

Interactive Installations as Performance: Inspiration for HCI

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ABSTRACT

This paper identifies a theoretical framework of interactive installations as inspirational artistic probes for human-computer interaction (HCI). It develops interstices of interactive installations by drawing from new media and digital art. Performance studies provides key terminology – in constitutive, epistemic, and critical characteristics of performance – to illustrate how interactive installations can reference their audiences' social and cultural contexts and foster physical and emotional engagement, and influence critical thinking. This overlaps with HCI concerns but provides an approach that originates in the art-based community, highlighting the relevance of interactive installations to HCI. This connection and the inspirational role of interactive installations are discussed and supported by examples.

Author Keywords

Interactive installations; human-computer interaction; digital art; performance; physical interfaces; bodily movements.

ACM Classification Keywords

H.5.2 Information interfaces and presentation (e.g., HCI): User interfaces.

General Terms

Design; Human Factors; Performance.

INTRODUCTION

Interactive art has gradually found a persistent presence not only in specialized art galleries but also in events such as ISEA and Prix Ars Electronica as well as in the art or demo tracks at academic conferences such as CHI, SIGGRAPH, and TEI. Most often, these are works that explore social, political, and experiential boundaries of digital interfaces. They manage to break tradition, ask new questions, and explore new venues. Therefore, they present an inspiring combination of art, design practice, and implementation.

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They have become a strong influence on both art and the HCI community. 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 This argument also applies to art tracks in TEI and SIGGRAPH, which aim to inspire and facilitate new insights through boundary crossing. They engage in debate about how artistic and humanistic approaches can inform science and research. The debate about art and science or art vs. science is too wide to be covered here. Instead, this paper concentrates on a particular subgenre of art-based inspiration for HCI. This subgenre can be termed interactive installations, single works that are not necessarily intended for wider commercial use but instead live in the context of the art-related venues and engage participants in full-body interaction with computational physical interfaces. This paper is directed at both HCI researchers and digital artists looking for theoretical frameworks within which they place interactive installations as inspiration for HCI.

Motivation

A work created by Hye Yeon Nam, *Please Smile*² (2011), was shown at the 2012 CHI Conference in Austin in a typical environment for art-based interactive works. *Please Smile* consists of five interactive robotic skeleton arms that change their gestures in response to participants' smiles. Using computer vision, a camera recognizes the facial expressions of visitors standing in front of the robotic arms. Based on their facial expressions, the system activates 20 motors that control an array of skeletal hands that change their gestures.

Participants interact with *Please Smile* in three different ways. When no one is standing within the view of the camera, the five robotic skeleton arms set their default

¹<http://chi2014.acm.org/communities-spotlights/art-interaction>

²<http://www.hynam.org/>

position, bending their elbows and wrists towards the wall behind them. When participants step closer, the fingers point at and follow their movements. When the participants smile, the hands wave at them.

In many ways, *Please Smile* is a typical example of interactive art, and the creator has been invited to a range of other events and exhibitions. However, how can we identify the bridge between this work and the mainly research-oriented HCI community at the conference? Other scholarly approaches in this area have concentrated on design and emotion among interests. Gaver [17] introduces several works by artists who have explored multiple interpretations or provocations in design, and Benford et al. [5] use 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. The closest model to the proposed framework is provided by Sheridan et al., who also assert that public space can transform into a performance place by encouraging participation in digital live art [36], but they do not fully cover installation features of digital live art as a technological partner in a shared performance condition.



Figure 1. Interaction in *Please Smile* (2011)

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

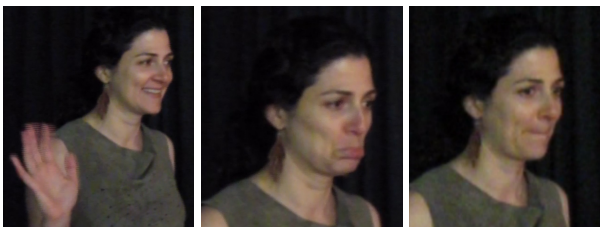


Figure 2. Participant's reactions to *Please Smile*

The participatory nature of interaction design has been noted before [33], but the specific context in the art gallery

at the CHI Conference creates a particular spatial condition. Taking this condition into account, Erika Suderburg defines installations as “the art form that takes note of the perimeters of space and reconfigures it” [41]. Michael Rush articulates interactive installations as “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” [33]. Definitions by Suderburg and Rush translate into an emphasis on (1) bodily interaction beyond restricted mouse clicking, (2) physical interfaces (often on a large scale) involved in digital technologies that can reconfigure a space, and (3) participants’ engagement. Combining these perspectives, interactive installations can be defined as facilitating the physical as well as the emotional engagement of the audience, involving bodily interaction in the reconfigured space of the art-related context. Distinct from a consumer-level interface design or a traditional art exhibit, interactive installations have carved out a place and condition of their own. Through their artistic quality, not necessarily their usability, they are important innovators and flourish in particular contexts and practices often informed by media theory and realized in the area of new media art. However, current approaches fail to provide theoretical frameworks for interactive installations.

Given their relevance in the field, interactive installations call for the development of a theoretical framework. This paper builds such a framework for interactive installations, asserting that in some areas, interactive installations and performance overlap and inspire the HCI community. Related key fields such as identity, body, critical thinking, and context are already part of the HCI debates. However, a new perspective from which one can approach these core terminologies and design qualities is suggested: one that originates in media theory and art history and arrives at HCI through performance studies.

First, to explain their dual nature as technological and conceptual innovations for HCI, this study will outline their connection to media theory and new media art. Then, it will develop a framework that will embody their particular qualities with references to performance studies. Third, it will discuss examples of interactive installations within this framework.

BACKGROUND

Digital Media Theories

This paper will begin by discussing the similarities and differences between traditional and interactive installation art within a particular field of HCI. Two basic initial conditions of interactive installations inform this development into a combination of digital art and tangible interaction design.

First, interactive installations involve physically interfacing with *digital technology*. In other words, they incorporate the

particular affordances of digital media. Janet Murray states that digital media has its own unique affordances [29] defined by their computational nature. Murray claims this nature as procedural, spatial, participatory, and encyclopedic as it transforms the user through agency [28]. Lev Manovich broadens the categories of digital media. He mentions that digital processes affect not only the production, but also “all stages of communication, including acquisition, manipulation, storage, and distribution” [26]. In an attempt to categorize the digital characteristics, he presents numerical representation, modularity, automation, variability, and transcoding. He argues that through digital media, the “cultural layer” and the “computer layer” affect one another. These affordances influence how interactive installations can present performance and participatory features and make the transition from object to event and from delivering meaning to providing dialogue. This echoes Lucy Suchman’s view on digital technology when she identifies a shift “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” [40]. In this regard, an interactive installation provides questions instead of solutions, for example, through a reencounter with one’s body [38].

Interactive installations also involve *full-body* interaction. Such an engagement of the whole bodily presence breaks the dominance of the eye as the main organ that perceives art [10]. In interactive installations, the interface as an event is not limited to a viewed object, but provides a stage on which the entire body can be engaged. An interactive installation reconfigures not only the space of the gallery but also the spatial presence of the visitor. Instead of Cartesian dualism of mind and body, Merleau-Ponty [27] says our body is tied to a world. Consequently, embodied artistic interaction can provide unique qualities of physical and cognitive transitions for participants, for it shifts participants from visitors to performers.

The meeting point of body and technology is a field for not only theoretical debate but also artistic practice. This paper argues that the application of these fundamental questions through art underscores the value of interactive installations for HCI. As even practitioners tend to categorize new media art through media theory, the theory often blends into this art-based debate. For example, Dietz [11] classifies the distinctive characteristics of new media as interactivity, connectivity, and computability, which relates to Manovich’s approach. Likewise, Saltz [34] maps the HCI triage of input, digital processing, and output onto digital art. These technological interdependencies foster a parallel among HCI, media studies, and digital art.

Roots in Art History

Digital art is a type of new media art that necessitates digital technology specifically in its form and/or process.

The traces of digital art originate mainly in Fluxus, Surrealism, Dada, and conceptual art movements focusing on “concept, event, and audience participation” in contrast to “unified material objects” [19, 31]. However, digital technologies have influenced art practices and expanded the definition of new media art. Christiane Paul traces the terminology for technological art forms throughout their evolutions. Since the 1970s, it has been referred to as “computer art” and “multimedia art”; currently it is called “digital art” under the inclusive term “new media art” [31]. The name changes and cross-disciplinary evolution reflect the ongoing dialogue between the art and HCI fields. They also indicate the fundamental impact that digital media and interaction design have had on art as it became process-based practice. Roberto Simanowski explains that when the viewer became part of a work of art and participates in the creation of the work (i.e., interactive art), a further change took place that contrasts with his summary of the classic notion of an artist, a viewer, and a work of art as “one viewed a static object on which an artist had bestowed meaning” [38]. This contributing role also reflects the historic definition of HCI and its focus on human use [21]. As HCI grows to include more factors such as emotion [5], awareness [17], cognition [16], or sustainability [13], digital art continues to evolve in parallel with differently weighed interaction design.

When interactive installations encourage or require the audience to complete or even produce the work through participation, they continuously challenge the relationship among artist, audience, and artwork. According to Paul, this classic triad of art involvement is blurred as (1) “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,” (2) the “public or audience becomes a participant in the work, reassembling the textual, visual, and aural components of the project,” and (3) “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” [31]. At the same time, Rush emphasizes interactivity as the driving factor that transforms museumgoers into participants, users, and players [33].

Notably, these definitions often already foreshadow a turn toward performance in art-based interaction design. As these pieces incorporate both digital and artistic concepts, they emerge as machines for a performance that functions via bodily engagement and thus transform viewers into participants as they become part of the art process.

HCI and the Performance Studies

HCI has used theater and performance as references in the past. Laurel [25] projected Aristotle’s elements of structure in drama to human-computer activity. In her theory, both human and computer agents interact as characters and collaborators. In this expanded performance theory, a

dramatic event is presented as an alternative to the notion of a traditional task. Interactive installations step beyond Laurel's comparison of computers with traditional theater-based performances. Interactive installations extend cognitive and physical interaction beyond the two-dimensional computer screen into three-dimensional space to offer new experiences and new forms of engagement.

Influenced by Laurel, Jacucci [23] adapts mixed media that employs digital and physical artifacts in HCI. He claims that mixed media can lead to "experiential, presentational and representational interaction" of participants. In his view, participants use body movements and mixed artifacts to reconfigure space during an expressive event. Similarly, Benford et al. [3] and Reeves et al. [32] present the concept of the performance frame in HCI including the active involvement of participants as well as spectators in mixed reality pieces. Both positions are relevant to the arguments presented in this paper. HCI heavily features various realizations of the kind of mixed-reality performances that include robotics, video games, telematics techniques, or online communication. However, the combination of performance and the digital art calls for more critical attention. Steve Dixon defines 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" [14], which is an inclusive term. To support this paper's claim that performance in digital art, particularly in interactive installations, is important, one must acknowledge the need for an examination of performance studies.

Performance studies evolved out of two main fields: anthropology and communication. Representing the anthropological tier, Richard Schechner describes performance as an umbrella term containing multiple spheres of rituals and dramatic expressions from shamanistic rituals to everyday life behavior [35]. Similarly, Erving Goffman claims "performance may be defined as all the activity of a given participant on a given occasion which serves to influence in any way any of the other participants" [20]. He asserts that our sociocultural actions in everyday life become performances. Indeed, Goffman's approach to identity through performance already describes one aspect of interactive installations as performance for viewers. Performances can support a new engagement with everyday life. In contrast to traditional art, the performance stance of new media art often does not provide specific guidelines to audiences. Instead, it bestows the power of control to the audience as 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 interaction creators and interpreters within their social and cultural backgrounds. Gaver et al. [18] claim that users can enjoy voluntary interaction and often obtain a deeper level of understanding of the system through ambiguous interactions. In addition, anthropological views of performance expand the

perspective towards emerging applications based on our everyday life and beyond. For example, Dailey and Conquergood [9] add that not only can different sociocultural backgrounds stimulate performance, but performance can also influence an individual's sociocultural experience. Culture is not a rigid reference point but a fluid and active term in performance studies. Thus, by incorporating performance studies' approach into research, the HCI community can strengthen its role as cultural producers through the adaptation of a new dynamic cultural framework.

On the communication-driven side, Richard Bauman defines performance as "a mode of communicative display, in which the performer signals to an audience" [1]. He emphasizes the collaborative participation. Performance is a dynamic and interactive form that involves continuously communication in and across language, order, roles, identities, and culture. Performance is seen as expressive in and through communication "to heighten experience, to comment upon experience, and to make experience available for contemplation" [2]. According to Bauman, expressive forms of communication are not ends in themselves, but they have social and political effects. In HCI, several scholars and practitioners explore the importance of communicative and expressive interfaces for critical expression. For example, Kim et al. [24] introduce an expressive t-shirt that lights up to indicate the level of air contamination and DiSalvo et al. [13] include expressive eco-engaged art in the discussion of sustainable HCI.

To emphasize its principle effects on communication and understanding, HCI also applies expressive design to tangible interfaces. Nadeau and Williams [30] employ a tangible interface to encourage participants' collaboration and Sheridan and Bryan-Kinns [36] outline a design framework for performative tangible interaction. In their implantations, tangible features (e.g., movements, vibration, weight, scale) and audio-visual effects (e.g., laser, light, sound) enforce communicative and expressive characters. However, they stop short of a discussion of the fundamental influence of art and performance, which reconfigures spaces and interfaces in interaction.

This summary of selected theories in performance studies provides the background for the performance-driven framework of interactive installations and illustrates its relevance to HCI. Informed by new media theories as well as digital art, we can develop the necessary framework to explore the connection between the interactive installations and HCI.

FRAMEWORK OF INTERACTIVE INSTALLATIONS

Critical media studies and art history support a performance-based framework for interactive installations inspired by Bell [2]. Summarizing multiple strands of performance, Bell offers key terminology—constitutive, epistemic, and critical qualities of performance—that outlines the proposed argument in which interactive

installations can reference their audiences' social and cultural contexts, foster physical and emotional engagement, and influence critical thinking. Applying these performance-based criteria to the field of interactive installations provides a framework that outlines how these particular works draw from an art background and how they can relate to and inspire HCI.

Bell describes three terms that summarize three qualities of performance across different approaches: (1) *constitutive*, meaning "performance creates"; (2) *epistemic*, meaning "performance is a way of knowing"; and (3) *critical*, meaning "performance is a way of staking claims about...creation and knowledge" [2]. All three approaches apply to interactive installations.

First, an interactive installation being *constitutive* implies that the interactive installation references a participant's social and cultural condition. It mostly draws from the anthropological side of performance studies. Victor Turner 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'" [42]. Digital technology enables these transactions in interactive installations and strengthens performativity in them using the blurred border between physical and digital domains in the performance. Participants are continuously encouraged to reflect on their own experience based on their individual social and cultural backgrounds but also to act upon it. HCI, as a socially aware discipline, has been the subject of considerable debate, yet the particular performance situation encourages the HCI community to consider how it can involve users' heterogeneous social and cultural backgrounds in interaction and what the sociocultural experience inflicts on users' self-expression through performance with the interfaces.

Second, *epistemic* qualities relate to the full-body interaction that shifts focus to the physical space and embodied experiences. Merleau-Ponty emphasizes the body as "a nexus of living meanings" [27]. Using his explanation, embodied interactions provide particular forms of engagement that drive the development of tangible and embodied interaction [22]. Members of an audience in interactive installations learn about themselves from their embodied experience as well as about others and the world from observing (other participants') embodied experience. We understand our own embodiment (the phenomenological body) and how it is understood by others (the objective body) within a social context. Interactive installations reconfigure spaces, so participants create a shared performance. Inside these spaces, interactive installations are not passive objects, but technological co-performers. Embodiment is a well-covered field in HCI, but the role of technological parts as co-performers in the reconfiguration of performance spaces exposes the interactive object to multiple layers of artistic debate.

Third, the *critical* qualities of interactive installations help audiences identify hidden forces that operate beneath an interface. Concepts borrowed from critical performance theorists and practitioners such as Brecht [7] and Boal [6] can be referenced to analyze how interactive installations can reflect social and political roles. Since participants usually perceive critical views built on constitutive and epistemic factors, they generally overlap and re-enforce one another. Once again, a focus on critical use is not new to HCI, but performance can add a range of historical, theoretical, and practical views on this ongoing discussion.

To solidify the framework and to clarify how constitutive, epistemic, and critical qualities can inspire HCI, all three qualities will be discussed with examples.

DISCUSSION AND EXAMPLES

Constitutive Quality of Interactive Installations

As a responsive and communicative tool, interactive installations accelerate the formation of a connection between a participant and a corresponding representation. The constitutive qualities of interactive installations not only reference participants' individual experiences but also influence their social and cultural perspectives.

*Boundary Functions*³ (1999) by Scott Snibbe visualizes personal space in relation to individuals. When more than two participants are detected in the performance space, an overhead projection draws a straight line between participants to indicate their personal space. The more people that participate in the interaction, the smaller their dedicated personal space becomes. However, each participant has a unique perception regarding the size and the quality of a comfortable personal space. Thus, the experience of the interaction can vary depending on the individual cultural and social background.

Personal space can be related to other issues such as questioning control, ownership, and context. Another example, *Blendie*⁴ (2003), by Kelly Dobson, speaks to not only human identity in social relations but also machine culture. It presents the participant with a blender, which can only be operated through sound input. To initiate the blender, a participant has to imitate the operating sound of the machine. The power of the blender matches the volume of the participant's sounds (a soft, low-pitch sound causes the blender to spin slowly, and a loud, high-pitch sound causes the blender to speed up). 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. DiSalvo [12] 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

³<http://www.snibbe.com/>

⁴<http://web.media.mit.edu/~monster/blendie/>

traditionally utilitarian stance of domestic appliances to a personal and reflective relationship with them through performance, which questions techno-social conditions. *Blendie* and *Boundary Functions* illustrate how a constitutive shift can open up new perspectives. To apply this shift to HCI, designers and researchers of HCI can explore how culture and perspective are represented, enhanced, or adjusted through self-expression and self-reflection in their designs.

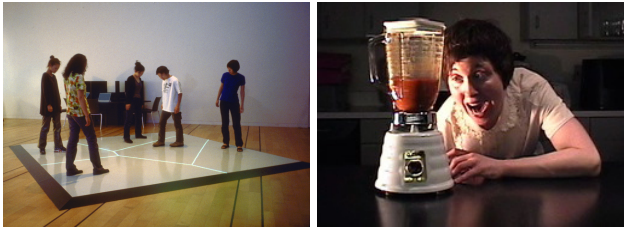


Figure 3. Left: *Boundary Functions* (1999); right: *Blendie* (2003)

Epistemic Quality of Interactive Installations

The epistemic quality of interactive installations is based on their embodied and phenomenological nature. Both have been emphasized in HCI. Paul Dourish notes, “Action both produces and draws upon meaning; meaning both gives rise to and arises from action” [15]. Dourish hints at how participants’ actions can affect and be affected by their meaning-making processes when they perform in an interactive installation.

The importance of embodiment continues into performance studies. Jonathan Sterne emphasizes the influence of technology to the 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” [39]. Similarly, Susan Broadhurst, in her work in which participants’ control over sound, light, and projected images through physical movement, 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” [8]. According to Sterne and Broadhurst, interactive installations using digital technology can provide a new form of experience through their engagement of the audience’s performing bodies.

*Access*⁵ (2003), a work by Marie Sester, transforms a public space into a dramatic public performance space through physical as well as digital interaction. To connect the two, *Access* uses surveillance and network technology. In the work, a bright robotic spotlight shines on a person selected by online users through a surveillance camera system. The spotlight singles out a person from other individuals in the surrounding area. The installation is not a normal object such as a light or a lamp, but it unfolds in a reconfigured

performance space that changes the bodily presence of the participants, both the selected individual and the surrounding ones. The interactive spotlight transforms a single spectator into a main character on the performance stage and often triggers new behaviors that differ from the responses of surrounding onlookers.

While the surveillance part of *Access* remains partially obscured, it is a key component of artist Golan Levin’s work. Several of his installations use sensors to detect and emphasize a visitor’s presence. In *Double-Taker*⁶ (2008), an eight-foot giant robot arm with one eyeball follows participants’ movements with its gaze, emphasizing surveillance and the direct view hidden in *Access*.



Figure 4. Left: *Access* (2003); right: *Double-Taker* (2008)

These works resonate with participants because they question the roles of their bodies in space and evoke new behavior within a dynamic social context. Such a reconfiguration of space and identity is a defining element of installation (see Suderberg above) as well as digital media (see Murray above). However, the emphasis on performance connects the spatial reconfiguration to embodied interaction designs, 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 the artwork into the position of being a co-performance beyond passive object-ness.

The Critical Quality of Interactive Installations

Like HCI, interactive installations inherit and convey social and political roles. However, their lineage takes a different route than, for example, third-wave HCI approaches to values in design. Brecht [7] discusses the critical role of the audience in its dialectic relationship with performance, not as one immersed in the drama in a cathartic Aristotelian way, but as a critical interrogator of the events on stage. Since Brecht’s alienation separates audience from performer, his “alienation effect” and artistic techniques can counter the new attempts of HCI.

In contrast to Brecht, Boal [6] provides “the theater of the oppressed,” which consists of a participatory theater or a rehearsal theater as a means of discussing social changes through dynamic roles. Audiences can become active

⁵<http://www.sester.net/>

⁶<http://www.flong.com/>

performers and relate the context of the performance to their everyday life. Boal tries to bridge the gap between actor and spectator and coined the term “spect-actor” as someone who has opportunities to act and observe. His techniques can foster critical thinking and engagement through performance. The activation of critical action is often initiated through a shift of the audience to the role of “spect-actor.” HCI researchers have already discussed such increased engagement through performance in the context of witting/unwitting participation [37] or in the increased immersion of inhabited television [4]. However, their approaches focus largely on levels of engagement without a central critical perspective.

Interactive installations often work by positioning the audience in a critical stance in a new sociopolitical context. For example, a Mexican-Canadian artist Rafael Lozano-Hemmer integrates political meanings into his work in such a way. In *Standards and Double Standards*⁷ (2004), fifty buckles are 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. 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. Engagement is part of realizing this inherent critique.

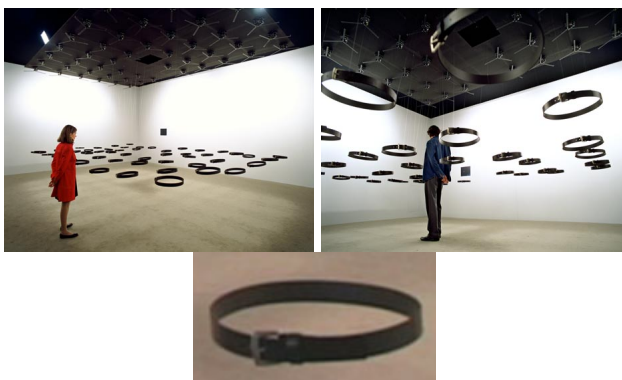


Figure 5. *Standards and Double Standards* (2004)

The examples are selective but show that the framework of interactive installations grows from their origin in art-based practice to add value and direction for a broader community overlapping that of HCI.

CONCLUSION

This paper identified interactive installations as artistic works including full-body interaction in art-related venues such as galleries, museums, theaters, city streets, or demo

floors. It also briefly outlined their context in new media and digital art. Based on this context, a three-tier framework was adapted from performance studies and outlined in theories and examples that are relevant in both the arts and the HCI domain.

The discussion highlighted the artistic implementation of the theoretical framework as adapted from an artistic lineage. The chosen examples convey these qualities of the theoretical framework that relate closely to HCI debates pertaining to identity, embodiment, and critical perspective. Through the framework, this paper provided inspirational variety for HCI by reinterpreting the three qualities that support an interconnection of art and science and that were originally outlined by performance scholars. The three qualities also provide a tangible, expandable connection between digital art and HCI.

The goal of this work was not to simply merge artistic and usability-oriented interaction design. On the contrary, we expect artists to evade such attempts now and in the future. However, what the theoretical framework for interactive installations that this paper provided was a conduit from one to the other without glossing over their differences. Such a link can work both ways: As argued above, although HCI has had tremendous impact on digital art, the reverse is also true. The presented framework outlines how such inspirational value can be achieved and supported.

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⁷<http://www.lozano-hemmer.com/>

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