show themselves and others what they are doing or have done; actions take on a reflexive and performed-for-an-audience aspect" (p. 186). It illustrates a dynamic relationship between active reflexivity and actions and the relationship can be applied to interactive installations. In terms of interactive installations, most of time interactive installations are not directly related to rites or crisis situations that can cause social and cultural transitions. However, participants can become involved in physical and emotional engagements as a constitutive aspect of performance because they can experience a liminal stage through interactions with active reflexivity. Active reflexivity can consciously or unconsciously influence participants' way of thinking on certain issues that artists convey in their artwork. Section 9.3 will examine practices that specify these transitions.

9.2.2 Performativity

When the constitutive aspect links the critical perspective to action, anthropologist Turner focuses on a critical transition with contextual awareness while gender theorist Butler pays more attention to origins, processes, and executions of action. Compared to Turner, who articulates the critical perspective as reflexivity in context, Judith Butler introduces her notion of building gender identity as performative. Contrary to the opinions of gender as a rigid factor, Butler (1988) claims that gender is performed "through language, gesture, and all matter of symbolic social sign" (p. 519) in society. She claims that all social signs impose certain types of action, as "performance which is performative,

gender is an 'act,' broadly construed, which constructs the social fiction of its own psychological interiority" (p. 528). In addition, Butler (1990) examines this process as "acts, gestures, enactments, generally construed, [that] are *performative* in the sense that the essence or identity that they otherwise purport to express are *fabrications* manufactured and sustained through corporeal signs and other discursive means" (p.136). She asserts that performance constitutes a continuous infusion and causes corresponding behavior upon the establishment of social reality. To clarify the transitions of how social reality establishes and influences action, she explains links from speech acts.

Influenced by John Searle's speech act theory, which states that speech actually acts, not merely represents, Butler asserts that all gender is not a natural being-ness; gender identity is continuously influenced by verbal or physical social reality. As an example of a speech act, a couple is married by the simple statement "I pronounce you man and wife" in a wedding ceremony. This announcement imposes the couple's new social reality. When the couple pronounces, "I do" in the ceremony, their speech establishes a new social role as a wife and a husband. Butler (1993) adapts speech act theory and claims that "within speech act theory, a performative is that discursive practice that enacts or produce that which is names" (p. 13). The speech act can impose explicit conformity in society. It can denote names within social norms such as a law or a custom, and people constitute performance in repeated practices. However, people do not simply choose what gender and what social reality upon their gender they perform. Society expects an individual to perform in a specific manner, which is normative

performance. The normative performance is what society expects of individuals imposing certain gender roles as norms while a performance is repeated.

She also explains that people sometimes perform against society's expectations. To destabilize Turner's *liminality*, she exemplifies the practices of drag as a parody of gender. Drag is a form of performance in which either a male performs a feminine character (a drag queen) or a female performs a masculine character in a film or other form of popular culture, that is, the act of cross-dressing. However, McKenzie (1998) criticizes the practice of drag, stating that it is not always subversive as "Drag thus may further sediment gender identities by repeating and reinforcing the orbit of hegemonic significations, while also destabilizing those very significations through exorbitant, hyperbolic repetitions that give rise to political resignifications" (p. 224). While Butler considers normative performance as society's expectations, McKenzie believes that normative performance is a type of performance. Butler's drag as a parody of gender can serve as an illustration of Boal's third degree: forum theater in the theater as language. Since Boal's forum theater contains political and social issues that can lead to difficult or controversial solutions, gender issues can be a good subject of forum theater. With drag as a parody of gender, Butler specifies Boal's radical statement that performance is a rehearsal of revolution in gender studies.

When it applies to interactive installations, interactive installations can represent, resist, subvert, and recreate society's expectations. As performing resistance is related to the critical aspects in Chapter 8, Chapter 9 develops processes of representing social and

cultural contexts and how these processes constitute actions. To examine it, practices in Section 9.3 focus on the process of how interactive installations use participants' references as on-going input and how they can represent an interrogator that influence participants' thoughts and behaviors.

9.3 Practices of constitutive quality

An illustration of constitutive quality is *Boundary Functions*[16] (1999), by digital artist Scott Snibbe, who visualizes personal space in relation to individuals in this work of art. When more than two participants are detected in a performance space, an overhead projection draws a straight line between the participants to indicate their personal space. The more people that participate in the interaction, the smaller their dedicated personal space becomes (Figure 37). However, each participant has a unique perception regarding the size and the quality of a comfortable personal space. According to anthropologist Edward Hall (1966), individuals have general four different proxemics patterns: intimate distance (up to 18 inches); personal distance (from 1.5 inches to 4 feet); social distance (from 4 feet to 12 feet); and public distance (12 feet to 25 feet). However, he examines people in various culture have different tendencies. Then, the experience of the interaction can vary depending on the individuals' cultural and social backgrounds. In terms of Turner's reflexivity, participants experience *Boundary Functions* based on their individual reflexivity in context. *Boundary Functions* becomes a canvas on which one draws temporary personal space as a result of experience. Since individuals have different backgrounds, context as references can vary. While experiencing *Boundary*

[16]http://www.snibbe.com/

Functions, participants can expose their perspectives with a comfortable personal space or learn from others. *Boundary Functions* represents a visualization tool that exposes the outcomes of individuals' reflexivity.

Figure 37. Scott Snibb, *Boundary Functions* (1999)

Compared to the limited visualization tool, *Boundary Functions, Blendie*[17] (2003), by Kelly Dobson, illustrates active performativity. *Blendie* explores not only human identity in social relations but also machine culture. It presents the participant with a blender that can be operated only through sound input. To initiate the blender, a participant has to imitate the operating sound of the machine (Figure 38). The power of the blender matches the volume of the participant's sounds (i.e., a soft, low-pitch sound causes the blender to spin slowly, and a loud, high-pitch sound causes the blender to speed up).

Figure 38. Kelly Dobson, Blendie (2003)

[17]http://web.media.mit.edu/~monster/blendie/

The experience of speaking the language of the machine connects the participant with the machine: One communicates in an expressive performance instead of an operationally functional condition. HCI scholar Carl DiSalvo (2012) discusses the shifting standard in the design of *Blendie* from human terms (i.e., human language) to machine terms (i.e., machine sound). This experience influences the user's perspective by shifting the traditionally utilitarian stance of domestic appliances to a personal and reflective relationship with them through performance. As Butler claims our identity is performative, *Blendie* demonstrates how our perspective is influenced to constitute new perspective and eventually lead new actions. It illustrates how a constitutive shift can open up new perspectives. From Turner's reflexivity to Butler's performativity, constitutive qualities become more active. Unlike in *Boundary Functions*, which fosters visualization of reflexivity, people can change their perspectives in *Blendie* as performativity.

As mentioned before, the three features—epistemic, critical, and constitutive qualities—are closely connected.

1. *Epistemic* qualities fundamentally stress the phenomenological values and the importance of the body. A definition of interactive installations draws a boundary of interaction involved in bodily experience.
2. *Critical* qualities encourage sharp insights into identifying, articulating, and analyzing issues. Participants sometimes use critical distance or direct participation as techniques. The issues they criticize range from mundane issues to social, cultural, and political situations, which can lead to controversy.

3. *Constitutive* qualities link knowledge (of the body and the mind) and action. The knowledge of bodily experience and critical perspective as reference leads to action. Theoretically, performance scholar Turner (1969) used the term "liminality" and Butler (1988) used "performativity" to explain how performance constitutes action. In interactive installations, the degree and intensity of interaction varies. Participants sometimes simply represent their heterogeneous social and cultural references in installations; however, they are often further influenced by interaction and then change their perspective.

Since the three features of the framework loosely overlap, theoretical discourse explains the connections. States (1987) mentioned the importance of complementary values between phenomenological and semiotic values, and Boal (1985) expressed that the critical perspective could lead to direct participation in several different degrees of participation. Turner's (1979) reflexivity is linked to the critical perspective, and Butler's (1988) performativity is based on all other social symbols, including physical behaviors such as gestures.

Because of the lack of theoretical discussion pertaining to interactive artwork, this work has aimed to provide a theoretical framework for interactive installations. With this framework, Chapter 10 will introduce two interactive installations: *Hooray* and *Please Smile*. It will explain the results of quantitative and qualitative tests that show how the features of the theoretical framework apply to these two interactive installations.

CHAPTER 10

PROJECTS AND ADDITIONAL EXPERIMENTS

This thesis defines interactive installations according to three dimensions. The first is that the scale of interaction includes embodiment beyond the limited actions of mouse clicking or keyboard typing, but instead involves the whole body. The second is that computational media integrates into a physical interface in an interactive installation; thus interactive installations provide reconfigured space. The last is that interactive installations involve the physical and emotional engagement of participants. Based on this definition, the theoretical framework identifies three features of interactive installations: epistemic, critical, and constitutive qualities. These features originate from the field of performance studies. To examine how these dimensions and features are applied, Chapter 10 introduces two interactive installations: *Hooray* and *Please Smile*. Additional HCI user studies will support the theoretical framework from a practical perspective.

10.1 Project description

The designs of *Please Smile* (2012) and *Hooray* (2013), both created by Hye Yeon Nam, represent different levels of interaction. According to the three dimensions of interactive installations, both meet the criteria: the scale of their interaction is beyond a limited space, but they require full-body interaction; the process of interaction employs physical interfaces with digital technology; and participants can create their own values while

interacting with them in the reconfigured environments. Both the design of the interfaces and the channels of interaction procedures vary. As interactive design may be predictable, some audiences may feel bored. However, when it is unpredictable and challengeable, some may feel frustrated because they are not in control. With different styles of interaction and techniques, *Please Smile* and *Hooray* demonstrate a diverse range of interactions. Such differences can facilitate certain levels of epistemic, critical, and constitutive features in the framework.

10.1.1 Hooray

10.1.1.1 Design

It is a collaborative work with an engineer, Yaesuk Jeong. It was originally funded by the Korean Ministry of Knowledge and Economy (MKE) and administered by the Korea Institute of Design Promotion (KIDP). It was first exhibited in Telfair Museum in Savannah, GA in 2013, then continued to exhibit in Gallery Ho in New York, NY and Lee Matney Gallery in Williamsburg, VA. It will be exhibited in Korea at the end of 2014. The user test was conducted during the group exhibition in Lee Matney Gallery.

10.1.1.1.1 Design principle: Epistemic quality of the framework

In *Hooray*[18] (2013), 80 human figures in eight rows and ten columns mounted on a board are initially standing up (Figure 39). To initiate *Hooray*, participants stand before the installation to create a shadow. A bright light source mounted on the ceiling casts

[18] http://www.hynam.org/HY/hoo.html

Figure 39. Hye Yeon Nam, *Hooray*

shadows of viewers interacting with *Hooray* (Figure 40). Participants' shadows activate the light sensors, which in turn, activate motors that cause the figures to bow. As a result, when participants approach the work, all of the figures bow. The goal of the experiment is to observe the transition in which physical bodies and digital sensors reconstruct a gallery space into an active environment that encourages engagement.

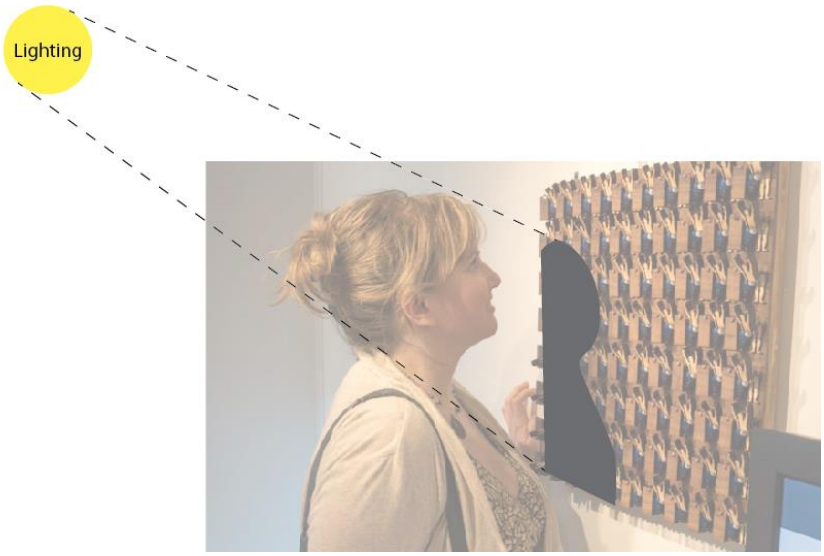


Figure 40. Design Principle: Epistemic Quality of *Hooray*

To encourage engagement, the reconfigured space requires participants to use their bodies to become involved in the interaction. Installed on a wall, the interface of *Hooray* prompts participants to move their bodies in vertical and horizontal directions. In all cases, whether participants know or do not know the instructions for how to interact with

Hooray, it is activated by the presence of participants. That is, it is built according to a design principle that encourages direct interaction with body movements.

10.1.1.1.2 Design principle: Critical quality of the framework

With physical and emotional engagement, *Hooray* represents a social relationship with viewers. When participants approach *Hooray*, the scale of the participants' shadows is larger than the scale of the human figures, and their shadows appear to overwhelm the 80 small-scaled human figures that bow to show their obedience to the participants (Figure 41). The contrast between the scale of the shadow of the participant and the 80 human figures and the ratio of the number of participants to the 80 figures emphasize the critical concept of hierarchical power in society. With the aid of digital technology and design principles, including the setup and the scale of the figures, the purpose of the design of *Hooray* is to evoke a critical discussion regarding power and relationships in society.

Figure 41. Design Principle: Critical Quality of *Hooray*

10.1.1.2 Fabrication

Hooray consists of microcontrollers, potentiometers, light sensors (photocells), servomotors, printed circuit boards (PCBs), and wooden small-scaled human-shaped figures (Figure 42). When a participant breaks a light sensor, a servomotor changes its

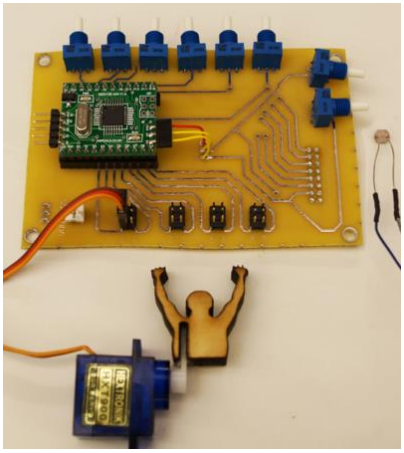


Figure 42. Hye Yeon Nam, *Hooray*: Hardware

angle from 20 degree to 110 degree. In the end of the wings of the servomotors, wooden small-scaled human figures are attached. Changing an angle appears to change the gesture of the human figures from standing to bowing. One unit of a PCB controls eight figures. The figures are cut by a laser cutter from an illustrator file format. The PCB design file is attached in Appendix A.

10.1.2 Please Smile

10.1.2.1 Design

It is a collaboration work with a robotics expert, Changhyun Choi. It has been invited to a number of exhibitions and demos including the Brazilian international art festival FILE

in 2013 and demo venues of the human computer interaction conference such as CHI 2013 and TEI 2014. User testing was conducted in the Van Every/Smith Gallery in Davidson College in Davidson, NC during the *Parodic Machines* exhibition in 2013.

10.1.2.1.1 Design principle: Epistemic quality of the framework

Please Smile[19] (2012) consists of five interactive robotic skeleton arms that gesture in response to the body movements and smiles of participants (Figure 43). To analyze their

Figure 43. Hye Yeon Nam, *Please Smile*

movements and smiles, *Please Smile* requires data of the positions and facial expressions of participants. To receive these signals, *Please Smile* sets up a camera in front of the five skeleton arms. The left-hand side of Figure 44 shows the setup of a camera that analyzes signals, and the right-hand side presents an image that the camera receives. A red square appears when the *Please Smile* system detects a face, and it becomes a green square when the system detects a smiling individual. This setup relates to the notion of emotion. *Please Smile* can react to the facial expression of the smile. The design contends that the smile can either signal or evoke an emotion.

[19] http://www.hynam.org/HY/ple.html

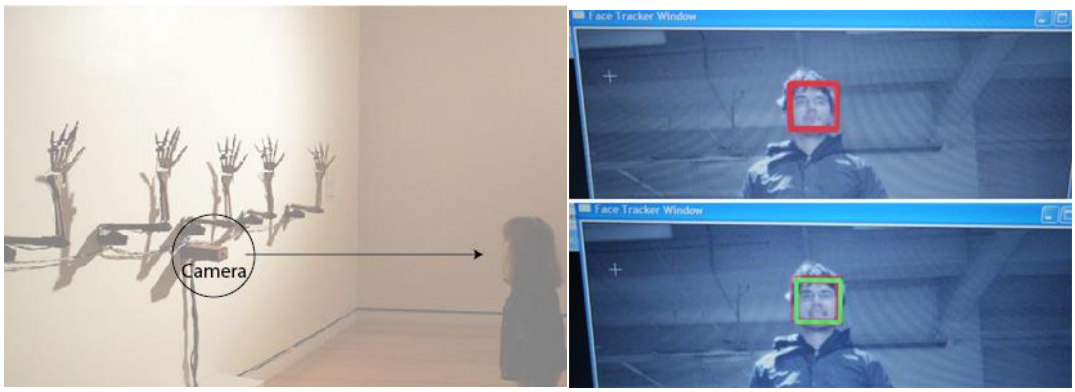


Figure 44. Design Principle: Epistemic Quality of *Please Smile*

In contrast to the direct and predictable interaction in *Hooray*, *Please Smile* employs two layers of interaction: facial expressions and body movements. With the current setup, participants should understand how to activate *Please Smile* with their body movements and smiles. Compared to *Hooray*, *Please Smile* provides more opportunities to engage with interactive installations.

10.1.2.1.2 Design principle: Critical quality of the framework

To create a more expressive interface, *Please Smile* incorporates elements from mechanical engineering and computer vision perception while *Please Smile* uses gestures to respond to participants. Participants interact with *Please Smile* in three different ways. When no one is standing within view of the camera, the five robotic skeleton arms set to their default position: bent elbows and wrists with fingers pointing towards the wall behind them. When participants step closer, the fingers turn and point at them, following their movements. When the participants smile, the hands wave at them. The design of the skeleton arms initially looks frightening, but when participants smile at them, the arms wave in a friendly manner. With physical body movements and facial expressions through the incorporated technology, *Please Smile* provides a reconfigured space. Within that space, participants are encouraged by the main design, which is based on emotional

conflicts, to re-evaluate their relationship with the machine.

10.1.2.2 Fabrication

Please Smile has five skeleton arms, each of which is composed of four servomotors (Figure 45). These arms are controlled by a set of PWM (pulse-width modulation)

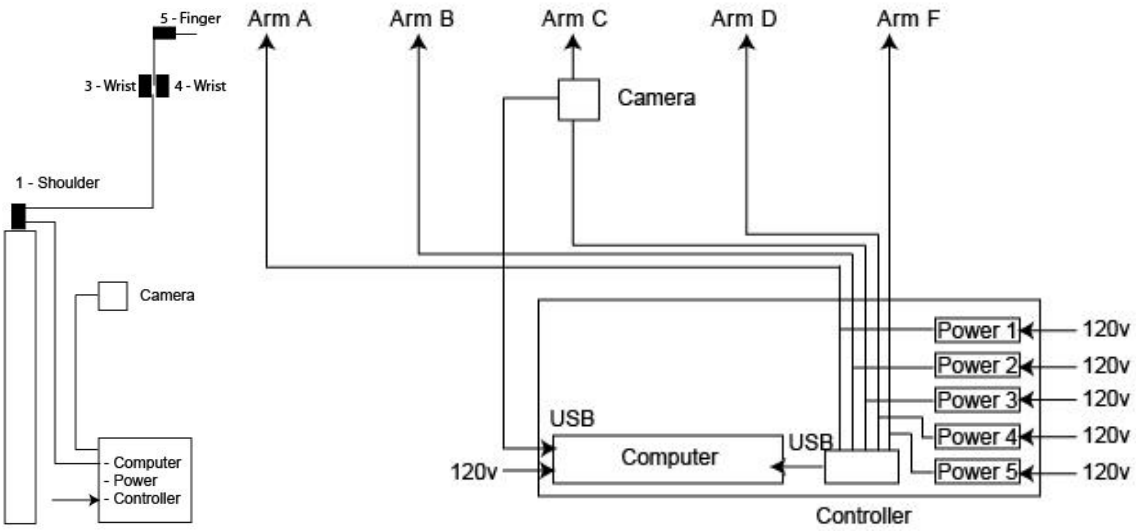


Figure 45. Hye Yeon Nam, *Please Smile*: Diagram

signals generated by a timer interrupt service routine in a microcontroller. It employs the ATMEL® ATmega 128 microcontroller because of its sufficient number of ports as well as computing power. The firmware inside the microcontroller receives data from the Smile Detector program through Universal asynchronous receiver/transmitter (UART) communication, generating PWM signals based on the data. The details of the software (equations and algorithm) are attached in the Appendix A.2.

10.1.3 Summary

Even though the main material, wood, and imitation of human gestures are common to both works of art, *Hooray* and *Please Smile* employ different technology and interaction. *Hooray* reacts more directly to the presence of participants, and *Please Smile* uses body

movements and a facial expression—the smile—to interact with participants. However, both *Hooray* and *Please Smile* attempt to convey the notion of a relationship with participants through interaction. When participants experience *Hooray* and *Please Smile*, they tend to verbally communicate and bodily interact with them. Most participants imitate bowing, pointing, and waving gestures when the interfaces initiate their gestures. To support these claims, condition includes non-interactive installations (repeating every five to seven seconds) in a user test to examine the interactivity of works.

10.2 Additional user studies

The main analytical method of this thesis consists of performance studies and the three features of the theoretical framework adapted from performance studies. To test the framework, HCI traditional evaluation methods were conducted. With the introduction of recent attempts that apply HCI traditional methods to interactive artwork, Section 10.2 identifies the goal and procedures and summarizes the results of the user tests.

10.2.1 Background: User studies and artwork

In contrast to traditional HCI methods, which measure effectiveness that improves a computational application, art projects tend to be subjective, reflecting artists' intention. However, interactive installations take a stance that differs from that of fine art in terms of the scale of interaction, media, and engagement. It has the potential to reconfigure a space and at the same time, encourage the physical and emotional engagement of participants. Thus, HCI scholars recently attempt to analyze interactive installations with

traditional HCI evaluation methods. To explore interactive art as affective computing, Hook et al. (2003) evaluates *Influencing Machine*, with which participants interact through postcards. They investigate the application of HCI evaluation methods to interactive installations as an additional tool to enhance the accuracy of artists' intention. By measuring the accuracy of the interaction, Hook et al. claims that the artists are able to learn a great deal about participants and their reactions. Compared to Hook et al., who measure the efficiency of interaction in *Influencing Machine*, Jacucci et al. (2009) conduct user tests to measure how participants' experienced two interactive works of art in public spaces by *Galileo all' Inferno*. They measure mainly the playfulness and engagement of participants. Unlike user tests on *Influencing Machine*, which measures how effective the artist's intention is transmitted, those on *Hooray* and *Please Smile* more closely relate to the approach by Jacucci et al., except they concern social interactions in the public space. In other words, tests on *Hooray* and *Please Smile* focus on interactions between participants and installations, which are five skeleton arms in *Please Smile* and 80 small-scaled human figures in *Hooray*. To clarify user tests on *Hooray* and *Please Smile*, Sections 10.2.2 and 10.2.3 explain the goal and the process of the user tests.

10.2.2 Goal

In this thesis, user tests are conducted to explore the relationship between interactivity and emotional/ physical engagement in different spaces of two interactive installations, *Hooray* and *Please Smile*. They measure participants' scales of emotion during their experience with both interactive and non-interactive works and analyze their levels of body movements, verbal conversation, and length of interaction. The purpose of this test

is to research 1) what role interactive technology plays in installations in an analysis of the difference between interactive and non-interactive installations, 2) how participants engage emotionally and physically in interaction in an analysis of videotaped observations and interviews, and 3) how important context is in an analysis of the differences between gallery and lab spaces.

To measure these values, user tests included 48 individuals (both female and male) who participated in four sets of user tests in three places (the Georgia Tech TSRB lab in Atlanta, Georgia; the Linda Matney Gallery in Williamsburg, Virginia; and the Van Every Smith Gallery in Davidson, North Carolina). Participants' reactions were compared between interactive work and non-interactive work in both a gallery space and a lab space.

10.2.3 Method and procedures

In the beginning of the tests, participants were told, "You will experience two different conditions. One has responsive qualities that enable it to react to your body presence [and your smile when *Please Smile* was tested] and the other does not have responsive qualities." The sequence of interactive installations and non-interactive installations were mixed. The participants were allowed to interact with the installations for up to five minutes in each condition, but they could choose to stop before the five-minute period. They were informed that all interactions would be videotaped. After the interaction, for the quantitative data analysis, participants were asked to fill out a questionnaire (see Appendix B.1), the Positive and Negative Affect Schedule (PANAS), which measured

the activation of positive and negative affect. PANAS, originally developed by psychologists David Watson and Lee Anna Clark (1988), is comprised of 20 items that measure positive and negative affect on the participants, which is a self-report. This self-report can measure the ten individual activation of positive effects, which are interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active. The ten individual activations of negative effects are distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid. After participants completed the interactions and the questionnaire, they were asked about their impressions of the interactions in open-ended interviews. Interviews were omitted in the test for *Hooray* in the gallery.

10.2.4 Results and analysis

From September to November in 2013, 67 subjects participated in the study. Because of missing answers and condition changes, the final number of participants was 48. Among the 48 participants, 16 (10 men and 6 women) participating in the tests in the Georgia Tech TSRB lab, 16 (6 men and 10 women) in the Linda Matney Gallery, 16 (8 men and 8 women) in the Van Every Smith Gallery. The participants' ages appear to be diverse in each location (Table 3).

Table 3. Participants' age groups of the user test

	Georgia Tech TSRB Lab	Linda Matney Gallery	Van Every Smith Gallery
10s	2	2	2
20s	9	8	6
30s	3	1	0
40s	0	1	2
50s	2	3	2
60s	0	1	4

All statistical tests were conducted according to the significance level of alpha = 0.05/4 = 0.0125. This significance level is used because four separate split plot ANOVAs were conducted. ANOVA is a statistical model and an acronym for analysis of variance. Because each analysis contains both between and within subjects effect, ANOVA is used for analysis. The analysis of *Hooray* with regard to interactive installation/non-interactive installation, positive affect/negative affect, and gallery/lab space (Data = average ratings) showed the following results:

- The difference between interactive and non-interactive installation ratings is statistically significant: $F = 14.682$, $p < 0.0125$ (within subject effect)
- The difference between positive and negative affect is statistically significant: $F = 84.539$, $p < 0.0125$ (within subject effect)
- The difference between gallery and lab ratings is statistically significant: $F = 3.244$, $p = 0.082$ (between subject effect)
  - ✓ It indicates that results in PANAS questionnaire rating by participants are significantly different between the interactive *Hooray* and the non-interactive *Hooray*. The results of the PANAS questionnaire rating for positive and negative affect is also significantly different. However, the results of the

PANAS questionnaire rating between gallery and lab do not show any difference. However, it is unclear whether there is no difference or there are not enough subjects to prove the difference because analysis for between subjects usually requires a larger pool of subjects than within subjects. This applies to all results for between subjects in the user test.

The analysis of *Hooray* interactive installation/ non-interactive installations and gallery/lab space (Data = time in seconds) produced the following results:

- The difference between interactive and non-interactive installation times is not statistically significant: $F = 4.348$, $p = 0.046$ (within subject effect)
- The difference between gallery and lab times is not statistically significant: $F = 4.164$, $p = 0.050$ (between subject effect)
  - ✓ It shows that time in seconds for engagement of participants is not significantly different between interactive *Hooray* and non-interactive *Hooray* as well as between gallery and lab.

The analysis of *Please Smile* interactive installation/non-interactive installation, positive affect/negative affect, and gallery/lab space (Data = average ratings) yielded the following results:

- The difference between interactive and non-interactive installation ratings is statistically significant: $F = 22.282$, $p < 0.0125$ (within subject effect)
- The difference between positive and negative affect is statistically significant: $F = 74.541$, $p < 0.0125$ (between subject effect)

- The difference between gallery and lab ratings is not statistically significant: F = 0.393, p = 0.535
  - ✓ It means that results in PANAS questionnaire rating by participants are significantly different between interactive *Please Smile* and non-interactive *Please Smile* as well as between positive and negative affect. However, the results in PANAS questionnaire rating between gallery and lab do not show any difference. Results of analysis for two different interactive installations, *Hooray* and *Please Smile*, are the same.

The analysis of *Please Smile* interactive installation/ non-interactive work and gallery/lab space (Data = time in seconds) produced the following results:

- The difference between interactive and non-interactive installation times is statistically significant: F = 27.967, p < 0.0125 (within subject effect)
- The difference between gallery and lab times is not statistically significant: F = 0.028, p = 0.869 (between subject effect)
  - ✓ It illustrates that time in seconds for engagement of participants is significantly different between interactive *Please Smile* and non-interactive *Please Smile*. However the time in seconds for engagement of participants is not significantly different between gallery and lab.

To summarize the results, while the differences related to interactivity (interactive work and non-interactive work) and affect (positive affect and negative affect) are statistically significant, the differences related to time (length of time spending for interactive work

and non-interactive work) and location (gallery space and lab space) are not significant except the time engagement for *Please Smile*. Section 10.3 will examine what these results signify and how they represent the main framework and its characteristics: epistemic, critical, and constitutive qualities.

10.3 Discussion

User tests show a statistical difference between the reaction of participants toward interactive work and their reactions toward non-interactive work. The level of non-interactive work is diverse. Among other options, repetitive, non-interactive gestures are chosen as one independent variable because these gestures involve movement but not interactivity. Since user tests attempt to measure different levels of interactivity, these gestures are used for the testing of non-interactivity. In this case, repetitive, non-interactive gestures are generated by digital technology. Because both interactive and non-interactive installations are generated by digital technology, the key difference between the two is interactivity, not digital technology.

After the interaction, participants were interviewed about their impressions. They were asked, "Which condition did you prefer and why did you choose it?" and "What did you feel when you experienced the two different conditions?" Analysis of the results of the videotaped interviews and observations in terms of bodily movement and verbal communication illustrates the following: 1) Interactivity encourages the physical and emotional engagement of participants, 2) the physical conditions of participants influence their engagement and impressions, and 3) the definition of art-related context is not

limited to either a gallery or a museum. These three points will be discussed in detail below.

10.3.1 Physical and verbal engagement

Observations and interview transcripts from video documentation illustrate that participants tend to bodily and verbally communicate more with interactive work. More specifically, participants tend to imitate the interaction of an installation. For example, participants imitate the bows they see in *Hooray*, and they point to and wave at *Please Smile*. The images below are taken from the videotapes of user tests. Figure 46 shows that #13 bows to the interactive *Hooray* in the gallery, and Figures 47 and 48 show #14 and #16 trying various gestures, including pointing and waving at *Please Smile* in the gallery.

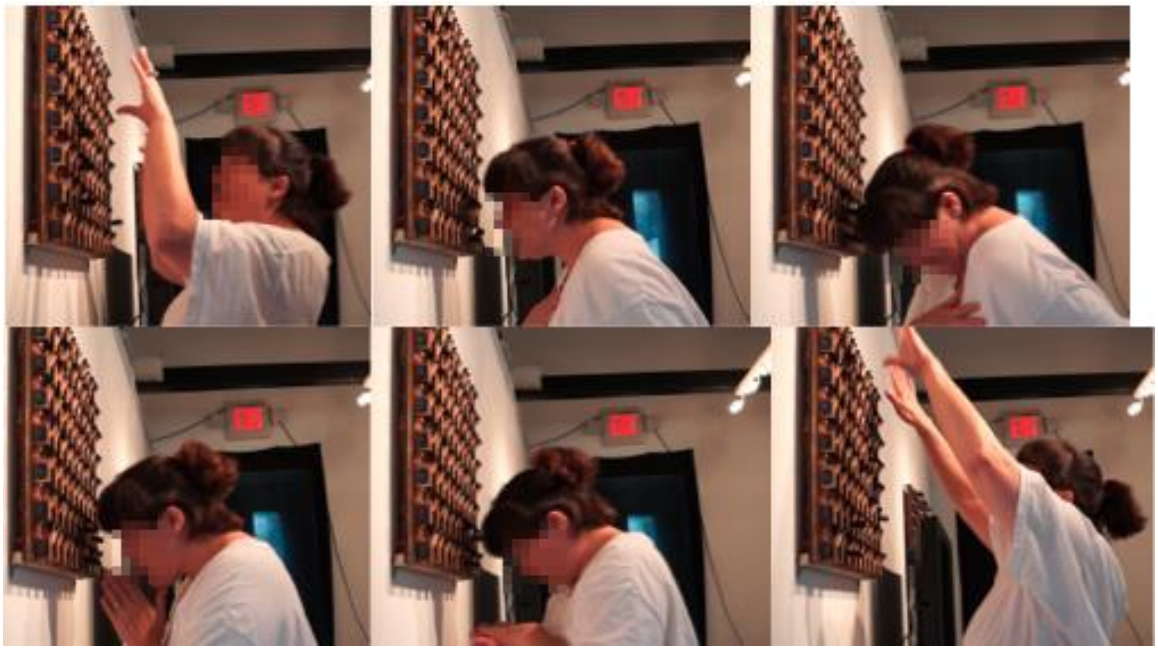


Figure 46. *Hooray* in the gallery, #13

Figure 47. *Please Smile* in the gallery, #14

Figure 48. *Please Smile* in the gallery, #16

Participants typically move their bodies when they stand in front of both interactive and non-interactive installations. After they become aware that the non-interactive work consists of repetitive gestures, they usually stop reacting to and observe it. In the lab, when #25 sees non-interactive *Hooray*, he interacts with it by imitating bowing gestures; however, after bowing twice, he stops but simply observes the repetitive gestures of the interface.

Figure 49. *Hooray* in the lab, #25

When participants use their bodies, they tend to talk more to interactive installations. While interacting with *Hooray*, #2 said "bye" at the end of the interaction, #5 and #13 said "High five," and #13 ordered the small human installation figures to "take a bow" or "bow to me." While interacting with *Please Smile*, #14 commanded it to "back up." In terms of interactivity, participants scarcely ever talk to non-interactive installations.

Butler (1988) emphasizes that speech can constitute action. She exemplifies social ceremonies such as weddings to explain the constitutive power of speech because it

imposes certain societal roles on the bride and groom after they are pronounced husband and wife. Likewise, talking to installations in the user test can transform the status of installations from a mere object to a meaningful subject, which represents a reconfiguration of space by participants. Even though interactive installations do not reply to participants, participants often continue to talk to them as if they were communicating with them. Bauman (2004) specifies performance in the ritual model of communication while sharing information. He states that the term "communication" signifies identities, cultures, and relationships. The results of user tests illustrate how participants share a common faith with installations. While participants are experiencing these installations, they appear to engage in interaction. When they talk to installations, they treat them as another subject or performer beyond the concept of a mere object. Based on the phenomenological perspective, the body is tightly coupled with the mind. That is, while participants use body movements and verbal communication, they tend to engage with interactive installations.

10.3.2 Physical condition and interaction

After performing the user tests, participants were asked whether they preferred the interactive work or the non-interactive work and why they preferred that particular work. Among 32 participants (the *Hooray* test in the gallery omitted interviews), 29 preferred the interactive installation and three preferred the non-interactive installation. These three participants were a 65-year-old female, a 64-year-old male (in the *Please Smile* user test in the gallery), and a 55-year-old male (in the *Hooray* user test in the lab). The following are excerpts from the videotaped interviews of these three participants:

#11 (Female, 65) said, "It [interactive *Please Smile*] was too complicated. The first one [non-*interactive Please Smile*] was more interesting [because] I was interested in each individual hand [and I had time to observe their design]."

#16 (Male, 64) said, "In the first mode [non-interactive *Please Smile*], I liked the motion…and the second one [interactive *Please Smile*] had less of that and a more stationary position." Since #16 did not smile, the interactive *Please Smile* did not respond and remained in a more static position.

#25 (Male, 55) said, "I liked the last [non-interactive *Hooray*] the most because they were more responsive. They moved all at the same time simultaneously and I like that sequence. It was not as slow and not as fast. [It] gave me a chance to analyze it. It was clearer…the other one [interactive *Hooray*] moved simultaneously, but too fast."

Based on their comments, their physical conditions and personalities appeared to influence their preferences and interaction. Table 3 indicates a 50% likelihood that the six participants between the ages of 55 and 65 preferred the non-interactive installations. Although the definite connection between age and preference of non-interactive work is not conclusive, the results provide some evidence that supports the existence of such relationships.

10.3.3 Art-related context

One of the hypotheses of the user tests was that the difference between lab and gallery spaces would elicit different reactions from participants. However, the results showed no significant difference. In other words, although in different locations, participants experience artwork and reconfigure the space in similar ways. Figures 50 and 51 illustrate slightly different setups such as the lighting and the display for *Hooray* and *Please Smile* in the gallery or the museum and the lab. For example, in the gallery the power strips were aligned and a wall was created for *Please Smile* to hide the computer and hardware behind the wall.

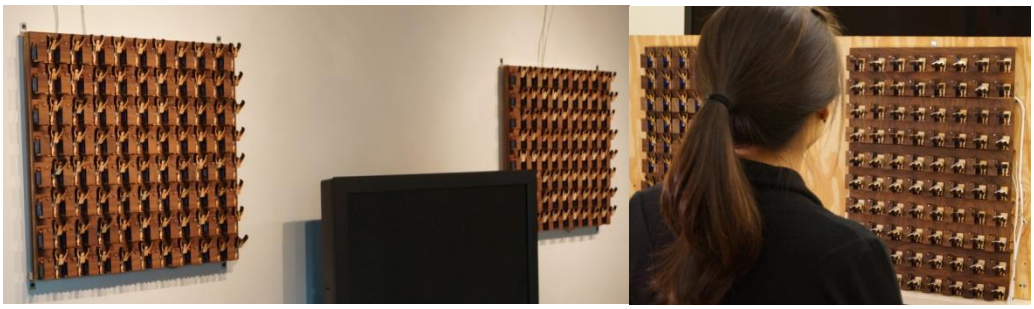


Figure 50. *Hooray*, Gallery (left) and lab (right) space

Figure 51. Please Smile, Gallery (left) and lab (right) space

Even if the physical setups differ, when participants experience artwork, they can reconfigure it in an art-related context that is not limited to a gallery or a museum space.

Then, such locations become reconfigured performance stages.

In Chapter 5, in the connection of digital art, Suderburg (2000) emphasized the importance of the active roles of participants exemplifying site-specific art work. She explained the meaning of *site specific* from the relationship between space and spectator instead of treating a gallery or a museum as an iconic place to display and appreciate artwork. According to Suderburg, spectators discover the meaning of space in site-specific installations while they interact, express, and explore, which is not determined by a gallery or a museum. In the user tests, *Hooray* and *Please Smile* create an art-related context that is not restricted to a traditional gallery or a museum space, but a transitional site that means any place can be transformed into a space in which participants interact with artwork. In the user tests, three locations, the Georgia Tech TSRB Laboratory, the Linda Matney Gallery, and the Van Every Smith Gallery, are all spaces reconfigured by active interaction with participants.

Chapter 11 will continue the discussion with a summary. With regard to interactive installations as a research subject, Chapter 11 will explore how the theoretical framework of interactive installations will be used in digital media research and how it will address useful connections to existing theoretical perspectives in digital media, digital art, and performance studies; and then it will discuss directions of future research.

CHAPTER 11

CONCLUSION

It is common to assume that interactive installations are art practices, not a research subject that provides theoretical value. However, the physical and conceptual background of interactive installations has changed and interactive installations are becoming pervasive not only in the galleries and museums, but also at interdisciplinary events and demo venues. The development of interactive technology has gradually extended the boundary of interactive installations and created an interdisciplinary field for possible creative collaboration. Because of these changes, interactive installations should be viewed from a new perspective.

Interactive installations comprise an interdisciplinary subset of digital media and digital art. Compared to art critic Rush (2005), who articulates the scale of interaction with digital and physical elements, Suderburg (2000) emphasizes art-related context in which a space is reconfigured by a work of art. Although another contemporary art critic Bishop (2005) does not address the digital aspect of installations, she explains the transition in which a viewer becomes a participant in installation art. She also explores the transitional performance stage of installation art. Based on the references by Rush, Suderburg, and Bishop, interactive installation is defined according to the scale of interaction, reconfiguration of space in an art-related context, and engagement by

participants. Interactive installations as physical interfaces integrated with digital technology can encourage both emotional and physical interaction in participants.

As a subset of digital media and digital art, interactive installations possess the characteristics of both. Janet Murray claims that digital technology can lead to participants' entering an immersive and expressive platform. Roots in digital art explain the meaning of a space as one that is configured by participants, not characterized by the space itself since participants re-examine and recreate the space through their behaviors with the interactive installations. Although interactive installation practices originate from digital media theory and the digital art context, both are not fully developed theoretical discourses for interactive installations. Interactive installations call for a new approach through *performance studies* that can provide logic and elements to analyze interactive installations as a research subject.

This thesis provides three core features of a theoretical framework. The core features are epistemic, critical, and constitutive features originating from performance studies. Performance theorist Bell (2008) summarizes the three qualities of performance—constitutive, epistemic, and critical aspects. She claims that performance is *epistemic*, that is, performance is a way of knowing. The subject of knowledge refers to somatic knowledge in which participants can learn from their bodies. When it applies to interactive installations, participants can engage in embodied movements to learn, express, and explore. The second *constitutive* feature, the critical aspects, means that performance is a form of criticism. When applied to interactive installations, criticisms

refer to questions and analysis by participants viewing the work. The last is *constitutive*, which signifies that performance can actuate a configuration.

Two interactive installations, *Hooray* and *Please Smile*, are analyzed with the core qualities of the framework and additional HCI user studies. Using a quantitative and qualitative method, the study found the following. First the results from the videotaped observations (verbal communications and physical movements) show that participants tend to communicate more with interactive installations. Physical engagement is related to the epistemic qualities of the framework, which emphasize that humans can use their bodies to express and learn. Verbal communication is related to the constitutive qualities of the framework. As Bauman (2004) explains how people share information in the ritual mode of communication, and Butler (1988) claims that language has the power to constitute action. When participants communicate with interactive installations, they shift their perspectives of an installation from controlling to sharing it. Interactive digital technology and art-related contexts create a transitional moment in which participants interact with technological performers, not mere objects. In this sense, participants and installations are co-performers.

The study also identified certain relationships between the ages of participants and their interactions, for the three participants who preferred non-interactive installations were between the ages of 55 and 65, the oldest of the participants. These three participants represented half of the participants in the same age group. Although the relationships are

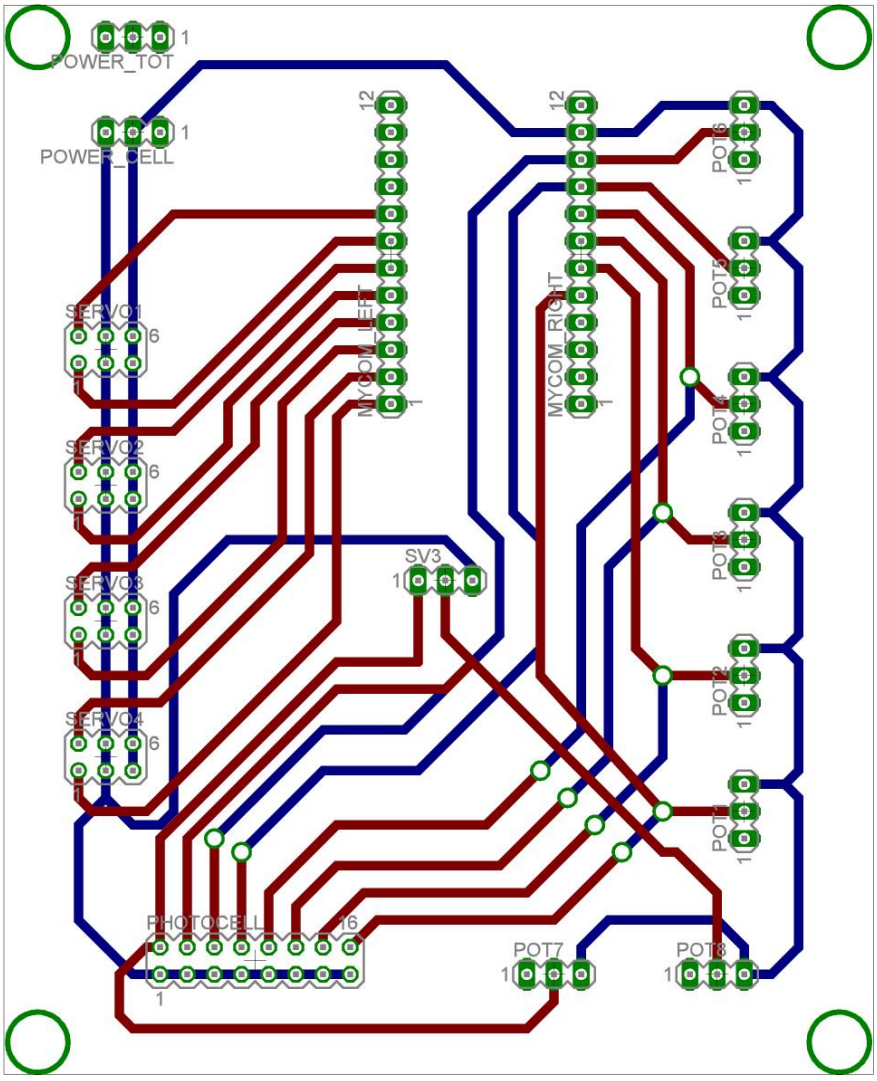
not definitive, they can represent a correlation between individuals' physical conditions and their reflected interactions.

The final set of results shows how space becomes reconfigured into an art-related space. Although the method of display in a lab or a gallery such as lighting and structures differ, the analysis of the ratings regarding positive and negative affect shows no significant difference between the gallery and the lab space. That is, when participants experience artwork, they reconfigure the space into an art-related context, indicating that this effect is not restricted to a gallery or a museum space. It also indicates that space in interactive installations is defined by the behaviors and the interactions of participants, not by the location itself.

This research provides a theoretical framework that prompts the critical discourse of interactive installations. After an examination of the background of interactive installations, which is digital media and digital art, the framework analyzes interactive installations with regard to three core features—epistemic, critical, and constitutive qualities—originally from performance studies. Additional HCI user studies support the analysis of these qualities of interactive installations and attempt to apply traditional HCI methods to experimental subjects in art-related contexts. Theoretical reviews of interactive installations identified their relationships to performance studies, which will contribute to the development of future research. This framework will be an analytical tool that digital media researchers can employ to research interactive installations as a focus of study that examines the transition from art practice to a research subject.

APPENDIX A: Project

A.1 Hooray: PCB design



A.2 Please Smile: software

The Smile Detector (SD) program is a perception module in which a computer vision technique is implemented. From the sequence of images from a camera, SD first detects frontal faces, and then the detected face regions are evaluated through a smile detection function. The function is trained in the SVM (support vector machine) algorithm in which HoG (histogram of gradient) features are used as feature vectors. To train the SVM, it prepares training data from a Genki-4K dataset, which contained 4,000 faces, smiling labels, and head poses. Since the faces are not preprocessed enough, it crops the frontal face regions from the dataset using the head pose data. With HoG features defined as 6 by 6 cells and 8 by 8 blocks, the smile detection function shows 95.5963% accuracy. The parameters of SVM training are cost $C = 1$ and $\gamma = 0.125$. Although the face and smile detection modules generally demonstrate high accuracy, they cannot guarantee high recall and precision in highly cluttered scenes. To address this problem, it applies particle filtering to track faces whose motions are typically nonlinear and non-Gaussian. State X is defined as

$$X = [x, y, \sigma, smile]^{\mathrm{T}}$$

where x and y represent the center location of the faces in the image, σ is the scale of the face, and *smile* represents the degree of the smile. The measurement likelihood is defined by the intersect area of the current rectangle regions of the hypothesis and new regions via face detection. With multiple weighted samples, it can approximate the posterior density distribution $P(X_t|Z_t)$, and the mean of particle samples is calculated by an arithmetic mean; the binary value of the smile, however, is determined by a threshold value on the mean smile value. *Please Smile* employs 32 particles, and the threshold

value is set at 0.3. When audiences consist of more than one person, the biggest face among them is selected because it assumes that the one with the biggest face is the person closest to the camera according to the perspective projection.

APPENDIX B: User Test

B.1 Questionnaire

Subject ID: Date:
Gender: Male / Female Age:

The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)

PANAS Questionnaire
This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers.

1	2	3	4	5
very slightly of not at all	a little	moderately	Quite a bit	extremely

_____	1. Interested	_____	11. Irritable
_____	2. Distressed	_____	12. Alert
_____	3. Excited	_____	13. Ashamed
_____	4. Upset	_____	14. Inspired
_____	5. Strong	_____	15. Nervous
_____	6. Guilty	_____	16. Determined
_____	7. Scared	_____	17. Attentive
_____	8. Hostile	_____	18. Jittery
_____	9. Enthusiastic	_____	19. Active
_____	10. Proud	_____	20. Afraid

Reproduced from Watson D., Clark L.A., Tellegen A. (1988), Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality Social Psychology, 54(6), 1063-1070.

B.2 Results

Analysis 1: Please Smile (measure: rating)

General Linear Model

Notes

Output Created		02-APR-2014 23:02:37
Comments		
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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.

Syntax		GLM Mean_Positive_P1 Mean_Negative_P1 Mean_Positive_P2 Mean_Negative_P2 BY Group /WSFACTOR=interactive 2 Polynomial Emotion 2 Polynomial /MEASURE=Rating /METHOD=SSTYPE(3) /PLOT=PROFILE(Group interactive Emotion) /EMMEANS=TABLES(Group) /EMMEANS=TABLES(interactive) /EMMEANS=TABLES(Emotion) /PRINT=DESCRIPTIVE ETASQ OPOWER /CRITERIA=ALPHA(.05) /WSDESIGN=interactive Emotion interactive*Emotion /DESIGN=Group.
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	Elapsed Time	00:00:00.84

Within-Subjects Factors

Measure: Rating

interactive	Emotion	Dependent Variable
1	1	Mean_Positive_P1
	2	Mean_Negative_P1

2	1	Mean_Positive_P2
	2	Mean_Negative_P2

Between-Subjects Factors

		N
Group	gallery	16
	lab	16

Descriptive Statistics

	Group	Mean	Std. Deviation	N
Mean_Positive_P1	gallery	2.8938	.72798	16
	lab	2.9375	.67020	16
	Total	2.9156	.68867	32
Mean_Negative_P1	gallery	1.3188	.32908	16
	lab	1.5625	.82290	16
	Total	1.4406	.62880	32
Mean_Positive_P2	gallery	2.3813	.75031	16
	lab	2.2813	.84397	16
	Total	2.3313	.78717	32
Mean_Negative_P2	gallery	1.2563	.28745	16
	lab	1.4250	.54955	16
	Total	1.3406	.43984	32

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df
interactive	Pillai's Trace	.426	22.282[b]	1.000	30.000

	Wilks' Lambda	.574	22.282[b]	1.000	30.000
	Hotelling's Trace	.743	22.282[b]	1.000	30.000
	Roy's Largest Root	.743	22.282[b]	1.000	30.000
interactive * Group	Pillai's Trace	.019	.569[b]	1.000	30.000
	Wilks' Lambda	.981	.569[b]	1.000	30.000
	Hotelling's Trace	.019	.569[b]	1.000	30.000
	Roy's Largest Root	.019	.569[b]	1.000	30.000
Emotion	Pillai's Trace	.713	74.541[b]	1.000	30.000
	Wilks' Lambda	.287	74.541[b]	1.000	30.000
	Hotelling's Trace	2.485	74.541[b]	1.000	30.000
	Roy's Largest Root	2.485	74.541[b]	1.000	30.000
Emotion * Group	Pillai's Trace	.022	.674[b]	1.000	30.000
	Wilks' Lambda	.978	.674[b]	1.000	30.000
	Hotelling's Trace	.022	.674[b]	1.000	30.000
	Roy's Largest Root	.022	.674[b]	1.000	30.000
interactive * Emotion	Pillai's Trace	.203	7.618[b]	1.000	30.000
	Wilks' Lambda	.797	7.618[b]	1.000	30.000
	Hotelling's Trace	.254	7.618[b]	1.000	30.000
	Roy's Largest Root	.254	7.618[b]	1.000	30.000
interactive * Emotion * Group	Pillai's Trace	.001	.038[b]	1.000	30.000
	Wilks' Lambda	.999	.038[b]	1.000	30.000
	Hotelling's Trace	.001	.038[b]	1.000	30.000
	Roy's Largest Root	.001	.038[b]	1.000	30.000

Multivariate Tests[a]

Effect		Sig.	Partial Eta Squared	Noncent. Parameter
interactive	Pillai's Trace	.000	.426[b]	22.282
	Wilks' Lambda	.000	.426[b]	22.282
	Hotelling's Trace	.000	.426[b]	22.282
	Roy's Largest Root	.000	.426[b]	22.282

interactive * Group	Pillai's Trace	.456	.019[b]	.569
	Wilks' Lambda	.456	.019[b]	.569
	Hotelling's Trace	.456	.019[b]	.569
	Roy's Largest Root	.456	.019[b]	.569
Emotion	Pillai's Trace	.000	.713[b]	74.541
	Wilks' Lambda	.000	.713[b]	74.541
	Hotelling's Trace	.000	.713[b]	74.541
	Roy's Largest Root	.000	.713[b]	74.541
Emotion * Group	Pillai's Trace	.418	.022[b]	.674
	Wilks' Lambda	.418	.022[b]	.674
	Hotelling's Trace	.418	.022[b]	.674
	Roy's Largest Root	.418	.022[b]	.674
interactive * Emotion	Pillai's Trace	.010	.203[b]	7.618
	Wilks' Lambda	.010	.203[b]	7.618
	Hotelling's Trace	.010	.203[b]	7.618
	Roy's Largest Root	.010	.203[b]	7.618
interactive * Emotion * Group	Pillai's Trace	.846	.001[b]	.038
	Wilks' Lambda	.846	.001[b]	.038
	Hotelling's Trace	.846	.001[b]	.038
	Roy's Largest Root	.846	.001[b]	.038

Multivariate Tests[a]

Effect		Observed Power
interactive	Pillai's Trace	.995
	Wilks' Lambda	.995
	Hotelling's Trace	.995
	Roy's Largest Root	.995
interactive * Group	Pillai's Trace	.113
	Wilks' Lambda	.113
	Hotelling's Trace	.113

Emotion	Roy's Largest Root	.113
	Pillai's Trace	1.000
	Wilks' Lambda	1.000
	Hotelling's Trace	1.000
	Roy's Largest Root	1.000
Emotion * Group	Pillai's Trace	.125
	Wilks' Lambda	.125
	Hotelling's Trace	.125
	Roy's Largest Root	.125
interactive * Emotion	Pillai's Trace	.761
	Wilks' Lambda	.761
	Hotelling's Trace	.761
	Roy's Largest Root	.761
interactive * Emotion * Group	Pillai's Trace	.054
	Wilks' Lambda	.054
	Hotelling's Trace	.054
	Roy's Largest Root	.054

a. Design: Intercept + Group

Within Subjects Design: interactive + Emotion + interactive * Emotion

b. Exact statistic

c. Computed using alpha = .05

Mauchly's Test of Sphericity[a]

Measure: Rating

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
interactive	1.000	.000	0	.	1.000
Emotion	1.000	.000	0	.	1.000

interactive * Emotion	1.000	.000	0	.	1.000

Mauchly's Test of Sphericity[a]

Measure: Rating

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
interactive	1.000	1.000
Emotion	1.000	1.000
interactive * Emotion	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + Group

Within Subjects Design: interactive + Emotion + interactive * Emotion

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: Rating

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
interactive	Sphericity Assumed	3.747	1	3.747	22.282	.000
	Greenhouse-Geisser	3.747	1.000	3.747	22.282	.000
	Huynh-Feldt	3.747	1.000	3.747	22.282	.000
	Lower-bound	3.747	1.000	3.747	22.282	.000
interactive * Group	Sphericity Assumed	.096	1	.096	.569	.456
	Greenhouse-Geisser	.096	1.000	.096	.569	.456
	Huynh-Feldt	.096	1.000	.096	.569	.456
	Lower-bound	.096	1.000	.096	.569	.456

Error(interactive)	Sphericity Assumed	5.045	30	.168		
	Greenhouse-Geisser	5.045	30.000	.168		
	Huynh-Feldt	5.045	30.000	.168		
	Lower-bound	5.045	30.000	.168		
Emotion	Sphericity Assumed	48.634	1	48.634	74.541	.000
	Greenhouse-Geisser	48.634	1.000	48.634	74.541	.000
	Huynh-Feldt	48.634	1.000	48.634	74.541	.000
	Lower-bound	48.634	1.000	48.634	74.541	.000
Emotion * Group	Sphericity Assumed	.439	1	.439	.674	.418
	Greenhouse-Geisser	.439	1.000	.439	.674	.418
	Huynh-Feldt	.439	1.000	.439	.674	.418
	Lower-bound	.439	1.000	.439	.674	.418
Error(Emotion)	Sphericity Assumed	19.574	30	.652		
	Greenhouse-Geisser	19.574	30.000	.652		
	Huynh-Feldt	19.574	30.000	.652		
	Lower-bound	19.574	30.000	.652		
interactive * Emotion	Sphericity Assumed	1.877	1	1.877	7.618	.010
	Greenhouse-Geisser	1.877	1.000	1.877	7.618	.010
	Huynh-Feldt	1.877	1.000	1.877	7.618	.010
	Lower-bound	1.877	1.000	1.877	7.618	.010
interactive * Emotion * Group	Sphericity Assumed	.009	1	.009	.038	.846
	Greenhouse-Geisser	.009	1.000	.009	.038	.846
	Huynh-Feldt	.009	1.000	.009	.038	.846
	Lower-bound	.009	1.000	.009	.038	.846
Error(interactive*Emotion)	Sphericity Assumed	7.391	30	.246		
	Greenhouse-Geisser	7.391	30.000	.246		
	Huynh-Feldt	7.391	30.000	.246		

	Lower-bound	7.391	30.000	.246		

Tests of Within-Subjects Effects

Measure: Rating

Source		Partial Eta Squared	Noncent. Parameter	Observed Power
interactive	Sphericity Assumed	.426	22.282	.995
	Greenhouse-Geisser	.426	22.282	.995
	Huynh-Feldt	.426	22.282	.995
	Lower-bound	.426	22.282	.995
interactive * Group	Sphericity Assumed	.019	.569	.113
	Greenhouse-Geisser	.019	.569	.113
	Huynh-Feldt	.019	.569	.113
	Lower-bound	.019	.569	.113
Error(interactive)	Sphericity Assumed			
	Greenhouse-Geisser			
	Huynh-Feldt			
	Lower-bound			
Emotion	Sphericity Assumed	.713	74.541	1.000
	Greenhouse-Geisser	.713	74.541	1.000
	Huynh-Feldt	.713	74.541	1.000
	Lower-bound	.713	74.541	1.000
Emotion * Group	Sphericity Assumed	.022	.674	.125
	Greenhouse-Geisser	.022	.674	.125
	Huynh-Feldt	.022	.674	.125
	Lower-bound	.022	.674	.125
Error(Emotion)	Sphericity Assumed			
	Greenhouse-Geisser			

	Huynh-Feldt			
	Lower-bound			
interactive * Emotion	Sphericity Assumed	.203	7.618	.761
	Greenhouse-Geisser	.203	7.618	.761
	Huynh-Feldt	.203	7.618	.761
	Lower-bound	.203	7.618	.761
interactive * Emotion * Group	Sphericity Assumed	.001	.038	.054
	Greenhouse-Geisser	.001	.038	.054
	Huynh-Feldt	.001	.038	.054
	Lower-bound	.001	.038	.054
Error(interactive*Emotion)	Sphericity Assumed			
	Greenhouse-Geisser			
	Huynh-Feldt			
	Lower-bound			

a. Computed using alpha = .05

Tests of Within-Subjects Contrasts

Measure: Rating

Source	interactive	Emotion	Type III Sum of Squares	df	Mean Square	F
interactive	Linear		3.747	1	3.747	22.282
interactive * Group	Linear		.096	1	.096	.569
Error(interactive)	Linear		5.045	30	.168	
Emotion		Linear	48.634	1	48.634	74.541
Emotion * Group		Linear	.439	1	.439	.674

Error(Emotion)		Linear	19.574	30	.652	
interactive * Emotion	Linear	Linear	1.877	1	1.877	7.618
interactive * Emotion * Group	Linear	Linear	.009	1	.009	.038
Error(interactive*Emotion)	Linear	Linear	7.391	30	.246	

Tests of Within-Subjects Contrasts

Measure: Rating

Source	interactive	Emotion	Sig.	Partial Eta Squared	Noncent. Parameter
interactive	Linear		.000	.426	22.282
interactive * Group	Linear		.456	.019	.569
Error(interactive)	Linear				
Emotion		Linear	.000	.713	74.541
Emotion * Group		Linear	.418	.022	.674
Error(Emotion)		Linear			
interactive * Emotion	Linear	Linear	.010	.203	7.618
interactive * Emotion * Group	Linear	Linear	.846	.001	.038
Error(interactive*Emotion)	Linear	Linear			

Tests of Within-Subjects Contrasts

Measure: Rating

Source	interactive	Emotion	Observed Power
interactive	Linear		.995
interactive * Group	Linear		.113
Error(interactive)	Linear		
Emotion		Linear	1.000

Emotion * Group		Linear	.125
Error(Emotion)		Linear	
interactive * Emotion	Linear	Linear	.761
interactive * Emotion * Group	Linear	Linear	.054
Error(interactive*Emotion)	Linear	Linear	

a. Computed using alpha = .05

Tests of Between-Subjects Effects

Measure: Rating

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	515.606	1	515.606	799.086	.000	.964
Group	.254	1	.254	.393	.535	.013
Error	19.357	30	.645			

Tests of Between-Subjects Effects

Measure: Rating

Transformed Variable: Average

Source	Noncent. Parameter	Observed Power
Intercept	799.086	1.000
Group	.393	.093
Error		

a. Computed using alpha = .05

Estimated Marginal Means

1. Group

Measure: Rating

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
gallery	1.963	.100	1.757	2.168
lab	2.052	.100	1.847	2.257

2. interactive

Measure: Rating

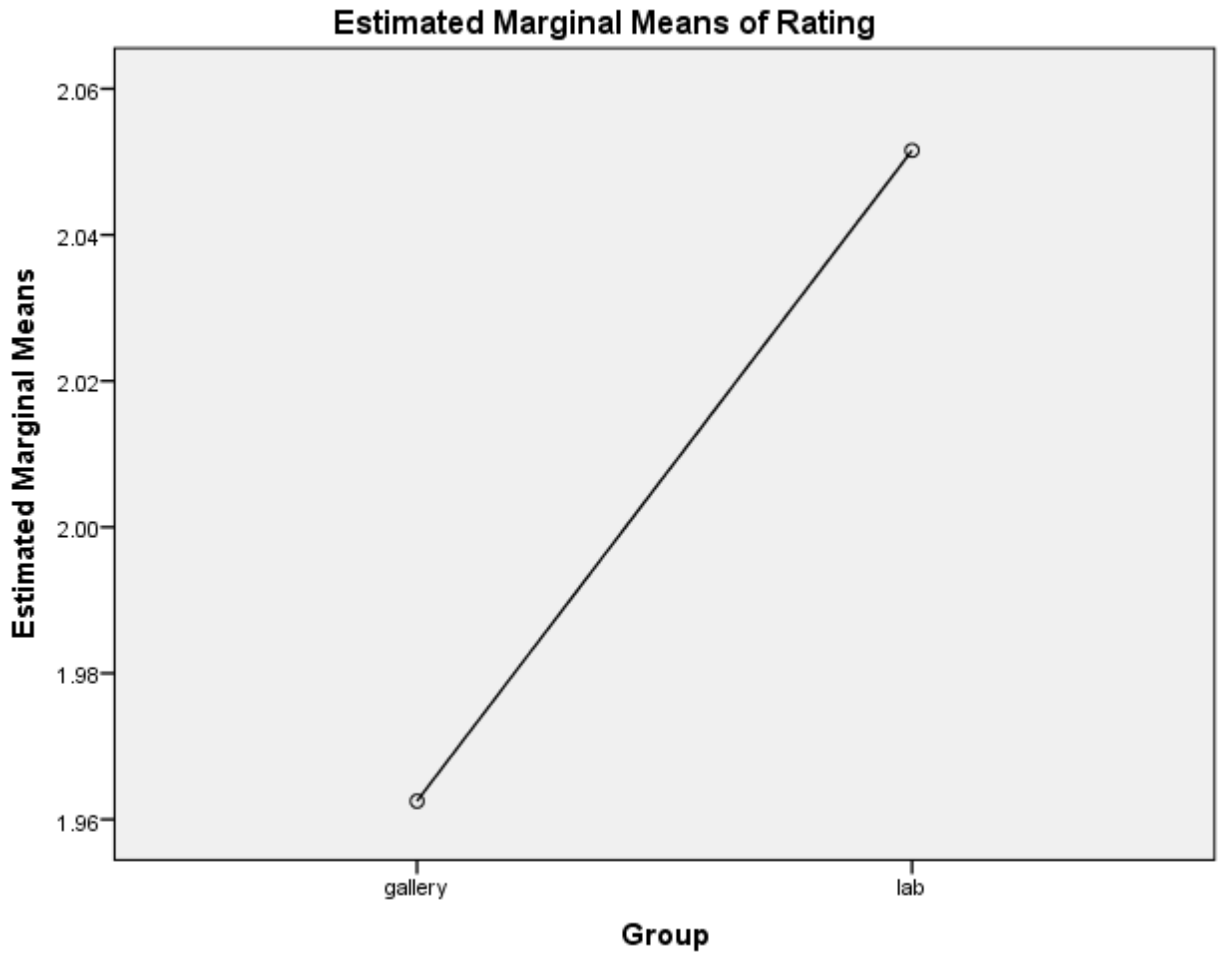
interactive	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	2.178	.078	2.019	2.338
2	1.836	.081	1.670	2.002

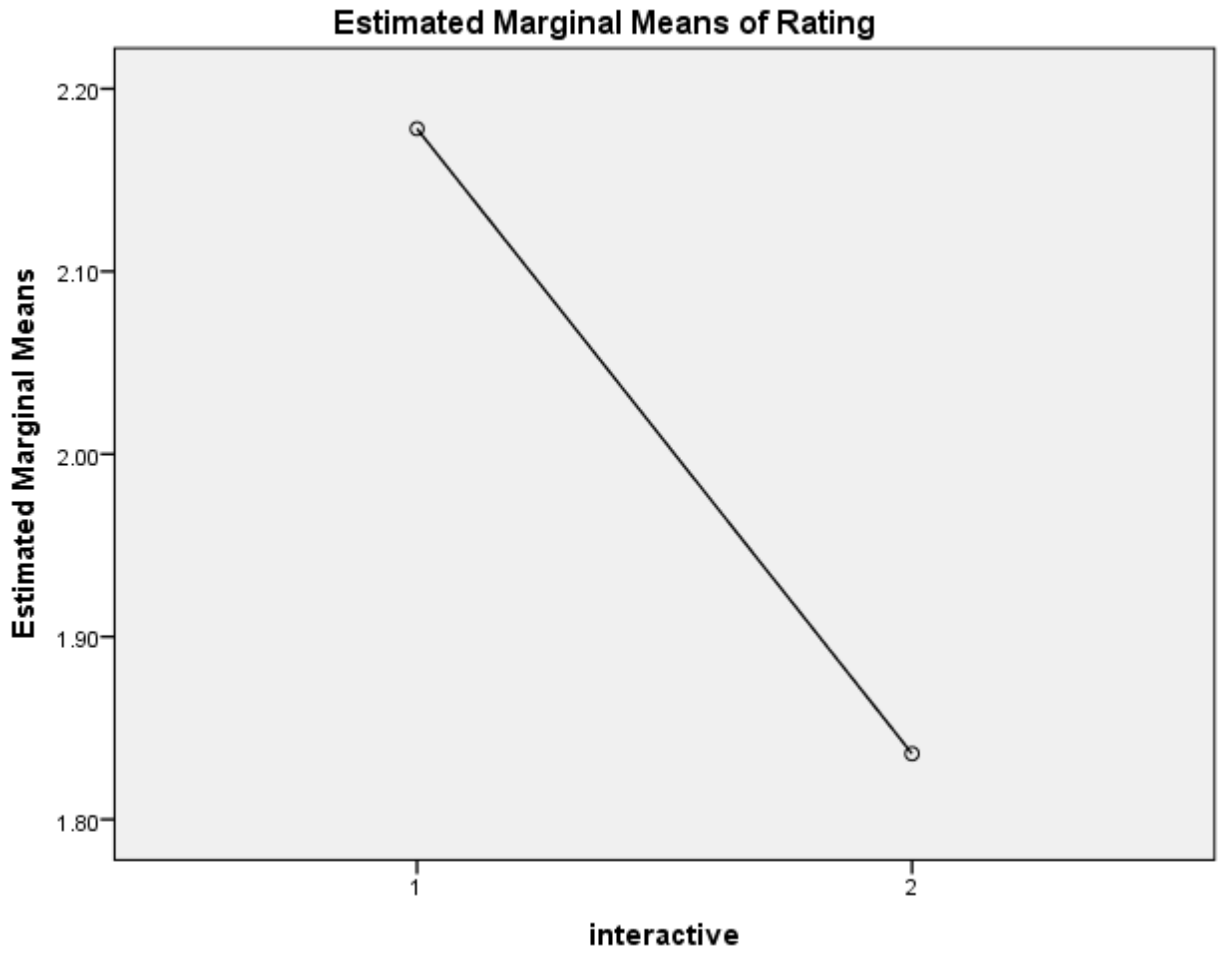
3. Emotion

Measure: Rating

Emotion	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	2.623	.115	2.389	2.858
2	1.391	.084	1.218	1.563

Profile Plots


Estimated Marginal Means of Rating
Estimated Marginal Means
2.06
2.04
2.02
2.00
1.98
1.96
gallery
lab
Group


Estimated Marginal Means of Rating
Estimated Marginal Means
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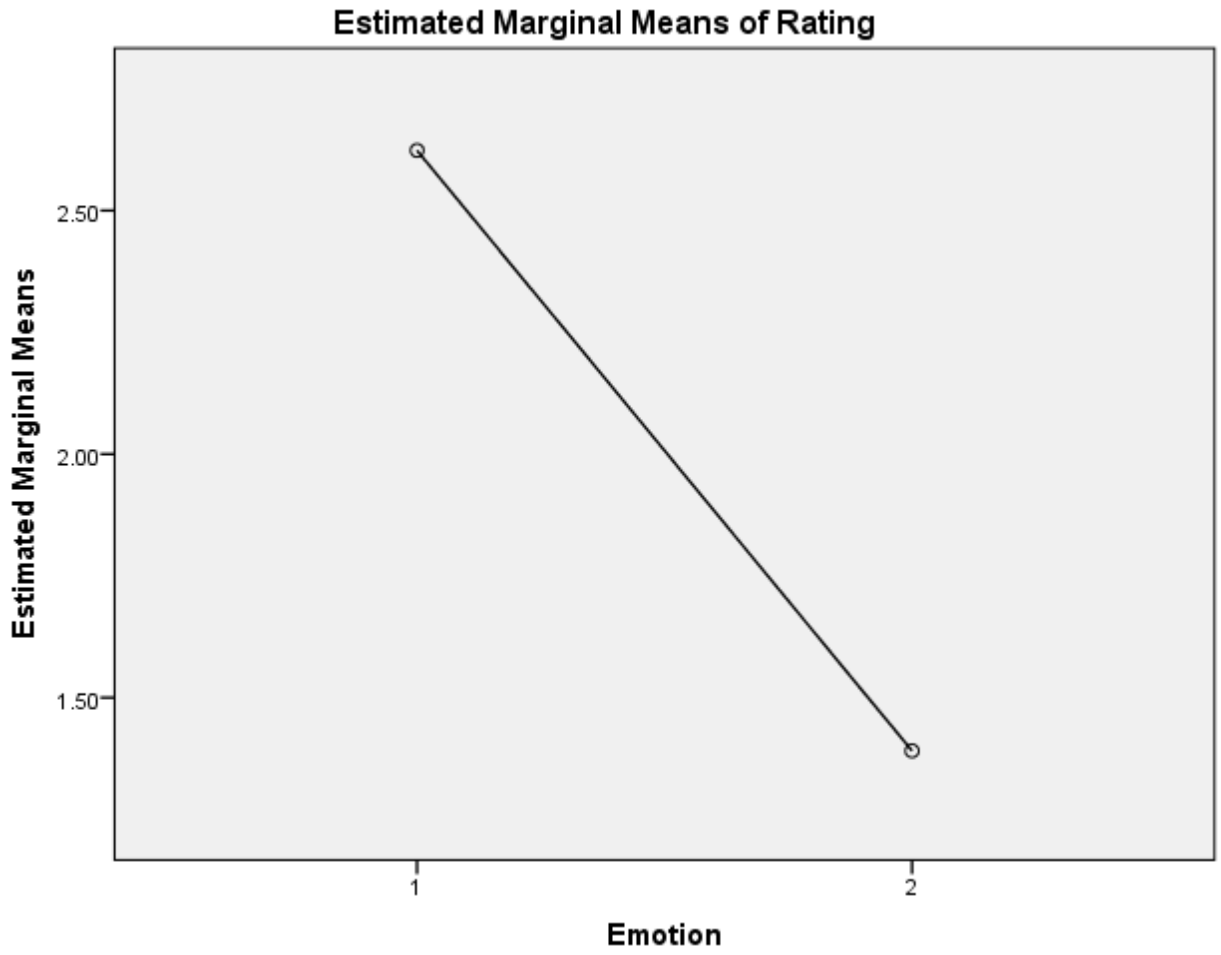
2.10
2.00
1.90
1.80
1
2
interactive


Estimated Marginal Means of Rating
Estimated Marginal Means
2.50
2.00
1.50
1
2
Emotion

Analysis 2: Please Smile (measure: time)

General Linear Model

Notes

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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		GLM P1_Time P2_Time BY Group /WSFACTOR=Interactive 2 Polynomial /MEASURE=Time /METHOD=SSTYPE(3) /PLOT=PROFILE(Group Interactive) /EMMEANS=TABLES(Group) /EMMEANS=TABLES(Interactive) /PRINT=DESCRIPTIVE ETASQ OPOWER /CRITERIA=ALPHA(.05) /WSDESIGN=Interactive /DESIGN=Group.

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Within-Subjects Factors

Measure: Time

Interactive	Dependent Variable
1	P1_Time
2	P2_Time

Between-Subjects Factors

		N
Group	gallery	16
	lab	16

Descriptive Statistics

	Group	Mean	Std. Deviation	N
P1_Time	gallery	218.88	82.886	16
	lab	221.00	87.122	16
	Total	219.94	83.655	32
P2_Time	gallery	137.56	84.812	16
	lab	144.31	90.647	16
	Total	140.94	86.419	32

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Interactive	Pillai's Trace	.482	27.967[b]	1.000	30.000	.000

	Wilks' Lambda	.518	27.967[b]	1.000	30.000	.000
	Hotelling's Trace	.932	27.967[b]	1.000	30.000	.000
	Roy's Largest Root	.932	27.967[b]	1.000	30.000	.000
	Pillai's Trace	.001	.024[b]	1.000	30.000	.878
Interactive * Group	Wilks' Lambda	.999	.024[b]	1.000	30.000	.878
	Hotelling's Trace	.001	.024[b]	1.000	30.000	.878
	Roy's Largest Root	.001	.024[b]	1.000	30.000	.878

Multivariate Tests[a]

Effect		Partial Eta Squared	Noncent. Parameter	Observed Power
Interactive	Pillai's Trace	.482	27.967[b]	.999
	Wilks' Lambda	.482	27.967[b]	.999
	Hotelling's Trace	.482	27.967[b]	.999
	Roy's Largest Root	.482	27.967[b]	.999
Interactive * Group	Pillai's Trace	.001	.024[b]	.053
	Wilks' Lambda	.001	.024[b]	.053
	Hotelling's Trace	.001	.024[b]	.053
	Roy's Largest Root	.001	.024[b]	.053

a. Design: Intercept + Group

Within Subjects Design: Interactive

b. Exact statistic

c. Computed using alpha = .05

Mauchly's Test of Sphericity[a]

Measure: Time

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser

Interactive	1.000	.000	0	.	1.000

Mauchly's Test of Sphericity[a]

Measure: Time

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
Interactive	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + Group

Within Subjects Design: Interactive

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: Time

Source		Type III Sum of Squares	df	Mean Square	F
Interactive	Sphericity Assumed	99856.000	1	99856.000	27.967
	Greenhouse-Geisser	99856.000	1.000	99856.000	27.967
	Huynh-Feldt	99856.000	1.000	99856.000	27.967
	Lower-bound	99856.000	1.000	99856.000	27.967
Interactive * Group	Sphericity Assumed	85.563	1	85.563	.024
	Greenhouse-Geisser	85.563	1.000	85.563	.024
	Huynh-Feldt	85.563	1.000	85.563	.024
	Lower-bound	85.563	1.000	85.563	.024
Error(Interactive)	Sphericity Assumed	107113.438	30	3570.448	
	Greenhouse-Geisser	107113.438	30.000	3570.448	

	Huynh-Feldt	107113.438	30.000	3570.448	
	Lower-bound	107113.438	30.000	3570.448	

Tests of Within-Subjects Effects

Measure: Time

Source		Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Interactive	Sphericity Assumed	.000	.482	27.967	.999
	Greenhouse-Geisser	.000	.482	27.967	.999
	Huynh-Feldt	.000	.482	27.967	.999
	Lower-bound	.000	.482	27.967	.999
Interactive * Group	Sphericity Assumed	.878	.001	.024	.053
	Greenhouse-Geisser	.878	.001	.024	.053
	Huynh-Feldt	.878	.001	.024	.053
	Lower-bound	.878	.001	.024	.053
Error(Interactive)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				

a. Computed using alpha = .05

Tests of Within-Subjects Contrasts

Measure: Time

Source	Interactive	Type III Sum of Squares	df	Mean Square	F	Sig.
Interactive	Linear	99856.000	1	99856.000	27.967	.000

Interactive * Group	Linear	85.563	1	85.563	.024	.878
Error(Interactive)	Linear	107113.438	30	3570.448		

Tests of Within-Subjects Contrasts

Measure: Time

Source	Interactive	Partial Eta Squared	Noncent. Parameter	Observed Power
Interactive	Linear	.482	27.967	.999
Interactive * Group	Linear	.001	.024	.053
Error(Interactive)	Linear			

a. Computed using alpha = .05

Tests of Between-Subjects Effects

Measure: Time

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	2083692.250	1	2083692.250	183.347	.000	.859
Group	315.063	1	315.063	.028	.869	.001
Error	340941.687	30	11364.723			

Tests of Between-Subjects Effects

Measure: Time

Transformed Variable: Average

Source	Noncent. Parameter	Observed Power
Intercept	183.347	1.000
Group	.028	.053

Error		

a. Computed using alpha = .05

Estimated Marginal Means

1. Group

Measure: Time

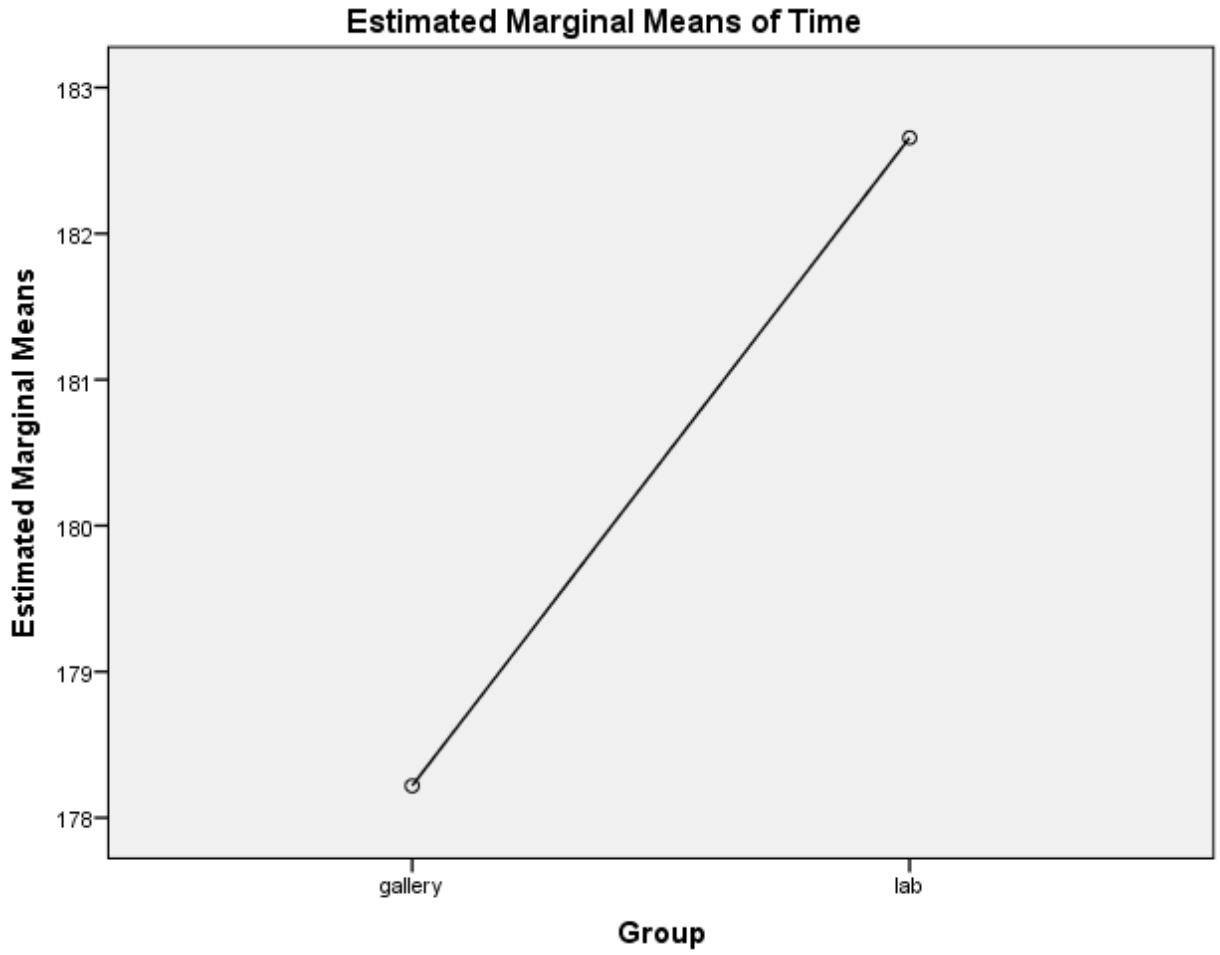
Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
gallery	178.219	18.845	139.731	216.706
lab	182.656	18.845	144.169	221.144

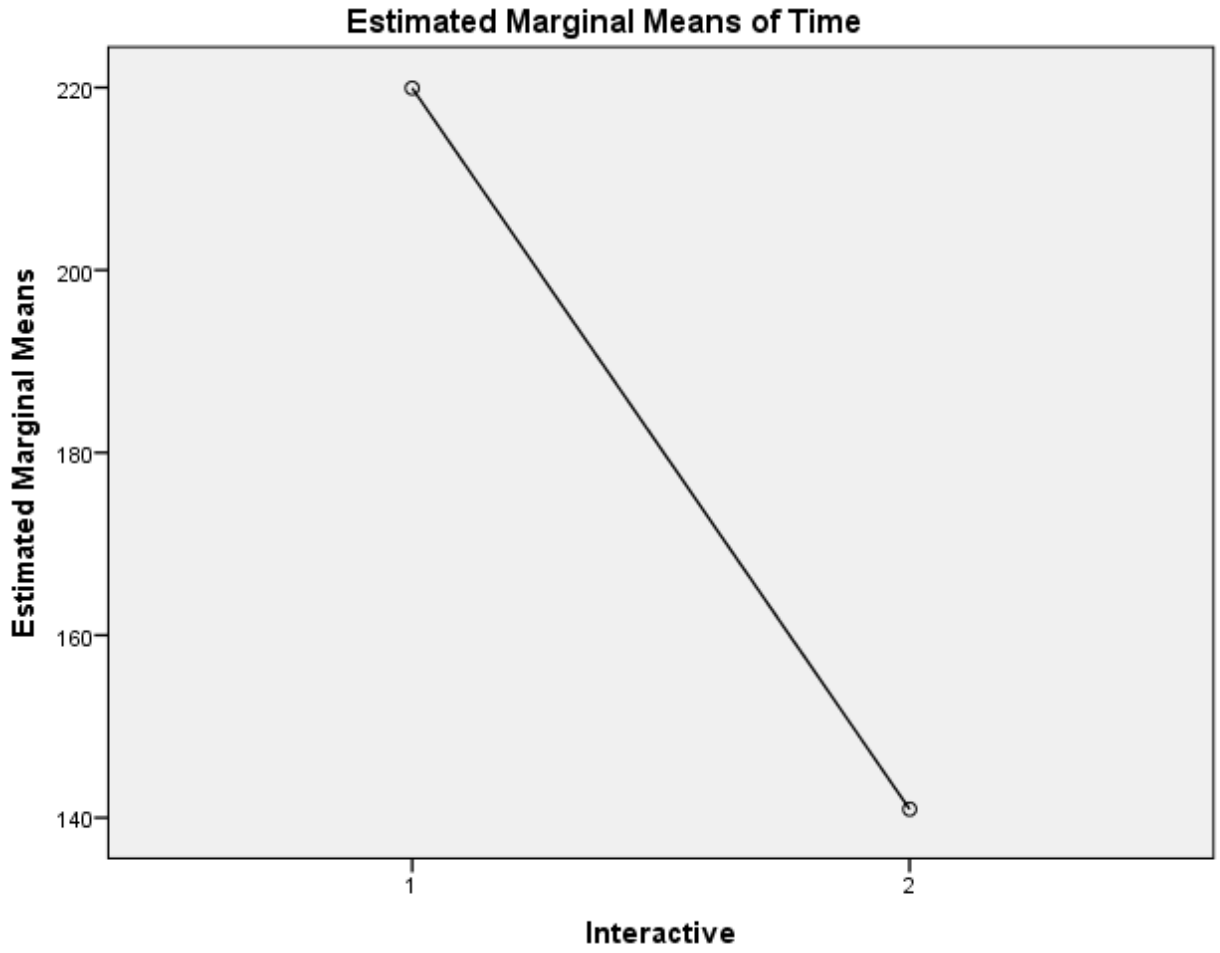
2. Interactive

Measure: Time

Interactive	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	219.938	15.031	189.239	250.636
2	140.938	15.517	109.247	172.628

Profile Plots


Estimated Marginal Means of Time
Estimated Marginal Means
183
182
181
180
179
178
gallery
lab
Group


Estimated Marginal Means of Time
Estimated Marginal Means
220
200
180
160
140
1
2
Interactive

Analysis 3: Hooray (measure: rating)

General Linear Model

Notes

Output Created		02-APR-2014 23:21:18
Comments		
Input	Data	C:\Dropbox\Hye Art Project\DataFIles\H_Master.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	32
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.

Syntax		GLM Mean_Positive_H1 Mean_Negative_H1 Mean_Positive_H2 Mean_Negative_H2 BY Group /WSFACTOR=interactive 2 Polynomial Emotion 2 Polynomial /MEASURE=Rating /METHOD=SSTYPE(3) /PLOT=PROFILE(Group interactive Emotion) /EMMEANS=TABLES(Group) /EMMEANS=TABLES(interactive) /EMMEANS=TABLES(Emotion) /PRINT=DESCRIPTIVE ETASQ OPOWER /CRITERIA=ALPHA(.05) /WSDESIGN=interactive Emotion interactive*Emotion /DESIGN=Group.
Resources	Processor Time	00:00:00.33
	Elapsed Time	00:00:00.31

Within-Subjects Factors

Measure: Rating

interactive	Emotion	Dependent Variable
1	1	Mean_Positive_H1
	2	Mean_Negative_H1

2	1	Mean_Positive_H2
	2	Mean_Negative_H2

Between-Subjects Factors

		N
Group	gallery	16
	lab	16

Descriptive Statistics

	Group	Mean	Std. Deviation	N
Mean_Positive_H1	gallery	3.5188	.88485	16
	lab	3.0375	.81558	16
	Total	3.2781	.87205	32
Mean_Negative_H1	gallery	1.2375	.21871	16
	lab	1.3125	.51104	16
	Total	1.2750	.38855	32
Mean_Positive_H2	gallery	2.7750	1.04594	16
	lab	2.2188	.83284	16
	Total	2.4969	.97202	32
Mean_Negative_H2	gallery	1.5813	.45199	16
	lab	1.4563	.59101	16
	Total	1.5188	.52144	32

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df
interactive	Pillai's Trace	.329	14.682[b]	1.000	30.000

	Wilks' Lambda	.671	14.682[b]	1.000	30.000
	Hotelling's Trace	.489	14.682[b]	1.000	30.000
	Roy's Largest Root	.489	14.682[b]	1.000	30.000
interactive * Group	Pillai's Trace	.031	.961[b]	1.000	30.000
	Wilks' Lambda	.969	.961[b]	1.000	30.000
	Hotelling's Trace	.032	.961[b]	1.000	30.000
	Roy's Largest Root	.032	.961[b]	1.000	30.000
Emotion	Pillai's Trace	.738	84.539[b]	1.000	30.000
	Wilks' Lambda	.262	84.539[b]	1.000	30.000
	Hotelling's Trace	2.818	84.539[b]	1.000	30.000
	Roy's Largest Root	2.818	84.539[b]	1.000	30.000
Emotion * Group	Pillai's Trace	.072	2.319[b]	1.000	30.000
	Wilks' Lambda	.928	2.319[b]	1.000	30.000
	Hotelling's Trace	.077	2.319[b]	1.000	30.000
	Roy's Largest Root	.077	2.319[b]	1.000	30.000
interactive * Emotion	Pillai's Trace	.466	26.133[b]	1.000	30.000
	Wilks' Lambda	.534	26.133[b]	1.000	30.000
	Hotelling's Trace	.871	26.133[b]	1.000	30.000
	Roy's Largest Root	.871	26.133[b]	1.000	30.000
interactive * Emotion * Group	Pillai's Trace	.003	.097[b]	1.000	30.000
	Wilks' Lambda	.997	.097[b]	1.000	30.000
	Hotelling's Trace	.003	.097[b]	1.000	30.000
	Roy's Largest Root	.003	.097[b]	1.000	30.000

Multivariate Tests[a]

Effect		Sig.	Partial Eta Squared	Noncent. Parameter
interactive	Pillai's Trace	.001	.329[b]	14.682
	Wilks' Lambda	.001	.329[b]	14.682
	Hotelling's Trace	.001	.329[b]	14.682
	Roy's Largest Root	.001	.329[b]	14.682

interactive * Group	Pillai's Trace	.335	.031[b]	.961
	Wilks' Lambda	.335	.031[b]	.961
	Hotelling's Trace	.335	.031[b]	.961
	Roy's Largest Root	.335	.031[b]	.961
Emotion	Pillai's Trace	.000	.738[b]	84.539
	Wilks' Lambda	.000	.738[b]	84.539
	Hotelling's Trace	.000	.738[b]	84.539
	Roy's Largest Root	.000	.738[b]	84.539
Emotion * Group	Pillai's Trace	.138	.072[b]	2.319
	Wilks' Lambda	.138	.072[b]	2.319
	Hotelling's Trace	.138	.072[b]	2.319
	Roy's Largest Root	.138	.072[b]	2.319
interactive * Emotion	Pillai's Trace	.000	.466[b]	26.133
	Wilks' Lambda	.000	.466[b]	26.133
	Hotelling's Trace	.000	.466[b]	26.133
	Roy's Largest Root	.000	.466[b]	26.133
interactive * Emotion * Group	Pillai's Trace	.757	.003[b]	.097
	Wilks' Lambda	.757	.003[b]	.097
	Hotelling's Trace	.757	.003[b]	.097
	Roy's Largest Root	.757	.003[b]	.097

Multivariate Tests[a]

Effect		Observed Power
interactive	Pillai's Trace	.960
	Wilks' Lambda	.960
	Hotelling's Trace	.960
	Roy's Largest Root	.960
interactive * Group	Pillai's Trace	.158
	Wilks' Lambda	.158
	Hotelling's Trace	.158

Emotion	Roy's Largest Root	.158
	Pillai's Trace	1.000
	Wilks' Lambda	1.000
	Hotelling's Trace	1.000
	Roy's Largest Root	1.000
Emotion * Group	Pillai's Trace	.314
	Wilks' Lambda	.314
	Hotelling's Trace	.314
	Roy's Largest Root	.314
interactive * Emotion	Pillai's Trace	.999
	Wilks' Lambda	.999
	Hotelling's Trace	.999
	Roy's Largest Root	.999
interactive * Emotion * Group	Pillai's Trace	.061
	Wilks' Lambda	.061
	Hotelling's Trace	.061
	Roy's Largest Root	.061

a. Design: Intercept + Group

Within Subjects Design: interactive + Emotion + interactive * Emotion

b. Exact statistic

c. Computed using alpha = .05

Mauchly's Test of Sphericity[a]

Measure: Rating

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
interactive	1.000	.000	0	.	1.000
Emotion	1.000	.000	0	.	1.000

interactive * Emotion	1.000	.000	0	.	1.000

Mauchly's Test of Sphericity[a]

Measure: Rating

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
interactive	1.000	1.000
Emotion	1.000	1.000
interactive * Emotion	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + Group

Within Subjects Design: interactive + Emotion + interactive * Emotion

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: Rating

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
interactive	Sphericity Assumed	2.311	1	2.311	14.682	.001
	Greenhouse-Geisser	2.311	1.000	2.311	14.682	.001
	Huynh-Feldt	2.311	1.000	2.311	14.682	.001
	Lower-bound	2.311	1.000	2.311	14.682	.001
interactive * Group	Sphericity Assumed	.151	1	.151	.961	.335
	Greenhouse-Geisser	.151	1.000	.151	.961	.335
	Huynh-Feldt	.151	1.000	.151	.961	.335
	Lower-bound	.151	1.000	.151	.961	.335

Error(interactive)	Sphericity Assumed	4.723	30	.157		
	Greenhouse-Geisser	4.723	30.000	.157		
	Huynh-Feldt	4.723	30.000	.157		
	Lower-bound	4.723	30.000	.157		
Emotion	Sphericity Assumed	71.103	1	71.103	84.539	.000
	Greenhouse-Geisser	71.103	1.000	71.103	84.539	.000
	Huynh-Feldt	71.103	1.000	71.103	84.539	.000
	Lower-bound	71.103	1.000	71.103	84.539	.000
Emotion * Group	Sphericity Assumed	1.950	1	1.950	2.319	.138
	Greenhouse-Geisser	1.950	1.000	1.950	2.319	.138
	Huynh-Feldt	1.950	1.000	1.950	2.319	.138
	Lower-bound	1.950	1.000	1.950	2.319	.138
Error(Emotion)	Sphericity Assumed	25.232	30	.841		
	Greenhouse-Geisser	25.232	30.000	.841		
	Huynh-Feldt	25.232	30.000	.841		
	Lower-bound	25.232	30.000	.841		
interactive * Emotion	Sphericity Assumed	8.405	1	8.405	26.133	.000
	Greenhouse-Geisser	8.405	1.000	8.405	26.133	.000
	Huynh-Feldt	8.405	1.000	8.405	26.133	.000
	Lower-bound	8.405	1.000	8.405	26.133	.000
interactive * Emotion * Group	Sphericity Assumed	.031	1	.031	.097	.757
	Greenhouse-Geisser	.031	1.000	.031	.097	.757
	Huynh-Feldt	.031	1.000	.031	.097	.757
	Lower-bound	.031	1.000	.031	.097	.757
Error(interactive*Emotion)	Sphericity Assumed	9.649	30	.322		
	Greenhouse-Geisser	9.649	30.000	.322		
	Huynh-Feldt	9.649	30.000	.322		

	Lower-bound	9.649	30.000	.322		

Tests of Within-Subjects Effects

Measure: Rating

Source		Partial Eta Squared	Noncent. Parameter	Observed Power
interactive	Sphericity Assumed	.329	14.682	.960
	Greenhouse-Geisser	.329	14.682	.960
	Huynh-Feldt	.329	14.682	.960
	Lower-bound	.329	14.682	.960
interactive * Group	Sphericity Assumed	.031	.961	.158
	Greenhouse-Geisser	.031	.961	.158
	Huynh-Feldt	.031	.961	.158
	Lower-bound	.031	.961	.158
Error(interactive)	Sphericity Assumed			
	Greenhouse-Geisser			
	Huynh-Feldt			
	Lower-bound			
Emotion	Sphericity Assumed	.738	84.539	1.000
	Greenhouse-Geisser	.738	84.539	1.000
	Huynh-Feldt	.738	84.539	1.000
	Lower-bound	.738	84.539	1.000
Emotion * Group	Sphericity Assumed	.072	2.319	.314
	Greenhouse-Geisser	.072	2.319	.314
	Huynh-Feldt	.072	2.319	.314
	Lower-bound	.072	2.319	.314
Error(Emotion)	Sphericity Assumed			
	Greenhouse-Geisser			

	Huynh-Feldt			
	Lower-bound			
interactive * Emotion	Sphericity Assumed	.466	26.133	.999
	Greenhouse-Geisser	.466	26.133	.999
	Huynh-Feldt	.466	26.133	.999
	Lower-bound	.466	26.133	.999
interactive * Emotion * Group	Sphericity Assumed	.003	.097	.061
	Greenhouse-Geisser	.003	.097	.061
	Huynh-Feldt	.003	.097	.061
	Lower-bound	.003	.097	.061
Error(interactive*Emotion)	Sphericity Assumed			
	Greenhouse-Geisser			
	Huynh-Feldt			
	Lower-bound			

a. Computed using alpha = .05

Tests of Within-Subjects Contrasts

Measure: Rating

Source	interactive	Emotion	Type III Sum of Squares	df	Mean Square	F
interactive	Linear		2.311	1	2.311	14.682
interactive * Group	Linear		.151	1	.151	.961
Error(interactive)	Linear		4.723	30	.157	
Emotion		Linear	71.103	1	71.103	84.539
Emotion * Group		Linear	1.950	1	1.950	2.319

Error(Emotion)		Linear	25.232	30	.841	
interactive * Emotion	Linear	Linear	8.405	1	8.405	26.133
interactive * Emotion * Group	Linear	Linear	.031	1	.031	.097
Error(interactive*Emotion)	Linear	Linear	9.649	30	.322	

Tests of Within-Subjects Contrasts

Measure: Rating

Source	interactive	Emotion	Sig.	Partial Eta Squared	Noncent. Parameter
interactive	Linear		.001	.329	14.682
interactive * Group	Linear		.335	.031	.961
Error(interactive)	Linear				
Emotion		Linear	.000	.738	84.539
Emotion * Group		Linear	.138	.072	2.319
Error(Emotion)		Linear			
interactive * Emotion	Linear	Linear	.000	.466	26.133
interactive * Emotion * Group	Linear	Linear	.757	.003	.097
Error(interactive*Emotion)	Linear	Linear			

Tests of Within-Subjects Contrasts

Measure: Rating

Source	interactive	Emotion	Observed Power
interactive	Linear		.960
interactive * Group	Linear		.158
Error(interactive)	Linear		
Emotion		Linear	1.000

Emotion * Group		Linear	.314
Error(Emotion)		Linear	
interactive * Emotion	Linear	Linear	.999
interactive * Emotion * Group	Linear	Linear	.061
Error(interactive*Emotion)	Linear	Linear	

a. Computed using alpha = .05

Tests of Between-Subjects Effects

Measure: Rating

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	587.388	1	587.388	805.676	.000	.964
Group	2.365	1	2.365	3.244	.082	.098
Error	21.872	30	.729			

Tests of Between-Subjects Effects

Measure: Rating

Transformed Variable: Average

Source	Noncent. Parameter	Observed Power
Intercept	805.676	1.000
Group	3.244	.414
Error		

a. Computed using alpha = .05

Estimated Marginal Means

1. Group

Measure: Rating

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
gallery	2.278	.107	2.060	2.496
lab	2.006	.107	1.788	2.224

2. interactive

Measure: Rating

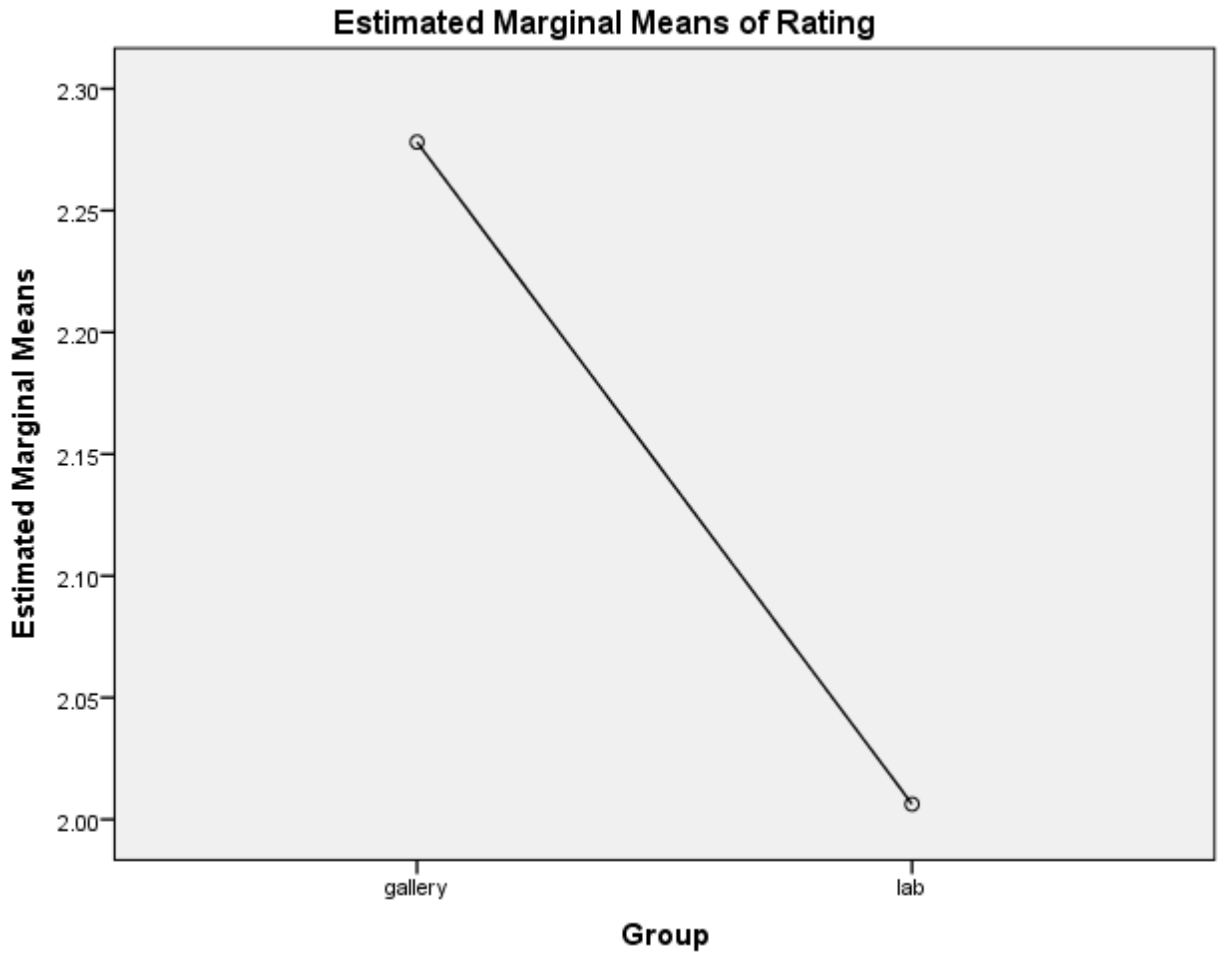
interactive	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	2.277	.081	2.111	2.442
2	2.008	.085	1.834	2.182

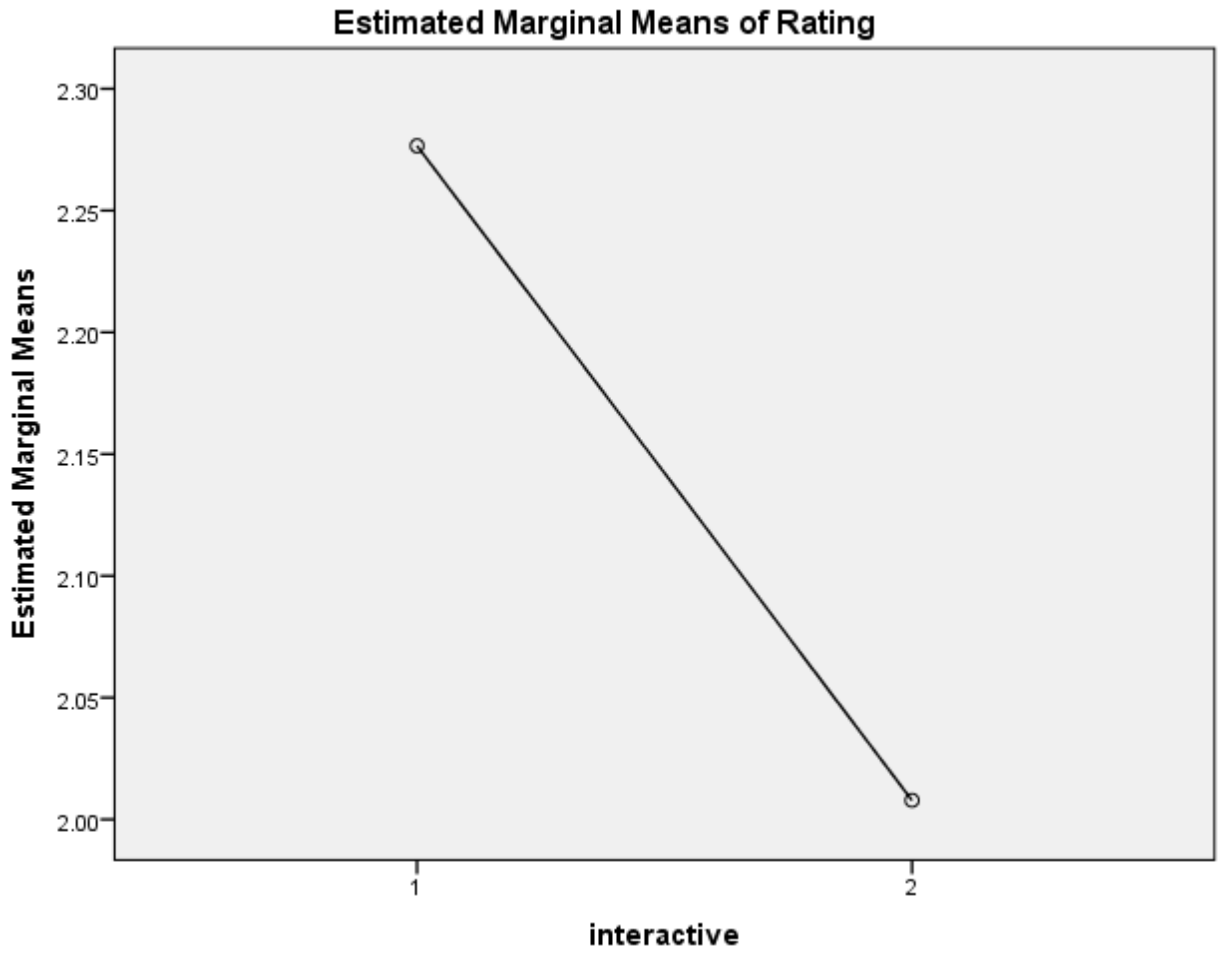
3. Emotion

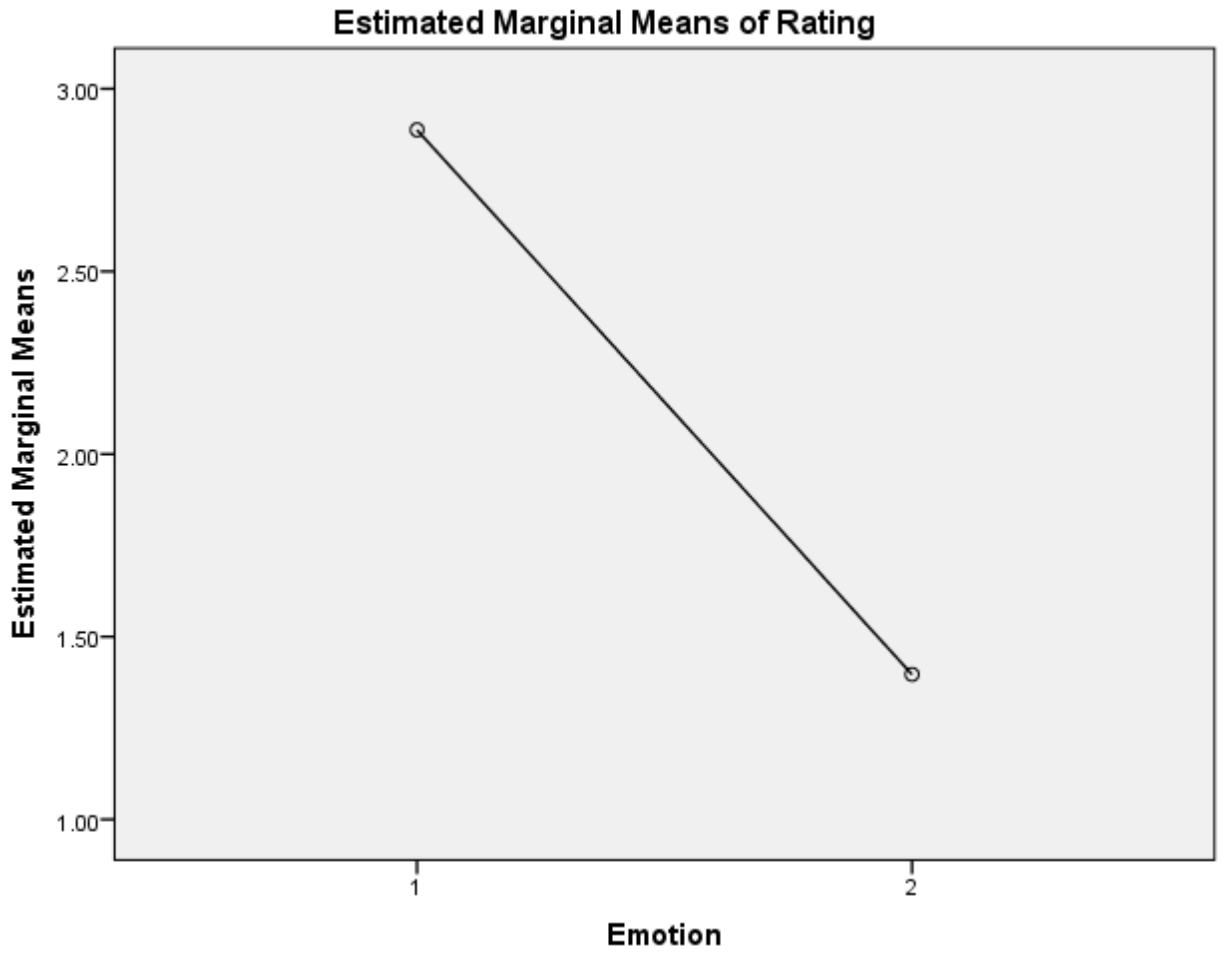
Measure: Rating

Emotion	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	2.888	.139	2.603	3.172
2	1.397	.072	1.251	1.543

Profile Plots


Estimated Marginal Means of Rating
Estimated Marginal Means
2.30
2.25
2.20
2.15
2.10
2.05
2.00
gallery
lab
Group


Estimated Marginal Means of Rating
Estimated Marginal Means
2.30
2.25
2.20
2.15
2.10
2.05
2.00
1
2
interactive


Estimated Marginal Means of Rating
Estimated Marginal Means
3.00
2.50
2.00
1.50
1.00
1
2
Emotion

Analysis 4: Hooray (measure: time)

General Linear Model

Notes

Output Created		02-APR-2014 23:24:48
Comments		
Input	Data	C:\Dropbox\Hye Art Project\DataFIles\H_Master.sav
	Active Dataset	DataSet1
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	Split File	<none>
	N of Rows in Working Data File	32
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		GLM H1_Time H2_Time BY Group /WSFACTOR=Interactive 2 Polynomial /MEASURE=Time /METHOD=SSTYPE(3) /PLOT=PROFILE(Group Interactive) /EMMEANS=TABLES(Group) /EMMEANS=TABLES(Interactive) /PRINT=DESCRIPTIVE ETASQ OPOWER /CRITERIA=ALPHA(.05) /WSDESIGN=Interactive /DESIGN=Group.

Resources	Processor Time	00:00:00.20
	Elapsed Time	00:00:00.21

Within-Subjects Factors

Measure: Time

Interactive	Dependent Variable
1	H1_Time
2	H2_Time

Between-Subjects Factors

		N
Group	gallery	16
	lab	16

Descriptive Statistics

	Group	Mean	Std. Deviation	N
H1_Time	gallery	238.13	55.252	16
	lab	194.38	88.931	16
	Total	216.25	76.144	32
H2_Time	gallery	216.38	94.776	16
	lab	153.25	96.312	16
	Total	184.81	99.313	32

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Interactive	Pillai's Trace	.127	4.348[b]	1.000	30.000	.046

	Wilks' Lambda	.873	4.348[b]	1.000	30.000	.046
	Hotelling's Trace	.145	4.348[b]	1.000	30.000	.046
	Roy's Largest Root	.145	4.348[b]	1.000	30.000	.046
	Pillai's Trace	.014	.413[b]	1.000	30.000	.525
Interactive * Group	Wilks' Lambda	.986	.413[b]	1.000	30.000	.525
	Hotelling's Trace	.014	.413[b]	1.000	30.000	.525
	Roy's Largest Root	.014	.413[b]	1.000	30.000	.525

Multivariate Tests[a]

Effect		Partial Eta Squared	Noncent. Parameter	Observed Power
Interactive	Pillai's Trace	.127	4.348[b]	.523
	Wilks' Lambda	.127	4.348[b]	.523
	Hotelling's Trace	.127	4.348[b]	.523
	Roy's Largest Root	.127	4.348[b]	.523
Interactive * Group	Pillai's Trace	.014	.413[b]	.095
	Wilks' Lambda	.014	.413[b]	.095
	Hotelling's Trace	.014	.413[b]	.095
	Roy's Largest Root	.014	.413[b]	.095

a. Design: Intercept + Group

Within Subjects Design: Interactive

b. Exact statistic

c. Computed using alpha = .05

Mauchly's Test of Sphericity[a]

Measure: Time

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser

Interactive	1.000	.000	0	.	1.000

Mauchly's Test of Sphericity[a]

Measure: Time

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
Interactive	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + Group

Within Subjects Design: Interactive

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: Time

Source		Type III Sum of Squares	df	Mean Square	F
Interactive	Sphericity Assumed	15813.063	1	15813.063	4.348
	Greenhouse-Geisser	15813.063	1.000	15813.063	4.348
	Huynh-Feldt	15813.063	1.000	15813.063	4.348
	Lower-bound	15813.063	1.000	15813.063	4.348
Interactive * Group	Sphericity Assumed	1501.562	1	1501.562	.413
	Greenhouse-Geisser	1501.562	1.000	1501.562	.413
	Huynh-Feldt	1501.562	1.000	1501.562	.413
	Lower-bound	1501.562	1.000	1501.562	.413
Error(Interactive)	Sphericity Assumed	109105.375	30	3636.846	
	Greenhouse-Geisser	109105.375	30.000	3636.846	

	Huynh-Feldt	109105.375	30.000	3636.846	
	Lower-bound	109105.375	30.000	3636.846	

Tests of Within-Subjects Effects

Measure: Time

Source		Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Interactive	Sphericity Assumed	.046	.127	4.348	.523
	Greenhouse-Geisser	.046	.127	4.348	.523
	Huynh-Feldt	.046	.127	4.348	.523
	Lower-bound	.046	.127	4.348	.523
Interactive * Group	Sphericity Assumed	.525	.014	.413	.095
	Greenhouse-Geisser	.525	.014	.413	.095
	Huynh-Feldt	.525	.014	.413	.095
	Lower-bound	.525	.014	.413	.095
Error(Interactive)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				

a. Computed using alpha = .05

Tests of Within-Subjects Contrasts

Measure: Time

Source	Interactive	Type III Sum of Squares	df	Mean Square	F	Sig.
Interactive	Linear	15813.063	1	15813.063	4.348	.046

Interactive * Group	Linear	1501.563	1	1501.563	.413	.525
Error(Interactive)	Linear	109105.375	30	3636.846		

Tests of Within-Subjects Contrasts

Measure: Time

Source	Interactive	Partial Eta Squared	Noncent. Parameter	Observed Power
Interactive	Linear	.127	4.348	.523
Interactive * Group	Linear	.014	.413	.095
Error(Interactive)	Linear			

a. Computed using alpha = .05

Tests of Between-Subjects Effects

Measure: Time

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	2573618.062	1	2573618.062	234.536	.000	.887
Group	45689.062	1	45689.062	4.164	.050	.122
Error	329196.875	30	10973.229			

Tests of Between-Subjects Effects

Measure: Time

Transformed Variable: Average

Source	Noncent. Parameter	Observed Power
Intercept	234.536	1.000
Group	4.164	.506

Error		

a. Computed using alpha = .05

Estimated Marginal Means

1. Group

Measure: Time

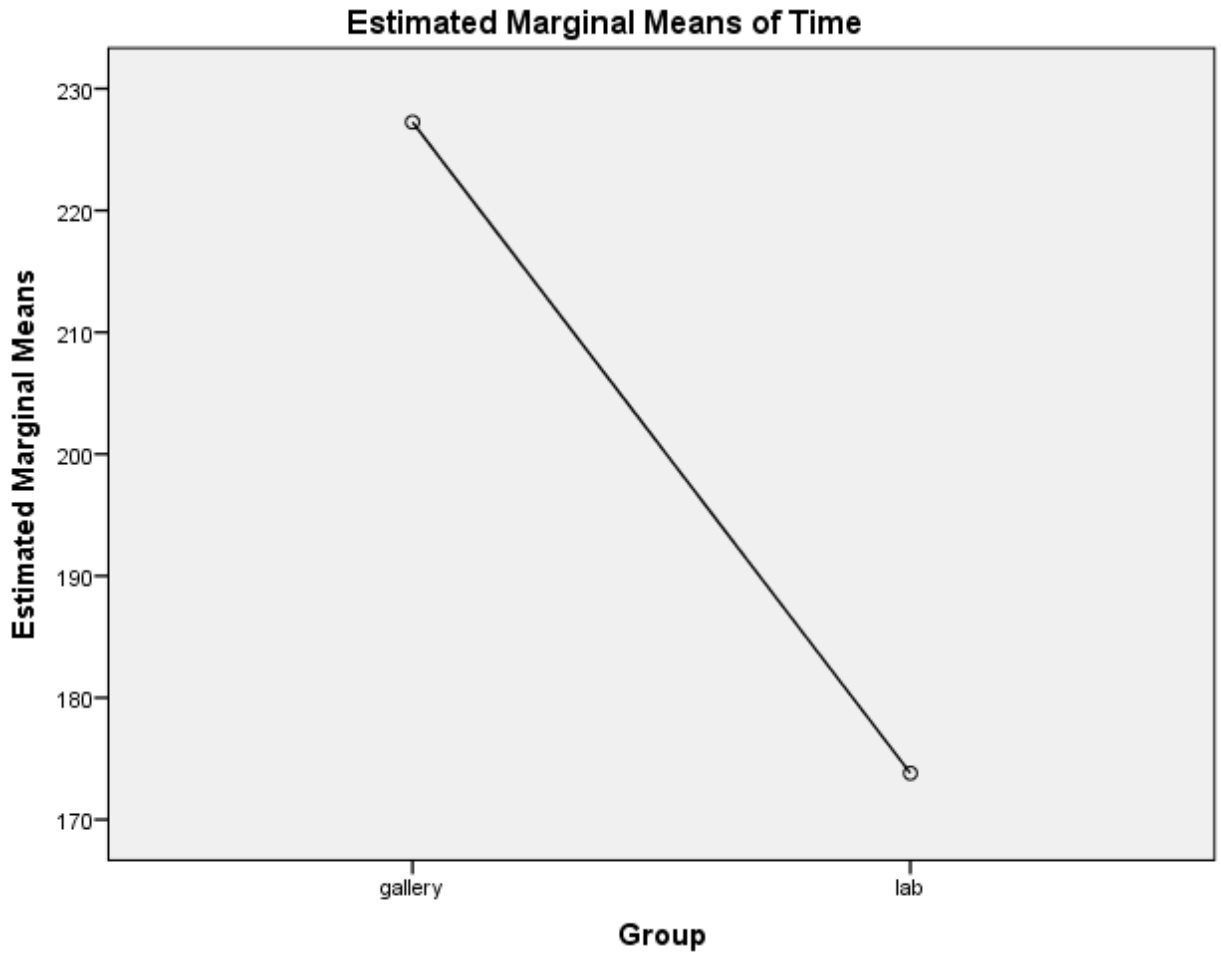
Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
gallery	227.250	18.518	189.431	265.069
lab	173.813	18.518	135.994	211.631

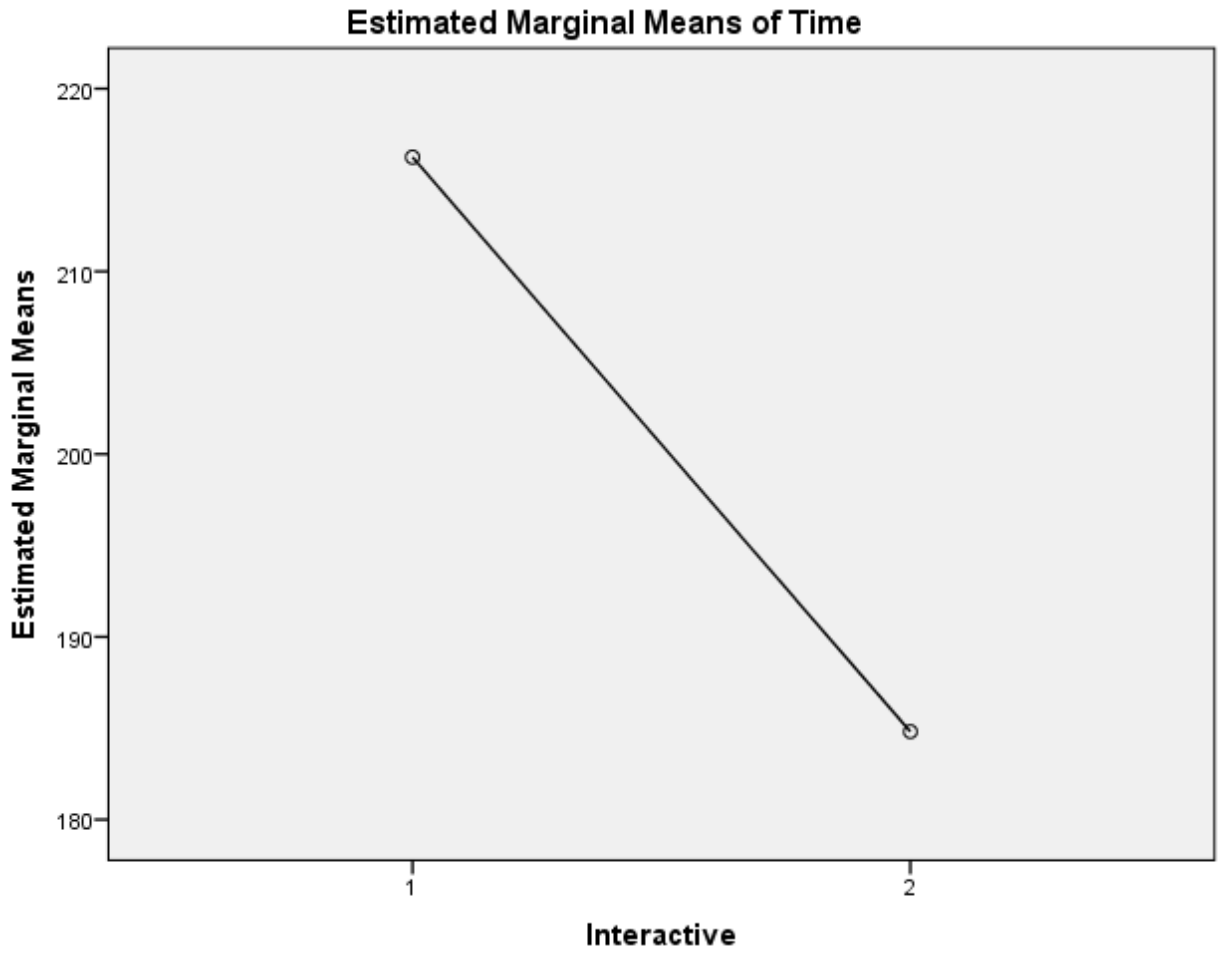
2. Interactive

Measure: Time

Interactive	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	216.250	13.087	189.522	242.978
2	184.813	16.891	150.317	219.308

Profile Plots


Estimated Marginal Means of Time
Estimated Marginal Means
230
220
210
200
190
180
170
gallery
lab
Group


Estimated Marginal Means of Time
Estimated Marginal Means
220
210
200
190
180
1
2
Interactive

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VITA

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