DELIGHTING SPACES

towards a platform for animating pedestrian passageways

Thesis presented by Patrick J. O’Donnel
Department of Art + Design
College of Arts, Media and Design
Northeastern University

Submitted to the Department of Art + Design
in partial fulfillment of the requirements for the degree of
Master of Fine Arts in Information Design and Visualization at
Northeastern University

April 2017
Acknowledgements

**Thesis Advisor**
Kristian Kloeckl  
Associate Professor  
Department of Art + Design  
Department of Architecture  
Northeastern University

**Reader**
Mark Sivak  
Associate Teaching Professor  
Department of Art + Design  
College of Engineering  
Northeastern University

**Reader**
Jose Luis García del Castillo y López  
Part-Time Lecturer  
Department of Art + Design  
Northeastern University

*Additional thanks*
In addition to those listed above, I would like to thank professors Thomas Starr and Pedro Cruz for instructing a designer who needed to write. I would like to thank professor Nathan Felde for guiding a student who needed to read. I would like to thank Lucy Green and Jessie Richard (and all other members of the IDV 2017 cohort) for supporting a philosopher who needed to make sense. And finally, I would like to thank Bree Edwards and Thomas Vannatter (as well as the Public Arts Initiative) for assisting an artist who wanted to accomplish something big.
Abstract

A recent renovation at Northeastern University has left a vast network of tunnels pristine, over-lit and barren. A request for proposal has led to the development of a device which applies the philosophies of smart environments and installation art to make an immersive and beautiful information-space. The visual language is rendered by recoloring and reshaping the diffuse, overhead lighting… or de-lighting the space. The mechanics behind the device collect local occupancy data and the visual language reflects an ambient display of accumulated usage of the passageway. The animation and activation of the space serves an aesthetic function that foreshortens the hallway experientially, while also provides an opportunity to re-perceive the oft-forgotten transitory space. Implications from this proposal illuminate a reconsideration of how designers might better contextualize lighting of interior urban spaces. The hurdles of implementing a novel medium, and the messages designed for them, are considered in respect to the sensorial product of the device. By overcoming the temporal occlusion of daily use in these passageways, patterns of use reflexively fuel a novel feedback loop for the pedestrian passersby.
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>State of the Art</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>Conceptual Framework</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Philosophies for making</td>
<td></td>
</tr>
<tr>
<td></td>
<td>An artist’s perspective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A designer’s perspective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A medium and a message</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Explorations</td>
<td>85</td>
</tr>
<tr>
<td>4</td>
<td>Pre-Installation</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Epiphany</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proposal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concept design</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Implications</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>Coda: A Reverie of Shadows</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>References</td>
<td>141</td>
</tr>
</tbody>
</table>
Architect and scholar Gunter Nitschke points to the evolution the Japanese word for “floorplan” or *ma-dori*, which historically had meant “design,” and literally had translated to “grasp of place.”
Prelude: A Reverie in the Candlelight

Novelist Jun’ichirō Tanizaki, in his aesthetic manifesto *In Praise of Shadows*, speculates upon the development of visual culture between the philosophies of an ancient Japanese tradition and a technology-forward Western society. On one occasion of revelation, Tanizaki visits a famous restaurant (the Waranjiya) for his first time in years to discover the management has refitted the lanterns surreptitiously with electric lights cloaked in paper. The service staff offers him a candle, and it is then that he takes notice to the effects of lighting:

And I realized then that only in dim halflight is the true beauty of Japanese lacquerware revealed. The rooms at the Waranjiya are about nine feet square, the size of a comfortable little tearoom, and the alcove pillars and ceilings glow with a faint smoky luster, dark even in the light of the lamp. But in the still dimmer light of the candlestand, as I gazed at the trays and bowls standing in the shadows cast by that flickering point of flame, I discovered in the gloss of this lacquerware a depth and richness like that of a still, dark pond, a beauty I had not before seen. It had not been mere chance, I realized, that our ancestors, having discovered lacquer, had conceived such a fondness for objects finished in it. (p. 13)

For Tanizaki, the intimacy of the room in conjunction with the dancing candle flame activates the lacquerware, exposing the depth of its muddy colors. Our perception of visual culture is contingent upon the lighting. Prior to the modern invention of electric light, the Japanese words for describing the third dimension had been put in terms of space’s phenomenological aspects—lived space, or place (Nitschke, 1988). Though society now has objective terms for the measurable extent of space, the experience of space is still apropos of an emotional and perceptual being. With Tanizaki’s anecdote as evidence, technologies of lighting shift the context in which all products, art and architecture were once made and viewed.
Introduction

Jun'ichirō Tanizaki reveals a world view at odds with the modern invention of electric light. It is through observations of science, theatre, products, and interior design that he recognizes the many and varied invisible forces behind any act of making. For him, the overbearing and garish electric light only highlights what was never meant to be highlighted, and de-shadows what previously had depth. Are there still objects and parts of our environment which would shine best under the conditions of their invention? Sure, objects that existed in Tanizaki’s time—1930’s Japan—still exist and function in the age of electric light. But as Donna Haraway suggests to inquisitive students, “unpack an object” until it reveals a “world history” (Schneider 44). Who made these objects of culture, and how they were made, ultimately matters.

An interesting parallel exists between Tanizaki’s dimly restaurant and the urban landscape. Pieces of interactive art or interactive technology have been introduced to non-traditional spaces in museums, as well as beyond its walls in public. Regardless of intention, works placed in public spaces must consider the reactions of emotional and sensorial population; the interpretations and inspired discourses can vary as much as the actual uses (Stevens and Lossau 3). These works, by the nature of the physicality and location, are complex objects—or devices, or environments, or situations—which require a multi-philosophical approach to understanding them. A review of complex technological feats will help clarify the space exists between art, design and architecture. These projects are (a) situated in public or semi-public spaces, (b) have an information back-end, and (c) provoke user interaction.

By exploring these works, the artistic and design perspectives present two homogenous paradigms by which we can consider these complicated expressions of technology. The result of an interaction between work, space, and viewer is described as a “situation” by those with an artistic focus (Reiss 3), and as an “experience” by those with a design focus (Verbeek 29). In the development of
a novel displays, it is also helpful to consider the nature of communicating. While media can have varying levels of salience for the receiver, the designer is often more aware of the effects of the medium on the message. Marshall MuLuhan’s succinct thesis “the medium is the message” (3) is re-discussed in order to consider its applicability to the wealth of new media placed in public spaces.

Experimentations, or provotypes (Boer et al. 388), seek to explore two aspects of novel technical situations: the nature of the interaction between the medium and potential user, the effect of the medium on designing the message. These experiments serve to inform the creative processes behind proposing an immersive and interactive art project at Northeastern University.

The proposal for the public art project recognizes a need for aesthetic experiences among the vast network of underground tunnels at the University. During a series of “harried ethnographic studies” (Wolcott 198), conducted in order to better understand the context presented by the tunnels, an epiphany concerning media materialized. The majority of projects which served as inspiration were light-positive displays. While these media facades and LED boards overcame dark urban spaces or night-time scenes, the tunnels did not need the activation provided by light. In fact, there was too much light. With this valuable insight, an appropriate redesign sought to finesse the abundant light in a meaningful way. The proposal was approved by the Public Arts Initiative at Northeastern University, and its production is currently underway.
The project, briefly,

is a display
which presents an ambient visualization
of occupancy data about its locale
with immersive color and interactivity
to encourage a sense of place.

By engaging in the engineering and design practices necessary to prepare for an installation of this type, an artistic perspective was developed. A design which combines a reproach of institutional lighting with a retrofitted implementation ensures an expression of art in public space that isn’t an affront to daily activity. The modulation of lighting to produce a data-driven message and aesthetic experience embodies an approach to immersive technology that is expressive and informative. The interplay of artistic and design-led choices reinforces the project’s conceptual multiplicity.

The project epitomizes a critical artistic reaction to excessive modern institutional lighting, and to the Western devaluation of the shadow. This document serves as a call to arms for remedial works that overcome architecture of non-places (Augé 75). There exists a potential to recognize the value of visualizing the traces of spatial socialization. Indices of use, like a smoky patina on silverware (Tanizaki 10), should be celebrated through the reprogrammable aspects of immersive technologies.
Anthropologist Marc Augé hypothesizes that supermodernity produces non-places, or the effect of technology on our environment which creates space to carry out a means, such as transport, commerce or leisure. The follow matrix of photos examines urban settings which are often bare, in ornament and mood, as a product of their formation to meet certain ends (76).
Chapter 1

State of the Art

I
Array  United Visual Artists

II
Bilateral Time Slicer  Rafael Lozano-Hemmer

III
Crisscross Signal Spire  Höweler + Yoon

IV
CSIS Data Chandelier  Sosolimited

V
Light Creature  Estudio Guto Requena

VI
TrueCar L.E.D.  Tool of North America

VII
Vortex  1024 Architecture
As the terms installation and environment were being used to describe situational art in the 1960s, the movement championed spectator presence paramount to the work. Art historian Julie Reiss suggested that in situations of installation art, the “viewer is required to complete the piece: the meaning evolves from the interaction between the two” (xiii). Over fifty years later, the state of the installation art sits astride the fields of art, design, and architecture. The relationships between works, spaces, and inhabitants are still being emphasized and reinvented. With the ever-growing and easily accessible array of programmable technology, it seems makers of all kinds are devising installations, environments, and situations that make use of microprocessors, sensors, and their outputs: information.

The creation of work at the intersection of installation art, data visualization, and technology spectacles can take many forms, and be made by many people who consider themselves neither artists, designers nor architects. This list of works cannot be considered exhaustive; the domain is slippery and evolving. To better understand the situations created by the introduction of technologies, we must make the work-space-viewer triad explicit. Furthermore, we must also comment on a maker’s design “moves”—the origins, the intentions—and the resulting “systems implications” (Schön 99). These implications are a result of decisions: inherently political acts carried out by stakeholders and makers. What is being said by these decisions? Which stakeholders are saying what? This analysis on the following seven works seeks to explore how a design process results in meaning by analyzing the dialogue of art, space and inhabitant.
Array

United Visual Artists

2008

Creative
United Visual Artists

Commissioned
Yamaguchi Center for Arts and Media

Location
Chuya Nakahara Memorial Museum
Yamaguchi, Japan
Photograph 1.1 — Array, at night

A matrix of columns outfitted with LED lights occupy a courtyard. Sensors detect the presence of a viewer and animate the columns in reaction.
Photograph 1.2 — Array, the red spirit
Occasionally a single LED tower burns red, denoting the presence of a spirit. When that tower senses an inhabitant is close, the red light will pass between towers, perceptually evading those who seek it.
Array is an interactive sculpture in the courtyard of the Chuya Nakahara Memorial Museum. It consists of a matrix of columns outfitted with motion sensors and LED lights. The columns are networked, and custom software allows the grid to sense human presence and animate the single string of lights. The lights glow a cool, pensive white, a reflection of the tranquility of the surrounding gardens and hot springs. In addition to local animations triggered by human presence, sporadically and timidly a fiery red light possesses a column. A metaphorical “spirit,” (United Visual Artists) this red light can be chased around the space when human presence is detected before it eventually slips away.

Visitors of the courtyard are drawn into the space by the both the arrangement of columns and their friendly animations. Upon entrenching oneself amidst the lights, a sensing feedback loop causes the column’s LED lights to begin a twinkling animation. During such an exploration, the inhabitants will be delighted by the introduction of the red-lighted spirit. The spirit bounces around and evades in a playful way, that invites users to explore the courtyard in a new way. The immediacy of the feedback loop elicits enough intrigue to prime the inhabitant for the program’s eventual sequence of play. The designers at UVA exercised a constrained use of colored light, counterbalancing the white appropriately for constancy to be broken with the introduction of the red with much excitement and wonderment.
Bilateral Time Slicer
Rafael Lozano-Hemmer

2016

Creator
Rafael Lozano-Hemmer

Exhibition
Untitled, Art
Miami Beach, FL
Viewers stand before a display which maps the length of their bodily symmetry, and the resulting video loop is split and pushed toward the periphery of the display.
Photograph 4 — Bilateral Time Slicer, display

Narrow strips containing video stills get split apart as they are recorded. Then if no presence is detected, the display rejoins the videos, replaying the scenes in reverse.
Bilateral Time Slicer is composed of a wall-embedded LCD display and an audience-facing camera. The camera is outfitted with a biometric tracker that detects the presence of an immediate viewer and plots a line of symmetry down the front of the body. This line denotes the recording of two separate video loops, which when completed are split down the middle. These loops get split and pushed outwards, and the camera awaits a new audience or action to repeat the process. The video sensor can also detect the lack of an audience, and will begin a procession of most-previously recorded loops.

Upon arriving in front of the camera, viewers will be sensed by the program, and the center of the LCD screen becomes a space for live visual feedback. The biometric lines plotted down the body and across the eyes hint at the process to come. Some visitors engage in the dance and the play with their bodily orientation, only to later see their split image is always upright. The longer a visitor plays, the further to the periphery does the visitor’s own image spans. The ability for the program to capture and catalogue many different persons give a fascinating portrait of both the viewers and what connects them, both spatially and physiologically. Lozano-Hemmer sets up an interactive scenario where the work describes the space, but is only completed by the activity of a human actor. Paying homage to Aztec masks, early animation pioneers, and cubists, Lozano-Hemmer gifts his audience with the ability to simultaneously see spatial and temporal perspectives. Traces of these memories eventually close in on each other and the program forgets just as the audience does.
Crisscross Signal Spire
Höweler + Yoon

2014

Creative
Höweler + Yoon Architecture
Sosolimited

Commissioned
Boston Arts Commission
City of Boston, Office of New Urban Mechanics

Location
Dudley Square
Boston, Massachusetts
Photograph 1.5 — Crisscross Signal Spire, at night

A braided spire embedded with LED lights in Dudley Square. The tower lights up at night according to 311 requests submitted to the City of Boston.
Diagram 1.6 — Crisscross Signal Spire, mapping neighborhoods to tubes

A map of Boston shows the geographic centers of its twenty-one neighborhoods. An abstracted spatial arrangement determines the placement of the tubes at the ground level. Neighborhoods split and reform, and the braided form denotes these shifts over time: the top of the braided form is the original sectors of the city, and as the years have passed (moving downward on the sculpture) the twenty-one neighborhoods become distinct.
Crisscross Signal Spire draws its form from traditional structures for information, like the clock tower, as well as the city of Boston’s history of using beacons of light for communication, like the Berkley Building’s rooftop storm spire (Boston Art Commission). A series of braided tubes, filled with LED lights, rise from the ground outside of the Dudley Municipal Center and Transportation hub—a central point of activity in one of Boston’s most historic neighborhoods. At night, the LED tubes animate according to two types of activities: 311 requests and social media engagement. The structure is outfitted to read near-real-time submissions to the city’s 311 mobile application, and transform the locational data into a racing animation up the designated tube. If a passerby wishes to control the animation, they can tweet using the hashtag #signalspire on Twitter and be delighted by a spectacle of light animation.

The spectacle of the Höweler and Yoon’s public sculpture becomes meaningful through access to the information map, or by continued presence about the space. Positioned at the intersection of an economic, industrial and social revitalization, the landmark represents progress and change and potential. The work attempts a marriage between interactivity, spectacle and ambient information. The unique braided form excites and draws attention. The release of a data-driven animation keeps attention. The social media engagement relinquishes control to the public in a satisfying cause-and-effect feedback, enjoyable by both an attentive audience and oblivious passersby.
IV

CSIS Data Chandelier
Sosolimited

2013

Creative
Sosolimited
Hypersonic Engineering & Design
Plebian Design
Chris Parlato

Client
Center for Strategic and International Studies
Washington, DC
Photograph 1.7—CSIS Data Chandeliers from ground floor
Over 400 pendant lamps hang above the atrium of the Center for Strategic and International Studies’ offices.
Photograph 1.8 — CSIS Data Chandelier, map revealed

From directly below, the lamps reveal the familiar form of an international map, allowing light to communicate global data sets.
CSIS Data Chandelier consists of a collection of 425 programmable pendant lamps that hang in an atrium at the Center for Strategic and International Studies’ Washington, DC offices. The pendants are organized so that from below, an observer can see the form of a world map. The lights are programmed to animate data-fed maps with various international statistics, such as gross domestic product growth rate or energy consumption. The hanging map is further customizable by the buildings’ administration, giving them the ability to highlight certain regions or countries depending on developing news stories or the event schedule.

The design of this installation strikes a difficult balance of subtlety and relevancy for the space. Completely functional as overhead lighting, Chandelier also succeeds as an artistic statement about maintaining awareness that our actions reflect upon a larger ecosystem. Choosing to map the global data a traditional-looking projection, the design succeeds in presenting information in a manner that reduces the barriers to comprehension. Consumption of this information is not the project’s ultimate goal, rather it’s penultimate goal next to symbolizing this organization’s culture of mindful decision-making. The meaningful perspective for viewing this work is in the lobby of the building. This spatial decision signals to all those who engage in situations at the CSIS that the context for thought extends beyond these walls, that atrium, and even that city.
Light Creature
Estudio Guto Requena

2015

Creative
Guto Requena
Julio Radesca
Lucas Ciciliato
Paulo de Camargo
Vitor Reis

Client
WZarzur

Location
Hotel WZ, Jardins
São Paulo, Brazil
Photograph 1.9 — Light Creature façade, at night

A redesign of Hotel WZ Jardín’s exterior lighting acts as an ambient visualization of the local noise and air quality. With a mobile app, pedestrians can also control sections of the building via gestural drawings or microphone.
Photograph 1.10 — Light Creature façade, Metal panels
Diagram 1.11 — Light Creature façade, Concept drawing

A redesign of Hotel WZ Jardin’s exterior was governed by a data-driven process. Studio Guto Requena measured sonic activity from around the building, and color-coded intensity, and then mapped it along the height of the structure.
Photograph 1.12 — Light Creature façade, interactive mobile application

A mobile application permits two types of activation through the LEDs: a sketchpad and microphone input.
Light Creature evokes a computational approach to architecture favored by the Studio of Guto Requena. The project is a redesign of the façade for the Hotel WZ Jardins in downtown São Paulo. The façade was covered in metal sheets, arranged along the height of the building according to sound-data collected from the hotel premises. After dusk, the façade lights up, a “luminous creature” (Requena) of LEDs programmed to react in real-time to environmental stimuli and passersby.

A hacked piece of architecture takes what was already there, and introduces a new program while still using some of the original material (Baratto). Granting the public a visual readout of their activities suggests Requena supports an inclusive definition of public space. The inclusion of interactivity subjects the form to a collaboration by the public to create new visual culture. The studio appropriately published a design rationale video that gave meaning to the abstract code that patterned the façade and animates the building at night. By embedding sensors and microprocessors into this hotel, a dialogue was established between architecture, the public, and in the individual. The introduction of a mobile application that allows viewers in proximity to take control of the lighting design brings about an awareness at about environmental metrics of noise and air pollution. The design team realized a “hybrid” of the material world and the digital world (Baratto). Notably, this façade is constructed from data, as well as displays ambient information, in a design which juxtaposes advocacy and play.
TrueCar L.E.D.
Tool of North America

2015

Creative
Tool of North America

Agency
Tiny Rebellion

Client
TrueCar, Inc.
Santa Monica, California
The staggering form of LEDs, which offer both localized spatial data and interactive responsiveness, serves as a focal point of a weekend experience on the pier.
A nearby data display attracts guests to further analyze their newfound access to information regarding the context of the pier.
TrueCar L.E.D. is an interactive light sculpture installed on the Santa Monica pier for use during the Twilight Concert Series. The installation consists of a LED-lined spire, known as the Centerpiece, with LED columns and spherical hanging lanterns amongst its periphery. There are three types of input that manifest visually: picture or text from social media, audio from the event and the environment, as well as gesture near the Centerpiece. When these three sensors are stimulated by the audience, the Centerpiece reacts by changing its LED display. Additionally, the inputs’ visualization will propagate outwards from the Centerpiece into the free-standing towers of LEDs and hanging lanterns.

As a visitor of the pier approaches the installation, they are beckoned inwards by the light show emanating from its Centerpiece. The experience unfolds gently as the inhabitant traverses the pier and reveals itself to be interactive by simply approaching it. The Centerpiece’s complex physical stack of sensors and cameras permits all sides of the spires to give interactive feedback: an appropriate amount for typical concert-sized crowd. With the three separate types of input, it is obvious that the creative team at Tool was looking to guide the concert-going crowd fully from entrance to immersion. GMUNK, the project’s Director, describes the installation as a “Lighting Universe [that creates] one cohesive experience, with every light acting as one pulse, driven by the Centerpiece... The Centerpiece, in turn, is driven by the audience” (Munkowitz). As if a neural network electrified, the TrueCar L.E.D. experience offers a community a monument to a situation’s pulse and rhythms.
Vortex
1024 Architecture

2014

Creative
1024 Architecture
Pier Schneider
Franz Wunschel
Nico Merlin

Client
DARWIN ecosystem
Bordeaux, France
The structure of wood planks is lined with LED lights that pulse according to energy consumption of the offices or, during special events, music during concerts.
Photograph 1.16 — Vortex, Courtyard during the day

Planks of wood, assembled as a swirling causeway between two office spaces, create a dynamic sculpture that serves as a backdrop during outdoor workplace activities.
An “architectural fragment” enveloping a scaffolding bridge (1024 Architecture) between the two buildings of the DARWIN ecosystem’s cooperative workspace, Vortex is a data-driven mantra made manifest. Twelve lines of LED lights, trimming for a chaotic assemblage of wooden planks, animate according to energy usage of the hitherto separate buildings. The display functions simultaneously as a walkway, ambient information system, and sculptural cornerstone of a new public gathering space. Though the energy data display is the systems’ default, the designers at 1024 Architecture outfitted the lights with a program with a responsive music visualizer for special events. The unorganized chaos of the tunnel is made stable and purposeful with the brace of the fluorescent tubes.

Vortex serves a multitude of spatial functions: connecting two buildings, invigorating a once-vacuous public space, and through ambient information display summarizing the DARWIN mission statement of environmental awareness. While the energy consumption to light tube animation mapping is not made explicit, its presence enriches public space and augments the building inhabitants’ awareness. A viewer of this sculpture will be drawn to the uniqueness of its form, without knowing any of the data-driven architecture beneath its surface. Those who spend time in the space, like DARWIN’s cooperative workers, can familiarize themselves with the ambient display’s mapping strategy and take cues from it as their jobs take them from building to building.
Since the development of open source programmable microprocessors, such as Arduinos, professional and amateur makers alike have been crafting experiments which sit at the boundary of art, design and experience. The relationships between work, space and inhabitant become a unifying characteristic amongst a wide variety of designs and technologies. From attention-grabbing to pure spectacle, the works all have ramifications on the viewer and the space.

The series of works presented in the previous chapter seeks to summarize the current state of the art in the field of experiential, interactive visualizations. Projects like CSIS Data Chandelier and Vortex offer information in a mostly passive way, but how that information is decoded can vary from familiarly mapped to abstract (in this case, respectively). Other works, such as Array and Bilateral Time Slicer, set up a confrontation between sensor and viewer which engenders a novel physical relationship between bodily movement and sense of space and time. And then context-aware works, like TrueCar L.E.D. and the façade of Light Creature and Crisscross Signal Spire, make meaning of the data that exists at the site. Rather than simply giving inhabitants (or passersby) the key to understanding, the designers of these projects reward simple interactions between work and inhabitant in effort to prime the inhabitant for comprehension.
Chapter 2

Conceptual Framework
Interactive Public Art: Two Perspectives

In the inaugural essay for the Journal of Design and Science, scholar Neri Oxman, traces a history models for creativity and academic domains. Consistent with the philosophies of Rich Gold and John Maeda, she suggests that knowledge exists—and is sought after—in multiplicity as an affront to disciplines. She describes the present as the “Age of Entanglement,” an age where disciplines are border-free and a multiplicity of philosophies influence the culture of making (3). Presented in Poster 2.1, Oxman’s resulting schematization borrows its title from the biological-chemical process of cellular metabolism, but ultimately serves as a multimodal metaphor approaches to a person’s understanding of their world.

In the creation of products of science, engineering, design, and/or art, a bottom-up analysis of objects often forces an awareness of a non-singular and non-linear manifestation. These “knotty objects,” a term coined by Paola Antonelli, reveal themselves as more than the sum of their parts, with their creators being non-singular and knotty themselves: anti-disciplinarians. Antonelli aligns her belief with that of the tenets of critical design: these objects, and by extension their creators, constitute “possible futures” (2015). Likely unbeknownst to Antonelli, Joseph Dumit reflects on Haraway’s charge to study objects with a similar metaphor: “…the world itself is warped and the straight lines we see between categories may be twisted, but those twists must be carefully followed. Only in this manner can we confront the histories […] not just in objects but in ourselves” (Dumit 351). In this way, a concept of new objects—no matter if it is product, object d’art, material, invention—is that their analysis does not ascribe wholly to a single discipline.

For the analysis of this thesis, philosophies of art and design are compared to consider the possibility of an anti-disciplinary approach to a publically-situated artwork which employs a data-driven back-end. Public perception often confuses products created under the umbrella of design with works of art (Brynskov et al. 65). These disciplines can be independent, but
in a world of installation art and ubiquitous computing, the artistic output is incorporating designed technology, and the designed technology produces an artistic expression. If designers “produce changes of behavior” and artists “create awareness of the world” (Oxman, 2016), then it is conceivable that artists employ design and designers engage in art.
An Artist’s Perspective

A brief history of installation art

Room-sized multimedia works of art, like those of Allan Kaprow beginning around 1958, were referred to as “environmental work” and less specifically grouped with “project art” and “temporary art” (Reiss xi). Shown in Photograph 2.2, Kaprow’s Yard features an interior landscape of tires that viewers were allowed to traverse and rearrange as they pleased. In his essay “Assemblage, Environments and Happenings,” Kaprow acknowledges a separation between the objecthood necessary to build an environment, and the dynamic “Happening” during the piece’s use. For him, the shift from assemblage to environment is patent in the eyes of the viewer. With assemblages, there is a potential to handle and manipulate, but with environments, one must walk into it (Kaprow, 159). The difference is a change in scale towards the human body. But what can we say about Kaprow’s “Happening”—where does it fit into Environmental and Installation Art? Kaprow’s use of participation likens more to the world of performance art, but is not a defining element of the movement as a whole. His inclusion of the dynamic and social aspects of performance reflects his philosophy that makes art and life indistinguishable (Reiss 9). Critic Ken Johnson categorizes the performance aspect of Kaprow’s work as “un-art” or that which tests the boundaries between the prized and the mundane.

In Daniel Buren’s 1971 essay “The Function of the Studio,” the critic questions an artist’s practice of creating studio work and exhibition in a gallery. He finds an authenticity to the making process can be most purely observed inside the studio, for it is a space of character that imparts on the final piece (56). So, in this manner, the label of exhibition for some gallery shows is no longer accurate, especially in the event of environmental assemblages. The artist, directly manipulating space in gallery or otherwise make-shift space, is no longer curated. Buren says isn’t exhibition to be replaced by installation (57)? It isn’t until the 1980s that critical reception of room-scale artwork which was created for specific spaces, or in specific spaces, began to adopt Installation Art as a categorization (Reiss xii).
According to Julia Reiss, what relates all environmental art and/or installation art is a “reciprocal relationship of some kind between the viewer and the work, the work and the space, and the space and the viewer.” She clarifies this as non-exclusive to other works of art, but it is this perspective which gives rise to artist’s consideration of the triad as a “single situation” (xiii). The triad is modeled in Diagram 2.3. The implication here explicitly includes the viewership as integral. The artist’s inclusion of viewer participation can fall along a range of salience and force, as paralleled in the writing of Nynke Tromp et al. in the proceeding section (3).

When art critic Michael Fried condemned “theatrical” works of art, he illuminated the latent role of the spectator in shaping the artist’s process. For him, traditional theatre exists for and only in the presence of the audience (8-9).
This is where the metaphor runs dry. Fried seems to define art as what is behind the theatricality innate to sensorial beings. If the evaluation of the art creates its meaning, and these concerns guide the practice of the artists, then this process is, by Fried’s account, for show.

Installation art explores meaning developed through a temporal experience, or the particulars of a situation, or through the presence of the beholder. Fried’s critique ensures that the greater art community does not confuse the natural result of human interaction with their world as art. The artists behind Installation art have an awareness of the volatility of human behavior. The chance for play, reaction and improvisation in the presence of their art is controlled and specific. The level of control and the nature of the specificity is the vehicle by which Installation artists express themselves.

Diagram 2.3—Reiss’s definition of Installation Art
A reciprocal relationship between work, space and viewer.
The utility of public art

Can art be designed? Indeed, there are aspects of expression, especially those created in a technology-rich post-modern world, that have been made beyond the artist’s control. It is also possible that an artist engages in the communicative aspects of design for expressive purposes. The chasm of utility no longer separates works of design and works of art.

During 20th century, avant-garde artists developed an art that was opposed to practical utility. However, historically, artists were suppliers of aesthetic objects, rather than autonomous agents (Lossau and Stevens 2). Though there was an original purpose for the art, often to commemorate a person of historical interest for the specific area, monuments are used alternative ways by the general public. These monuments that survived time, rigid and cold, can go unnoticed within a modern landscape (Franck 183), but their presence still shapes space.

Lossau and Stevens further examine public art in order to call attention to art’s utility beyond memorializing. “Public artworks may be understood as useful in terms of their properties as material objects, sensory experiences, spatial contexts or representational discourses” (2).

When one considers public art in a larger existence, it becomes clear a participation of the viewer exists by the nature of its placement in a social sphere. It is not inconceivable to liken public art, even historical monuments, to that of participatory art. Critic Claire Bishop describes the participatory effect of situating public art as enabling, inviting or provoking a population (“The Social Turn” 179). She suggests spectators can be active or passive, and authorship can be singular or collective, and these in combination are wrapped up in the spectacle (“Artificial Hells” 12). But, is this spectacle the end-all result of art that has utility?

Lossau and Stevens don’t take a position on Bishop’s critique of the spectacle, but recognize a value in addressing art that is used or observed beyond the intent or imagination of its authorial body. This state of détournement is
Delighting Spaces  Conceptual Framework

an affront to the spectacle, while not excluding its presence. If this expansion of use is developed after the unveiling, in a time-series of pragmatic events, then its benefit is rarely surveyed by critics and historians (3). It is possible this consideration, being that of utility beyond intention, is unwanted by the artistic body. It might highlight the process of creating public art as “a series of unsatisfactory compromises which constrain artistic freedom and quality.” And for that reason, art can be seen as a costly alternative to ordinary street furniture that achieves the same utility (Deutsche 10). Bishop’s participation—or least the design of participation—is product of authority and intention, while use—and by extension users—results from an unpredictable convergence of time, space, and forces (Stevens 5, Franck and Stevens 9). Uses become an index of a changing context or process (Lossau and Stevens 7).

In agreement with Bishop, Lossau and Stevens do suggest analysis of public art, especially participatory public art, should go beyond a hermeneutic perspective (9). An interpretation is a valuable reaction, and can offer a platform by which others discuss or contemplate public art. However, an audience reaction to public art is an uncontrollable element of putting (indeed, imposing) work in the public realm” and it does not exist in a singular state of correctness (Calhoun and Kendellen 161). Public art also exists within a greater context, or situation. Experience of art occurs over time, and some analyses begin to explore the effects of temporality on use (e.g. transgressions at night, reaction after performances). Some art can even take advantage of temporality and grow or evolve with time (Lossau and Stevens 10).

As prop and symbol  There is a distinction between symbolic uses and performative uses. Symbolic uses refer to the representational ability of artwork—meaning, identity, difference, embodiment. Performative uses refer to the inspiration of intra-bodily action
Karen Franck refers to these categories as symbolic and physical (183). The space carved out by public artwork is dynamically defined by its intended uses as well as its unintended uses; they call this “loose space” (Franck and Stevens 2).

As a prop, uses of public art are not prescribed, and are often a result of right-place, right-time, right-means. William Whyte, in The Social Life of Small Urban Spaces, observed ledges and railing or any other architectural feature which afforded sitting or leaning generally experienced use of it as such (33). More than just a piece of furniture, the spaces surrounding a monument or sculpture might act as a canvas that incites performance, and without authoritative restrictions allows (and persuades) this kind of use.

Photograph 2.4—Titled Arc
Titled Arc, Richard Sierra’s infamous public sculpture, was uninstalled due to public opposition which sought to speculate on its potential instrumentation as an agent of public deviance (Lossau and Stevens 7-8).
Diagram 2.5—Uses of Public Art

In The Uses of Art in Public Space, Lossau and Stevens organize a survey of writing which categorizes the use of public art into five categories: perception, interaction, participation, appropriation and reception.
As a symbol, uses of public artworks might also bring to light a conceptual relationship between present action and historical action. The commemorative expressions of memorials and monuments are generally recognized, or easily researched. Engagement with the works of public art that relate to its symbolic meaning is a result of public location, accessibility and popularity. Franck categorizes symbolic interactions as affirming/extending the work’s original message, or resisting it (188). Increasingly artists and architects are designing works that encourage “ingenious” engagement which reveal art’s unintended advantages (Franck198).

Digital Image 2.6—Reddit r/Place
A still moment from a crowd-sourced public art experiment, r/Place tasked users of forum website Reddit to alter a blank canvas, though each user could only change one pixel every five minutes. Though digital, the public space encouraged improvisational symbolic action—both affirmative and resistant—by the hands of many individuals.
A Designer’s Perspective

As a reaction to the personal computer, a group of scientists and designers at Xerox’s Palo Alto Research Center in 1988 sought out solutions of office technology that (a) weren’t complex, (b) didn’t demand attention, (c) didn’t isolate persons using them, and (d) wasn’t burdensome on limited desk-space. These initial experiments lead to a philosophy of technology that would be known as ubiquitous computing, for the role of computing technology would take a backseat to human activity (Weiser et al. 689-694). Mark Weiser and John Seely Brown predicted that the miniaturization of the microprocessor, in tandem with the pervasive potential of the Internet, would usher in a new era of ubiquitous computing (75-76)—an environment, laced with perceptually invisible technology, that was task-oriented.

With the power to integrate information-transmitting and information-displaying technologies into the existing environment, the design challenge was described by Weiser and Brown as to produce “calm” technologies (79-81). The development of technologies in laboratories was in part the cause for the non-calm status of the PC, and the study of how people actually used computers influenced Xerox’s research in UC (Weiser et al. 693). The tenants of ubiquitous computing criticized the personal computer for developing solutions of organizing mass amounts of information as overloading the human ability to process and analyze. Therefore, built into the technologies, must be a way for the machine to know when to reveal itself. The calm technology should understand when to hide its information in the background of human activity and human attention—this is what Weiser credits John Seely Brown for as the “periphery” (94). The result of these design choices would be an increased availability of the information that doesn’t obstruct human activity.

Weiser’s writings have spawned a number of other organization’s research and applications+, of which the most prominent themes include context-aware computing, ambient intelligence and monitoring (Rogers 407).
Context-aware computing comes from the academic inclusion of sociological and psychological literature. Research and applications which fall under the umbrella of context-aware computing are often aligned with Weiser’s original tenets of ubiquitous computing (Chalmers et al. 3). Though never explicitly mentioned, Weiser’s vision includes observations of context. In his 2001 article “Seeking a Foundation for Context-Aware Computing,” Paul Dourish outlines a parallel series of research on social context that is relevant to the world of ubiquitous computing. For Dourish, the context of a computing interaction is the “social, cultural and organizational factors” that affect a user’s decision making and interpretations (233).

But more than just affecting a user’s decisions and interpretations, these factors give rise to decisions and interpretations, and meaning-making as a whole. Lucy Suchman, in 1987 (with Xerox at the time) published Plans and Situated Actions, a thesis which outlined a reconciliation of the inclusion of plans and actions when analyzing human-computer interactions. In prior sociological models, purposeful action was thought to mediate a choice in action that fulfilled a user-created goal. Suchman rebrands the ethnomethodological view of purposeful action as situated action in effort to emphasize the action’s circumstances are paramount (35). Plans are not rendered useless, they are just reconstructed as formulations of “antecedent consequences” and remain vague until in situ actions give them meaning or validation (Suchman 5). Context therefore shapes action, but also is the means by which persons take in events and apply meaning to them.

In this way, Dourish suggests that Weiser’s ubiquitous computing and Suchman’s situated actions are both concerned with “embodiment,” or bottom-up derivations of human activity. In scenarios epitomized by both Weiser and Suchman’s writing, users react in a context to events and then make decisions and actions before any theoretical or abstract understanding of the actions take place. Dourish relates this core concept with the foundations of phenomenology,
a long-established philosophy developed by Edmund Husserl that understands meaning-making of experiences as beginning with a sense-impression of earthly phenomena (234-236).

Context-aware computing therefore concerns both the building of artificial intelligence systems, which sense and make decisions, as well as the resulting actions that take place in a sociological context around the new technology. According to Chalmers et al., the research challenges that face context-aware computing, as it is manifesting in today’s society, are threefold: (a) the experience, (b) the engineering, and (c) the theoretical. The experience of such systems is interpreted widely by various actors in various environments. The engineering feat of the computing networks and information architecture at play require creative solutions to exist in large scales and with dynamicity. The theoretical models by which the systems and subsystems act and integrate can offer guidelines and ethics when designing (1-2).

**Ambient intelligence and monitoring**

Ambient intelligence, branching from artificial intelligence, refers to a computing system of a physical environment’s ability to predict and assist with human activity. The Journal of Ubiquitous Computing and Intelligence concerns itself with the technology of computing that permits a “right place/right time/right means” adaptability (Yang and Ma p. i). The feedback loop for a system with ambient intelligence begins with its ability to sense human activity. What the system is given permission to do with that data varies among projects with great ethical concern. A system that can shut off a television when it senses a viewer has a bored expression runs a small risk of mistaking emotion and being a nuisance, whereas a system that monitors an elderly person’s bed weight can lead to breaches of privacy far greater (Rogers 408-409). The considerations in designing a system that interprets sensed data correctly, or a system that monitors sensed data are similar to that of context-aware computing systems. The logic and predictability
that govern a certain location at a certain time with a certain person present exist in great multiplicity. Salvador and Anderson believe the extent to which ambient intelligence can succeed will be limited to “the most constrained and proscribed situations” (254).

**The technology-world-human triad**

It is useful to find parallels between Peter-Paul Verbeek’s article “A Short Introduction to Mediation Theory” Reiss’s earlier model for Installation Art’s work-space-viewer triad. In the theory of technological mediation, the object and the actor are not two “poles” between which an interaction occurs, but rather two entities which change after an interaction (26-28). The mutual plasticity of both the actor and the object form the basis of this technology worldview. Mediation theory recognizes that interactions are more than the sum of their parts. There exists a reciprocity that leaves no actor, nor technology, nor environment, unchanged by an encounter. This is what Verbeek refers to as the “hybridity” of technology and humans (29). Technology mediates the perceptions of reality.

In Diagram 2.7, a schematized version of Verbeek’s article shows a reciprocal relationship between technology. “The relation between humans and
Verbeek calls on the writings of Don Idhe to recognize four schematizations of the relationship between humans, technology and the world: embodiment, hermeneutic, alterity and background (Idhe 72). Verbeek appends an additional three categories as evidence of mediation evolution: cyborg, immersion and augmentation. Table 2.8 describes the configurations.

**Relationships**

Verbeek calls on the writings of Don Idhe to recognize four schematizations of the relationship between humans, technology and the world: embodiment, hermeneutic, alterity and background (Idhe 72). Verbeek appends an additional three categories as evidence of mediation evolution: cyborg, immersion and augmentation. Table 2.8 describes the configurations.

**Contact**

Steven Dorrestijn has utilized the tenets of mediation theory to explain the phenomenological presence between a human and an interactive technology. He suggests that technology can approach humans from one of four “sides:” cognitive, physical, environmental, and abstract (286). Diagram 2.9 describes the types of contact.

**Influence**

Nynke Tromp et al. suggest two dimensions of technological influence: salience and force. “A design can exert influence that can vary from weak to strong (force), and a design can exert influence that can vary from an implicit to a more explicit manner (salience)” (11-12). The influence is determined experientially. The influence of technology is not constant, nor inherent. It can change its influence over time, and space, and because of dynamic perception. Table 2.10 describes the two dimensions of influence by characterizing their extremes.
<table>
<thead>
<tr>
<th>RELATIONSHIP</th>
<th>SCHEMATIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Embodiment</strong></td>
<td>An embodiment relationship forms a unity of human and technology through which the world is understood. (Human-Technology) &gt;&gt; World</td>
</tr>
<tr>
<td><strong>Hermeneutic</strong></td>
<td>A hermeneutic, or an interpretation, exists between a human and a world interpreted by a technology. Human &gt;&gt; (Technology-World)</td>
</tr>
<tr>
<td><strong>Altery</strong></td>
<td>A traditional view of interaction design, the alterity relationship is created from human-technology interactions in which the world in the background. Human &gt;&gt; Technology (World)</td>
</tr>
<tr>
<td><strong>Background</strong></td>
<td>If the technology functions as to create a context, rather than a direct experience, it can be considered in a background relationship. Human (Technology/World)</td>
</tr>
<tr>
<td><strong>Cyborg</strong></td>
<td>With advancements in technology, it now exists a situation in which it is merged more intimately with the human body. This hybridity is considered a cyborg relationship. Human/Technology &gt;&gt; World</td>
</tr>
<tr>
<td><strong>Immersion</strong></td>
<td>If technology merges with the world in a more patently experiential way, like the smart environment, it is considered an immersive relationship. Human &lt;&gt; (Technology/World)</td>
</tr>
<tr>
<td><strong>Augmentation</strong></td>
<td>Wearable technologies form a simultaneous embodiment and hermeneutic relationship, offering an experience of the world and producing a representation of it. (Human-Technology) &gt;&gt; World &amp; Human &gt;&gt; (Technology-World)</td>
</tr>
</tbody>
</table>

*Table 2.8—Relationships in the Tech-World-Human triad*
A categorization of meta-thought, above-the-head contact places technology and interactions at the crux of a personal philosophy. The technology and its effects can cause a shift in human thought which guides their understanding of the human-technology-world triad.

**Abstract: Above-the-head**

Technology can influence a user’s decision-making abilities. Cognitive guidance takes advantage of self-evident forms—affordances—which allow certain behaviors over others. A more intrusive design guides human behavior to a certain task, often requiring a user to clear the gates in order to continue with the interface.

**Cognitive: Before-the-eye**

A context for any technological interaction can affect its use. Examining what technologies exist already—trend reinforcement (or trend conflict)—could factor into the current technology’s role. The environment, and its technologies that promote or maintain it, can shape user norms and behaviors slowly and with subtlety.

**Environmental: Behind-the-back**

Bodily and gestural control characterize technology’s ability to physically guide users. Access to space or activity is a coercive influence that often goes unattended on a moment by moment basis. Any mediated gestures resulting from technology interactions, such as a writing utensil or joystick, are also included in to-the-hand contact.

**Physical: To-the-hand**
Diagram 2.10—Types of Technological Influence

**Coercive**

A coercive design is apparent and explicit; the user is readily aware of its methods and its intentions. The user often perceives their encounters with the technology as a reaction of external motivation.

**Decisive**

Upon encountering decisive designs, users will be aware of its regulating powers. However, it will appear to be the result of a context rather than the designer who made the context. These designs are strong, yet implicit.

**Seductive**

A seductive design influences users with subtlety, both in visibility and force. Awareness of this influence is often hard to detect, and its behavioral effects are usually regarded as internally motivated.

**Persuasive**

Interactions with persuasive designs are also perceived as external reactions. Persuasive technologies are similar to a suggestion or an argument; its force is weak and only indirectly compelling.

---

*Diagram 2.10—Types of Technological Influence*
The aesthetics of mediating technologies

Not all visual technologies present themselves as art, but even those objects from which we derive utility have the potential for artistic effects. “One trait that [media architecture projects] share with many works of public art is that the audiences desire to decipher their meaning; to find out what is being communicated, why and to whom” (Dalsgaard et al. 65-66). Artistic practices and experimentation, regardless if the authoring bodies classify their endeavors as such, presents new possibilities for the use of public space. Wrapped up in the focus of passerby and the citizen, objects—no matter how discrete or ephemeral—possess the potential for meaning, which is unlocked through their sensorial faculties. Clarifying German philosopher Alexander Baumgarten’s Aesthetica, Steffan Gross reiterates that as cognito sensitiva—or, knowledge from the senses—reaches for perfection of inner representation, it yields aesthetic beauty—or, pulchritudo (409-410). In this definition, aesthetics is approached from an inner representation aligning with the reality of the situation. Aesthetic mediation technologies therefore make their intentions clear, and render themselves smoothly among their surrounding contexts.

In some instances, the practices which create these works formulate alternatives and ignite dialogues between stakeholders and their publics. Aesthetics play an important role in how these dialogues progress.

Urban Displays

The availability of sensing and display technologies has led many different stakeholders, including artists and designers, to consider planting information platforms into the urban landscape. Moere and Hill suggest that these urban displays have the ability to “comprehend the driving principles behind these [systemic] problems, let alone reflect upon how these affect the reality of their own daily lives” (25). How does one prepare information for consumption and reflection among the urban landscapes? The design of an urban visualization should be situated, informative, and functional (Moere and Hill 42). A situated
urban visualization is contextual, local and social. It recognizes the unique location and audience; its location provides a metaphorical meaning without a detailed explanation. The basis for its content is concerned with its locale and the population of viewership. An informative urban visualization provides a feedback loop between the city and the actions of its inhabitants. A balance must be struck between complexity, to allow insight, and clarity, to allow comprehension. A functional urban visualization presents requirements that exist beyond media facades, but are applicable to all urban displays. Herein lies the effects of aesthetics. The medium should be perceptible for the amount of expected traffic, but also opportunistic to live in the public’s periphery if not of vital importance. Moere and Hill suggest an aesthetic design should look to its surrounding environment for cues. A visual treatment must not be a nuisance of attention or taste, or else acceptance and trust of the information will be damaged (42).

Photograph 2.11—Cykelbarometer
The city of Copenhagen installed a counting device to recognize the sustainable efforts of the bicycling commuters; when the sensing device reached 100,000 cyclists, that citizen received a new bicycle as reward.
What keeps a visual display from being successful? The context and the medium play a large part in holding attention necessary for contemplation. A 2008 longitudinal study of passerby attention to publicly accessible media displays by Huang, Koster and Borchers reported that many persons pass up advertisement of deals without long glances. The psychology of attention believes the minimum time required to denote cognitive attention is 800ms, so most of the passersby met this criterion, but far fewer achieved a longer glance many psychologists say is necessary for contemplation. Consideration of the audience's bodily orientations is necessary to even enter the range of visual scanning. For example, displays at eye-level catch more glances than overhead displays. Consideration of the surrounding environment also effects the potential for capturing attention. For example, the presence of artifacts and objects near displays encourage passersby stopping behavior (234-241).

**Media Façades**

Arguably, the history of media façade begins with the clock and the clock tower. In his iconic essay “The Monastery and the Clock,” Lewis Mumford suggested that the clock—and by extension, the clock tower—was a “piece of power-machinery whose ‘product’ was seconds and minutes” (15). First by the sound of bells, and eventually hands on a face, the broadcasting of this artificial media became intimately connected with the architecture of the modern city. The role of media in architecture grew until modernism, in which technology produced a new information space intimately connected with structure and urban planning (Ibelings 22). However, media architecture is expressive enough that these “installations are often perceived to be works of public art by the public” (Brynskov et al. 52).

In a notable, recent example of a media façade transmitting information, the top of the Empire State Building has been lighted to display the
progression of live events: results of the Superbowl, results of the Presidential Election, and even a music-visualizer for an Alicia Keys’s song (Colangelo 11-12). It is far from the first building to use architectural lights to present information, but its landmark status and visibility has allowed the role of media façade visualizations in the urban city scape to be thoroughly observed. Uses of the building’s lights for more than just “color with meaning,” such as for holidays or special causes (Tauranac 538), was initiated in 2012 with CNN’s coverage of the Presidential Election (Colangelo 13). The addition of this type of lighting infrastructure gave way to a series of programming which featured the role of live events, data collection, and social media in a manner visible to millions of persons. Different events displayed on the Empire State Building have garnered different levels of acclaim and attention, however the effect remains unchanged: the formation of new connections between social beings.

Television Still 2.12—Empire State Building, at night
A series of LED lights were installed on top of the Empire State Building in 2012, and since then, it is one of the most highly visible public data visualization platforms.
Designing media façades is a feat that must be done with a consideration of the publics it serves. The dynamic relationships between viewer and world challenges a medium and message to deliver clarity of objective. As for how these media façades approach aesthetics, Dalsgaard and Halskov suggest the new interfaces must take into account the physical surroundings, develop the content for the medium, and reduce barriers to comprehension. The aesthetics of the message must consider its integration with physical and surrounding structures. If the medium and the message is to co-exist in the urban landscape, it must take on a visual language appropriate to its surrounding information system, including consideration of expectations from a new public. In some instances, the thoughtful presentation could use elements of surprise or reinvention in order to deliver a message. The medium should be crafted with a resolution appropriate for the message, while the data for the message should be collected at an appropriate specificity for this very resolution. A diversity of situations is possible with a public space. The audience for these displays are dynamic, diverse, emotional and social beings. A visual language that calls on intuitive or common metaphors primes a message for analysis and utility. Media façades should understand their audience, the public, and the rhythms and contexts they exist in throughout its operation (2280–2284).
Media architecture is foremost understood as having an aesthetic presence, much like any work of art. In this way, we can consider the writings of John Dewey, famed pragmatist, to consider the experience of a work of art is prompted by processing sensations from the presence of the work itself (36). In fact, in later writings Peter Dalsgaard (with Christian Dindler and Kim Halskov) suggest aesthetics deserve its own categorical importance in public media infrastructure. In their 2011 paper, they list aesthetics, interaction, meaning, participation, and space as the considerations for designing these systems (Dalsgaard et al. 213).

The media architecture, being observed by a subject, also provides a temporal interaction. The interactivity of such a medium can vary greatly, from ultimate rigidity to communicative plasticity. Understood as a novel medium, media architecture invites an interpretation. An interpretation of content through a medium is mitigated by the many forces of context. Participation in these acts of expression presents an opportunity for inhabitants to relate their self to the expression. The design of the medium and the context of its participants direct (explicitly and implicitly) the behaviors around the media system. Additionally, these qualities and events of media architecture take place within space—an amalgam of physical, social, and virtual entities (Dalsgaard et al. 220-224).

Where the models diverge

If one was to consider Reiss’s definition for Installation Art and Verbeek’s model of mediated technology relationships as analogous then what Reiss calls “work” and Verbeek calls “technology” must be one in the same. By some accounts, a union of these two descriptions is made manifest in projects like Array by United Visual Artists, or TrueCar LED by Tool of America. (See Photograph 1.1 and 1.13, respectively.) If we suspend belief in this respect, what distinctions remain?

First, Reiss’s model describes the “space” neutrally and Verbeek charges “world” with great meaning. Inherent in the world of design, according
to mediation theory, perceive a reality. There is an objective behind design—a commandment from the designer as author—by which success can be judged. The model for installations recognizes that the exchanges between work, space and viewer are bound by the installation themselves. Reiss then labels the result of artistic interactions as a “situation”—it is confrontation that is understood as temporary or experimental. Verbeek labels the result of design interactions as an “experience” or “practices”—a heavy re-assertion that all parties (technology, human and world) leave changed, beyond a spatially-limited situation.

Diagram 2.14—Comparing the Results from Installation Art and Mediated Technology
Another key difference between the two models is mediation theory’s inclusion of nested reciprocity between human and technology, and then the world. Reiss suggests the presence of the viewer “completes” the work and space relationship (ii). The departure mediation theory takes from interaction design, a predecessor, is more than an exchange and point of contact, a human and technology interaction reciprocally alters the human and their perception of the technology. Further, this dynamic exchange is tapped by a perspective on the reality in which the technology is applied (27).

The comparison of these models it is not to illuminate different semantics, but rather to broaden the vocabulary by which artists and designers develop process and contribute to making culture. Art approaches a situation with insight and expression; it concerns itself with a message that is directed outward from the artist. Design identifies an incongruence of expressions, and communicates is remedial path; it concerns itself with a feedback loop that externally sourced.
The Medium and the Message

**Is the medium really the message?**

In 1964 Marshall McLuhan published his now infamously succinct thesis: “The medium is the message.” He further qualifies the assertion by explaining that media has personal and social consequences which result from “the new scale that is introduced into our affairs by each extension of ourselves” (7). Is a message arbitrary until it is channeled through a medium? Additionally, the aphorism was written in a time where automation technologies were producing goods faster than ever, and television was just beginning to beam programs into living rooms. So, does McLuhan’s account of media communication still apply to a world which includes media façades and installation art?

It is true that the medium is the means by which we physiologically receive the sensations which make up the message. It cannot be argued that the medium is a “make happen” agent (McLuhan 48). But if we trace the feedback loop of medium and messages, where does the message originate? McLuhan likens the role of humans in the technological world as “sex organs” (46). Critical of the implications of this assertion, Paul Levinson finds it troubling to leave no space for the freewill of creative and emotional actors (Hiebert, n.p.).

As for environments, McLuhan was at least subconsciously aware that technology exists beyond its hybridity with humans. In an interview he states, “At the point where a new media-induced environment becomes all pervasive and transmogrifies our sensory balance, it also becomes invisible” (Norden, n.p.). Our awareness of the medium is precisely why its effects are sometimes difficult to observe. Maybe the greatest extension of McLuhan’s work permits us, as improvisational and emotional beings, an awareness that media impacts both “both the human sensorium and the nonhuman environment alike” (Grusin 57).

*An embedded medium* So what are we to make of media that is purposefully obscured or embedded, by mechanics or sensation or aesthetics? Even as technology merges with the built environment, such as background or immersive relationships (See Chart 2.8),...
Photograph 2.15—The Weather Project

Olafur Eliasson’s 2003 installation at the Tate Modern mimics the natural forces within institutional walls. “Every aspect of life – economical, political, technical, cultural, emotional – is linked to or derived from [weather]” (Eliasson in Beccaria, n.p.).
his hybridity still carries the ability to mediate the message. For Otto Bollnow, man is always in space somehow, and that different forms of this exist. Space is not merely a system of relationships, it a sort of medium—a “quasi-material”. Bollnow suggests that the built environment exists in a reciprocal relationship with its inhabitants’ perception of it. “As a medium it is an intermediate between an ‘object’ and a ‘way of seeing,’ neither a ‘container’ independent of the viewer, nor merely a subjective design” (257).

A contextual message “All cases, sensory change is levered by new technical innovations, since new technology inevitably creates new environments that act incessantly on the sensorium” (McLuhan and Fiore 136). Though this determinism does not account for natural or psychological forces. A great part of context, as Dourish earlier attempted to define, can be attributed to a media. McLuhan’s work is merely an analysis, for contemplation and explanation. However, if we consider the message containing an immutable sense of purpose, then in it lies an affordance for a receiving population. A reversal of attention makes this point patent: a message doesn’t affect a population not ready or able to understand it.

If we as designers are to flatten content to a secondary importance for communicating, what is the recommendation for artists, who wish to express? Is their expression nullified by the medium in which they present? Fortunately, in the daily experiences a population, “cultural goods are [still] conceptualized as content” (Anna McCarthy in Sterne 103). We can’t disregard the content, as it still objectified by audience and inhabitant alike.
Chapter 3

Explorations

I
Content for Ryder Media Facade  Popular Images

II
Content for Ryder Media Facade  Fireworks

III
Content for Ryder Media Facade  Annual Weather

IV
LED Heatmap Crosswalks
In the process of developing a proposal for a public art project on the Northeastern University campus, two previous projects influenced the design methods and ultimate form. In order to contemplate the role of data and display on a public context, one must first recognize context as a complex experiential observation of the world and self. It is influenced by actors (both emotional and logical), media, and messages, but is not a simple sum of the triad. Marshall McLuhan later clarifies in Understanding Media that the medium is intimately bound with the content or message, so much so that it mediates our interpretation of it (9). Schematized Diagram 3.1, context is an interpretation or understanding of influences—internal and external—as they evolve throughout experience(s). Much like looking at a fish through water surface, the content is seen through and behind the medium.

The first project, uses an established architectural media façade explore the limits of designing three different types of content in low resolution. In the first example, a curated series of Popular Images—paintings, photographs, and movie stills—were cropped and compressed for the display in effort explore the limits of a viewer's form recognition. The second example, Fireworks, is the initial attempt to prototype the visuals for an upcoming interactive project. The third example used the display to broadcast Annual Weather for four international cities.

LED Heatmap Crosswalks, a simulation of a novel roadway technology which illuminates a new type of pedestrian crossing, considers the role of an immersive smart-environment in urban life. If the status of a crosswalk's authority is pragmatically minimal, then it is conceivable to redesign the roadways around heavy pedestrian areas according to how they are actually used. By imagining an embedded crosswalk and roadway lighting system, it becomes possible to display hyper-local spatial usage patterns, reduce the perception of urban wait, and utilize data to promote pedestrian safety.
Content for Ryder Media Facade

Popular Images

2017

Creative
Patrick J. O’Donnel

Facade
Dietmar Offenhuber
Susanne Seitinger

Location
Ryder Hall
Northeastern University
Boston, Massachusetts
Photograph 3.1 — Popular Images, *The Creation of Adam*

The Ryder Hall Media Façade, at night, displaying a slideshow of popular images from paintings, movie stills, and photography.
Popular Images takes some of the most iconic visual imagery from the world of painting, photography, and film, and re-broadcasts them on a low-density LED media façade. Modeled after graphic designer Gary Andrew Clarke’s Remixed series, one of which is pictured in Figure 3.3, the classic imagery chosen for this slideshow style presentation relies on their ubiquity within our visual culture to overcome the perceptual gap created by the media façade. When choosing images from paintings, consideration was taken to avoid subject matter that is proportionally (or compositionally) vertical. Pushing the limits of the resolution difference between source and broadcast, famous images from the world of photography were also considered for their horizontal subject matter. Upon realizing many of these recognizable paintings and photographs are not suitable for the 50 x 18 aspect ratio of the media façade, stills from popular films were included for their natural similarity of shape.

Though expected, the results were not as clear as Clarke’s controlled juxtaposition of pixels. The “king of the world” scene from 1999’s Titanic, as a low-density pixilated graphic read quite clear at a distance from Ryder Hall. Despite being a fairly high resolution photo, the compression left a perceptual form intact. Its success seems to stem from three qualities of the original image: the subject matter is proportioned much wider than it is tall within the frame, lending itself to the 50 x 18 aspect ratio; the subjects matter is close to the screen.

1Ability to recognize and find clear forms is a subjective claim of the author, and does not assume a consensus of opinions regarding the following images.
and singular, allowing a narrow boundary between it and the background; the compositions colors have great contrast between subject matter and background. At the opposite end of the spectrum, da Vinci’s Annunciation, a famed oil painting from 1475, fails to read familiar or definite. While subject matter is composed properly about the required aspect ratio, it is the colors without great contrast and lack of depth that prevent the eye from form recognition. The results similarly reflect Offenhuber and Seitinger’s anecdotal findings in a paper published regarding this media façade (45).

Photograph 3.3a—Popular Imagery, clearest
Movie Still 3.3b—Scene from Titanic (1999)
The original source images vary in content, and establishing visual clarity with the media façade preferences certain compositions, subject matters, and color compositions. Greater color blocking, and color distinction between subject and background produced a clear image.

Photograph 3.3c—Popular Imagery, murkiest
Painting 3.3d—Annunciation (1475), da Vinci
Annunciation by da Vinci has a more muted color palate and a more gradual perspective which produced a muddled image when translated to the media facade.
Chart 3.4—Popular Imagery, mapping and results

A series of imagery, popular visual culture, was mapped to a low-resolution aspect ratio that ultimately determined its display on the media façade. Images on this page are difficult to recognize, even with the benefit of the photographer’s distance. Images on the opposite page feature a combination of color contrast, perspective, and subject composition in which recognition seems more possible.
North by Northwest (1959)
Alfred Hitchcock

The Creation of Adam (1512)
Michelangelo

The Sound of Music (1965)
Robert Wise

The Starry Night (1889)
Vincent van Gogh
Content for Ryder Media Facade
Fireworks

2017

Creative
Patrick J. O’Donnel
Jose Luis García del Castillo y López

Facade
Dietmar Offenhuber
Susanne Seitingar

Location
Ryder Hall
Northeastern University
Boston, Massachusetts
Diagram 3.5 — Fireworks, two exploding
A sketch for the visual aspects of a new project; plans are to give users access to a trigger through their smartphones to launch Fireworks at night on the media façade.
Fireworks is a visual sketch for an upcoming collaboration which reimagines the media façade as the night sky, allowing users to shoot fireworks through access to the webpage. The visual subject matter of fireworks was deemed appropriate because of the physical relationship between users, the sky and the media façade. The intention of the project is to invite and encourage a collaboration of people who inhabit the same space, at the same time, under media façade; it is only through multiple users, each with a unique color flare, that creates a full fireworks show.

Fireworks seeks to capitalize on the use of animations to increase perceived resolution, as well as minimize the behaviors resulting from an attempt at information retrieval. In a response to Offenhuber and Seitinge’s vote, this project takes utilizes animated sequences to increase a person’s ability to detect boundaries that exist in the voids between the pixels. Critically, the creators of vote noted that a trade-off of between information density and the visual means of explanation (text, labels, thresholds, etc.). By reducing the data display to a visual spectacle, the effort to understand and participate greatly declines. An identifier of color, shown by the web page, would denote a user’s flare color. Instead of playing with interactivity to understand the imagery—conceivably biasing data collection based on emotional state, as in vote—the one-to-one relationship between clicking and launching a firework encourages play to understand the façade’s function. The choice of content also suits the amount of available resolution, which is more than necessary for “ambient treatment” but enough for some texts and “rudimentary” geometries (46).
Content for Ryder Media Facade

Annual Weather

2017

Creative
Patrick J. O’Donnel

Facade
Dietmar Offenhuber
Susanne Seitinger

Location
Ryder Hall
Northeastern University
Boston, Massachusetts
Photograph 3.6 — Annual Weather, July
A scrolling bar chart that shows the monthly high, low, and average temperatures for four cities: Boston (orange), Dubai (green), Moscow (blue), and Sydney (pink).
Annual Weather serves as an exploration into the challenges a design overcomes with the Ryder Hall media façade’s ability to broadcast data. Monthly high, low and average temperatures were collected for four cities: Boston, Dubai, Moscow, and Sydney (www.holiday-weather.com). The bar chart animation, clustered by months, scrolls right to left, allowing an observer to watch season shifts and patterns. A darker line across the bar indicates where the average falls on the high-low range.
The design challenges presented by the media façade diverge from traditional visual displays. First, there are 144 values in the data set (12 months x 4 cities x 3 temperatures) and only 900 pixels: the display must transition information on and off of its visible canvas. Additionally, the use of symbolic graphics will require the design to provide key, or legend, or labels; without any additional device or infrastructure or experience, the code must be broadcast through the display. Offenhuber and Seiting found similar issues with the amount of pixels necessary for a self-contained the explanation versus the density of information to display (46). The display dealt with three types variables—categorical, ordered, and quantitative—in three separate ways. The cities (categorical) were coded by color. The time (months, ordered) were coded along an x-axis and clarified with text abbreviations. The temperature (quantitative) was coded with position, but found a low-resolution scale that fit the highest high and lowest low within the display’s frame. With this visual design, patterns among seasons and months were able to be discerned. From a pragmatic perspective, the utility of the broadcast would rely on a viewer to understand the color-code and follow it through a 30 second (or longer) animation loop. The information that is present on the screen at the same time should be the main focus for a viewer who is seeking the display as a tool or resource.

Photographs 3.8—Annual Weather, scrolling May to June
A chronological series of photos of the façade in action show how difficult it is to read the type, as well as the relative size between graphics and labels.
IV

LED Heatmap Crosswalk

2016

Research and Creative
Patrick J. O’Donnel

(Proposed) Location
Forsyth Street crosswalk
between Shillman Hall and Egan Research Center
Northeastern University Campus
Boston, Massachusetts
Digital Image 3.9— LED Heatmap Crosswalk, visualization sketch

The re-imagined crosswalk incorporates LED roadway panels in effort to create a heatmap visualization of spatial usage around urban areas with heavy pedestrian traffic.
“Solar Roadways® is a modular system of specially engineered solar panels that can be walked and driven upon. Our panels contain LED lights to create lines and signage without paint.”

Solar Roadways

“When someone steps on the crossing, it lights up, making it more visible to drivers—emphasizing the importance of allowing pedestrians to cross.”

Ogilvy and Mather, IBM

“...if regulations cannot force people to follow the law, wouldn’t it be more reasonable to change the law and fulfill the main purpose of keeping the safety and convenience of the pedestrian?”

Jae Min Lim

“Kinetic pads are installed near our EnGoPlanet Smart Street Lights, which harvest energy from pedestrians footsteps,” powering a street lamp and wifi/charging station.

EnGo Planet
LED Heatmap Crosswalk is an idealistic crosswalk redesigned to promote pedestrian rights and safety when interacting with roadways and roadway traffic. As part of an exploration into the nature of urban waits, the project began with research of urban activities and observations of users interacting with materials, tools and technologies along their commutes. Though not a lengthy wait, most pedestrians admit misusing crosswalks and signs with some regularity, crossing outside of the painted allotment, as well as out of turn with traffic signals (Feet First Philly, n.p.). The risk associated with crossing mid-block or out of sequence with traffic can be dangerous, and especially if at night. The Insurance Institute for Highway Safety found that approximately 70% of pedestrian deaths occurred at night (Nitzburg and Knoblauch 12). While the reasons for risky pedestrian behavior can be attributed to many contextual factors, there is a strong correlation between use of crosswalks and less injury. A design response from city planners should take into consideration the ineffectiveness of the status quo of authority measures at intersections.

The proposal for a new crosswalk takes into account a variety of past considerations and current technologies. What is unique to this project is the use of a heatmap visualization. The modular street panels, networked together, could form a matrix which lights up according spatial usage surrounding a crosswalk. Use of the space specifically is too volatile to predict with specific
The roadway panels would need to be simultaneously fitted with lighting technology and kinetic-energy capacitors. A centralized processor would take in kinetic sensor data and develop a heatmap based on how much kinetic energy was produced by each part of the matrix. The resulting visualization would create a heatmap reveals a collective index of past crossing behaviors.

precision, as many painted crosswalks attempt to do. The increased area of the LED matrix—greater than that of Lim’s suggested parabolic areas—allows for a crosswalk pattern that can adapt towards changing contexts, such as installation of a new business on one of its corners, or a large pedestrian boom. If powered by kinetic footsteps—as Lim envisions, and EnGo Planet realizes—the crosswalk is powered by the pedestrians and configured based on actual behaviors. On the following page, an interactive simulation was created to describe how crossing the street could be mapped to a matrix of LED roadway canvases. The information infrastructure tunes its visualization of heatmaps to sample crossing behaviors from a combination of many days or weeks or months, to allow plasticity without overreacting to fringe occurrences.
A simulation showing an overhead perspective of a crosswalk with heavy pedestrian traffic on Northeastern University’s campus. This is a potential pattern of use after 20 pedestrians have used the space. The heatmap would retain this data and add to it with each subsequent crossing, and remove it if the recorded behavior is not recent enough.
Chapter 4

Pre-Installation
A search for space that could benefit from the expression of art and the intervention of design seemed endless on Northeastern University’s campus. With the intention of submitting a proposal to the Public Arts Initiative, the campus survey focused on identifying spaces which were currently void of adornment. As of September 2016, a renovation of the Northeastern Tunnels system—the Tunnels from here on out—had recently been completed (Khavan n.p.). The result was both an improvement to infrastructure, but also glaringly bare spaces.

Upon settling on developing a project for a section of the Tunnels, research and observations were conducted to better understand the existing context. Making a site-specific required an investigation into the physical location—space—and associated technologies, and greater space constructed of experiences—place—and presentness of inhabitants.

The previous review of literature and interactive works of art and design revealed that many artists and designers use light to deliver their messages. From high resolution pixels on electronic displays, to low-resolution pendant lamps in data sculptures: the presence of light carried information. In the introductory text of Superlux: Smart Light Art, Design and Architecture for Cities, editor Davina Jackson observes that lighting technologies are used to activate derelict urban spaces, especially at night. The “desirable spirit of place” (Jackson 110) that these interventions create are predicated on the temporal context after the sun goes down. An epiphany in the development of the proposal highlighted that the Tunnels do not experience visual temporal shifts. In the plainest observation, they are always bright. A light-positive display (of any kind) could only be so effective in a well-lit environment. The development of the project began to consider how a light-negative display would communicate and express.
Three potential spots were identified for an work of immersive art, each varied in amount of daily traffic as well as permanent levels of wall decoration.
Research

The setting

After locations scouting in various other locations, the Northeastern Tunnel system was chosen for its prevalence of traffic and stark lack of traditional ornamentation. The tunnel system connects eleven buildings, and contains 16,705 square-feet of corridors and auxiliary spaces (Kornwitz, n.p.). Additionally, Northeastern President Joseph Aoun, in an interview chronicles the emergence of a public art scene at the University, calls for art that situated “everywhere” about the campus and specifically in places like elevators and tunnels (Khavan, 2015). A visit to Curry Student Center found that the elevators did indeed feature an environmental treatment of its interiors and exteriors, a canvas for student and faculty work. But a trip to the Tunnels, below Curry Student Center, found that the call for public art did not meet Aoun’s desired range.

Photograph 4.2 — Tunnels, bare walls
an example of bare white walls that are a common site in the periphery of the Tunnel system
**The renovation**

A recent effort on the University’s behalf transformed the Tunnels from dark and convoluted, to bright and rationale. With the help of Design Lab Architects, a new graphic and technological was implemented in the space. Some spaces received murals which touched on the Northeastern Community’s pledge to sustainability, but these graphic treatments are not ubiquitous. It's patent from the initial moments in the Tunnels that there are vast stretches of stark emptiness.

The same renovation also installed a state-of-the-art lighting upgrade to energy efficient bulbs that are active only when they sense inhabitants are present in the space. Gleaned through an interview with the facilities manager of Curry Student Center, the smart lights now reduce their energy consumption by approximately 25% due to the sensors. An unintended consequence of the new lighting technology, the spaces are bright, which only serves to emphasize their lack of adornment.

**Regulations**

The Tunnels are not formally recognized as a singular administrative space. Policies for adornment and activity in these spaces are governed by the Building Manager. However, the policies regarding events in the Curry Student Center are made explicit on the University website. Regulations on decorative lights and affixing materials to walls are not conducive to a series of installations (“Curry Student Center Policies,” 2016). Another interview with facilities discovered the tunnels, lawfully categorized as egress pathways, must maintain a base level of illumination in case of an emergency.

**Observing the inhabitants**

The inhabitants of the Tunnels include faculty, staff and students alike. Inspiration of observational methods of observation was sourced from the work of Harry F. Wolcott’s Ethnography: A Way of Seeing—namely, ethnographic reconnaissance (1999). Initials observations were that of an actual inhabitant, recording how one would navigate the Tunnels on an errand: a trip to the library from the Ryder Hall...
The most patent use case for the Tunnels are circulation. Many persons walking through the system did not stop in any of the auxiliary spaces accessed through the Tunnels. Structurally, the Tunnels are not exclusively hallways and there are many sections that are lined with lockers. These lockers are used by commuter students during their time on campus. Access to classrooms, offices and various amenities characterizes a more total understanding of the space’s utility.

The regularity in which these tunnels exhibit use is timed to the schedule of the university. Effectively, the university’s class and work schedule dictates a rhythmicity of occupancy that pulses through the tunnels. Those times before classes: the tunnels are busy. Those times at five in the evening, when it’s time to leave work: the tunnels are busy. But there are also circumstantial forces that give rise to occupancy fluctuations, such as inclement weather and social events.
Epiphany

A fundamental assumption in the initial process equated the Tunnels to urban space. Of the many urban interventions involving light, most of them intervened only at night. “In today's third age of light (the electroluminescent era following history's and natural radiant and electric periods), LED lamps and digital systems are providing unprecedented creative scope control and safety, with public light art performances at night” (Kyriakou, 176). In a subterranean situation, the natural cycle of daylight is decisively excluded from the context of its inhabitants. The issue becomes that light is most brilliant when contrasted by shadow or darkness. So if there is no shadow in the situation of the Tunnels, the intervention should argue for the contrast to exist. For any appreciation of space or light in this context... we must delight the space.
Diagram 4.4 — Interactive Feedback Loop

With diffuse overhead light as the situational constant, the light is first recolored by plastic filters and then reshaped by Fresnell lenses. The result is a passageway bathed in colorful wave-like patterns. The inhabitants that observer the light are sensed by the ultrasonic sensors, which then feed into the orientation of the filters and lenses. Additionally, an RFID reader allows participants to instantly co-opt the ambient display for a custom animation that settles into a unique configuration.
Proposal

A formal presentation to the Public Arts Initiative, a council of artist and administrators, was required in order to secure a public space managed by Northeastern University. Upon discussion with Initiative, it was by their request that the renovation project in the Tunnels left ample amount of room for future creative endeavors. The epiphany about modulating light formed the basis for the pitch. The design of a device needed to engage with an appropriate experiential shift. For the stakeholders from the Initiative, an art project must do avoid three conditions because of its design: structural damage, significant inconvenience, breaking fire code and spatial-related laws. Using light as a medium eases these concerns.

A device and an experience

To help explain the desired experience for an inhabitant in the Tunnels, a device was pitched as a means to carry out a novel situation that is immersive, interactive and delightful.

An immersive installation

A custom-assembled piece of technology would take the existing lights in a section of the tunnels, and retrofit filters and lenses, in order to create a space animated of color and patterns. Like a James Turrell installation, the wash of color seeks to reinvent the visual perceptions of space and depth. It is salient and monumental, without heavy materiality. Because of its sizable breadth, walking through the space takes time appropriate for perception and attention.

An interactive expression

The device would also be outfitted with sensors and an interactive hub. Sensors pick up on the presence of inhabitants, and uses their occupancy throughout the day to drive the colors and patterns. The walls and the floor are thus transformed into a display which reveals usage patterns in the space over a stretch of time—a uniform sense of time that is afforded in a subterranean tunnel. For its scale to be immersive, observation of the device (and its visual output) will be salient for
inhabitants. To satisfy a curious individual’s desire to participate and understand, a radio-frequency identification (RFID) reader will be placed in the tunnel to react to card-carrying members of the Northeastern Community. By tapping their NUID card, the device will jolt from its ambient display mode and present a unique configuration of colors and patterns. This interaction not only recognizes individuality and promotes inclusion in a community, but it satisfies an immediate participation that invites further observation and contemplation of an ambient display.

_A delightful experience_ The saturated colors and smooth undulating patterns projected on the bounding architecture satisfies an aesthetic adornment. Compared to the brightly lit, white walls of the Tunnels now, the addition of the installation will provide a controlled sense of aesthetics in color and motion. Though data-driven, the configuration of the filters and lenses will not move rapidly. By “binning” time along the length of the lights, there is not a dramatic reaction to an inhabitant entering the space. It accumulates data and shows summarized patterns. The choice of light as materiality does not impinge on the space’s primary function of transit. The installation was designed to provide an experience for those who give it attention, as well as for those who don’t.

The proposal was accepted on 22 March 2017.
Detail Design

The visual variables

To represent occupancy data, ultrasonic sensors will be tuned to the space and relay this information to the processor. The sensor sends a binary message: either there is someone in the space or there isn’t. In this way, the processor records this message and uses the most recent twenty-four hours of data. The violin plot in Graph 4.5 shows a single hour, between 11am and 12pm, of occupancy data. These statistics are calculated and then sent out as controls for a certain section of the passageway, certain color filter, and a certain orientation of lens. First, each hour of data is given a section of an overhead light. The modules run the length of the passage and each have two flanking lenses and a set of three filters.

The raw amount of occupied moments of the locale is encoded by the angle of the lens. The effect reads as patterns on higher on the wall and more visually pronounced.

Graph 4.5—Occupancy, 11am to 12pm

A violin plot that shows the frequency at which the sensor was interrupted (inhabitants present). Each bar is a minute, and the plot constitutes an hour. The max occupancy, though not exact, is estimated to be 77 people per minute.
The density of occupancy is calculated and encoded by color. The options for color are orange, green and blue. The color selection was selected from the experiential effects written about by Otto Bollnow. In Human Space, Bollnow references Goethe’s proof of mood space via holding up colored glass to re-experience an environment. He summarizes the effects of color on spatial perception. “Yellowish-red has an active effect on man, intruding upon us, enlivening us but at the same time narrowing our space, while the effect of blue is to retreat, expanding our space but at the same time emptying it and allowing it to become fixed. … Green on the other hand, is the outstanding colour in which the opposing effects balance each other and which therefore neither narrows nor expands, but in its neutrality rests itself” (219). If the passage way was active during that hour, the space is colored orange to re-ignite the narrow feeling of a crowd. And the opposite is true of the choice to use blue. Blue retreats from the viewer, seemingly expanding space, which is akin to a non-crowded hallway experience.

Diagram 4.6—Visual Variables mapped

The device produces a symbolic visual language that reads as occupancy data. Location along the length of all three lights is occupancy data on an hourly basis. The color of the filter represents how rapidly the occupancy grew or shrank. The position of the lens is based on the total amount of passersby.
Chapter 5

Implications
As the project grew, naturally the necessity of site was questioned. If not passageways, where else? The nature of the device and its design suggests that it would best thrive in passageways. Their narrow space and low ceiling height allows diffuse light a distance appropriate for the physics of Fresnel lenses. The calculation of the optics, or a quick experiment, shows the infeasibility of a single rigid lens producing a focused light beam on the floor while also the perpendicular walls. Additionally, the data-collecting sensors are not sophisticated enough to interpret variety of complex spatial behaviors. The sensors were selected for their resolution necessary to solely detect presence in the space. A more complicated spatial or social behavior, like making a turn at a hallway that meets in a four-way intersection, would require different hardware.

Despite these site-specific measures, the project explores some larger concepts regarding space and information which do not seem to be written about formally in the discipline of design. Most notably, the epiphany to remove light, rather than make a device which produces more of it, carries a critique of modern institutional lighting. And so the project uses this means to show occupancy data about a specific space, within that very space. Letting these accumulations become aesthetic adornment for the space becomes a way for the space to have a voice, or have a memory. The context that came before now influences the present. Finally, the ambient visualization of occupancy data comes from a long history of calm technology. The presentation of this information must be able to move in and out of inhabitants' periphery. This thesis offers a solution to provoke use with an immediate interactive mode, one where the participant can immediately effect the colors and patterns produced by the device.
Photograph 5.1—Stained Glass at Notre Dame

An ancient form of light modulation, stained glass filters light into its color components, creating an atmosphere conducive to contemplation of amazement.
Delighting Space, Delighting Experience

**Recent trends in lighting**
Cities are evolving with the access to lighting technologies. No longer are cities grids and plans by which people live and work. Peter Weibel says, “These are dream cities. They are sites and scenery for self-representations, moving poems of light, places where light and shadow” fluctuate. There is an untapped potential in the built environment. Artists and designers are now taking advantage of every façade, wall, intersection, or mobile object can be a screen. For these types of activities, lighting technology is the means (Weibel in Jackson, 14). In a prescient moment, McLuhan finds the electric light to be the ultimate communication medium, for it has no inherent content (9). Electric light permits these expressive cityscapes to develop. Urban lighting grants permission for new contexts to develop: it fuels the city.

**Modulation, not removal**
The play of shadow and light in architectural structures actively engage our sense of depth and presentness. Jackson sees the practice of architecture as the creation of “atmospheres that satisfy human emotions and to convince audiences to see their structures as works of art” (Jackson, 22). In the ultimate medium of light, architecture creates an arena in which its inhabitants react. Therefore, a change of lighting is a change of experience. In cases of excessive lighting, design decisions do not recognize the limits of the physiological pleasure nor the in-place events which constitute its context.

Are there any scenarios that could inform the modulation of light for aesthetic purposes? Though not exhaustive, two cases attempt to recast light for experiential gains. In a historical perspective, church architecture has long valued the art of stained glass windows. Inclusion of stained glass has two effects: physical and experiential. The colored glass separates natural light and only allows certain hues into the space, which is ultimately less luminance perceived by the constituency. It contextually appropriate, for these places of worship do not require the heavy clarity of natural light to proceed. The experience of stained
glass windows is varied among individuals, but it does bring attention to the far-reaching architecture. Attention to the stained glass passes the experience of space-time differently, allowing a faith-induced contemplation of our ability as humans to be present.

In a more modern scenario, airports have designed lighting some longer tunnels to facilitate an experiential foreshortening. Transportation around airport terminals can reduce waiting times (e.g. moving walkways), but a distraction of the mind can alleviate similar feelings of displeasure. At Detroit Metro Airport, the long tunnel becomes almost an attraction, though it was built for the function of connecting two distant terminals (Wayne County Airport Authority, n.p.).

*Photograph 5.2—Light Tunnel at Detroit Airport*

The Light Tunnel, lights and music in partnership by Firefox Glass and James Millnis, is one of the most talked about features of Detroit Airport, whereas the length of this tunnel is not seen as problematic.
Flooding interiors with light

Tanizaki compares the construction of houses in the Eastern and Western tradition pinpoint the initial divergence in shadow appreciation. His argument suggests the roof, “a parasol,” is thrust up for shelter and it leaves a hospitable space carved out by shadow. The Japanese home appreciates this shadow, and allows light back under its protection selectively. He contrasts this process: “There are of course roofs on Western houses too, but they are less to keep off the sun than to keep off the wind and the dew; even from without it is apparent that they are built to create as few shadows as possible and to expose the interior to as much light as possible” (20).

Considering the site: tunnels

The specific instance of the Northeastern University Tunnels shows a use of lighting that is excessively bright and unnecessary for the uses of the space. Discovered in interviews with the management of the facility, the renovation originally had not included a lighting upgrade. The permanence of architecture contrasts with the impermanence of interior lighting technology. A building’s exterior often outlives many iterations of its interior. It is in these scenarios where decisions that take into account context should be utilized. Projects which incorporate (or exclude) lighting that is permanently installed in the space must consider the functionality from the perspective of the administrative and management stakeholders. From their perspective, a retrofitted solution to lighting permits a low-risk and low-cost experimentation with space.

By modulating the light in the Tunnels, the natural temporality of architecture is heightened. A stroll down a bare hallway can feel long, or it can feel short. Some hallways can feel narrow, and some can feel wide, just by altering the situational aspects of space and activity.
Photograph 5.3—Raemar Pink White, James Turrell

A father of light art, Turrell compos[es] psychological space by flooding a room in color and erasing the visual perception of boundaries from which viewers traditionally take depth cues.
Indices of use as character of space

Accumulations  
Much like in the world of public art, there is a way to consider space by its pragmatic presence and what scenarios of use rise from its existence. Julia Lossau and Quentin Stevens suggest, from the perspective of public art, that uses become an index of a changing context or process (7). Our architecture serves as an arena for functions, but its uses are also valuable. Some aspects of architecture were built to be customizable, such as foldable walls, movable furniture, etc. However, by sensing the ways in which people actually use their architecture, we can design spaces that adapt to the convergence of time, space, and outside forces that result in a building’s context.

Visualizing indices of usage patterns within architectural spaces is most commonly result of incidence. Like stone stairs worn out where people step most frequently, accumulations of human behavior can physically alter our spaces (Felton, n.p.). Where management and administration might view these indices as worn out infrastructure, we can see these as evidence of usage. These markings show great character about a space. But, is there a way satisfy infrastructure upkeep and give these actions of past behavior a way to make themselves known? Critics Tacita Dean and Jeremy Millar suggest, “Art, like place, is a process of accumulation and seldom calls for the active destruction of that which came before.” A place for art might exist during the process of renovation. An analysis of what needs repaired, but also what situations caused it, could lead to valuable insights about the inhabitants and their contexts. It is a new space for art. Visualizations attuned to sensors is one solution for giving character to interior spaces without a worn-out aesthetic or the liabilities therein.

Mood space  
So if we are to create these visualizations about usage of space, within the space itself, the technology becomes part of the social situation. Otto Bollnow once opined, “A reciprocal influence exists between a person’s psychological state and the character of the surrounding space” (217). Our perceptions of space are the
means by which we make judgements and decide behaviors. Bollnow believes that every space has an inherent aspect of mood, regardless of its level of ornamentation.

Bollnow recalls the writings of Goethe, and finds that the visual aspects of space give heavy consideration to our perceptions of space. The same space, viewed through a different colored piece of glass, takes on another character or mood (255).

Descottes and Ramos examine how light works to create mood space. They find it essential to consider “both the color of light emitted by a given source as well as the qualities of its surrounding environment” before a perception of space occurs (43). Color can contribute to identity of a place. Descottes and Ramos continue to explain that colored light, specifically, can “leave us with a lasting impression of place,” because our memories are formed from that view pragmatic instance of presentness (46-48). The exact meaning and sensations from a colored light experience varies on a subjective level.
Immediacy Interactions for Ambient Display

As a reaction to Weiser’s critique of the personal computer having too much information to share, information displays can move into the periphery of our attentions by being incorporated into already existing archetypes of artifacts. According to Redström, Skog and Hallnäs, traditional aesthetic objects, or artworks, can be “amplified” with computing technologies to act as information displays (2000, p. 125). Though the examples implemented by Redström et al. showed that it is entirely possible, a restructuring of objects already known to inhabitants took a significant time to be understood as laden with information. For ambient displays to be effective, there is an intersection of sensible information mapping, relevancy to inhabitants, and ability to move in and out of the periphery of its viewer’s attention (Wisneski et al. 9-10).

Delight from feedback

A potential solution to encourage the comprehension of ambient visualizations in more public settings is to offer an immediacy interaction which sparks intrigue for passersby. Utilized in Crisscross Signal Spire, a 311 data visualization sculpture, an animation can be triggered by tweeting at a certain hashtag. The response of the tower to a simple use of social media delights the nearby viewer with a swirling tower of light. An experience such as this can result in enough of a social reward to inspire further contemplation of its purpose and underlying information.

Hervé Descottes considers control of light to be a designer’s “most powerful tool” for shaping perceptions of space (Jackson, 111). There are many aspects of light which act upon our senses simultaneously. Curbing a viewer’s attention most noticeably is the “play of brilliants”—the shine and highlight from focusing or reflecting light. Richard Kelly describes experiencing the play of brilliants as an excitement to the optic nerve, “and in turn [it] stimulates the body and spirit, quickens the appetite, awakens curiosity, sharpens the wit. It is distracting or entertaining” (25). Like the sun reflecting off a freshly waxed car, the distraction from the entertainment is often intimately connected effects.
By illuminating the spaces that inhabitants immediately push to their periphery—such as passageways—a new sense of appreciation can develop for the shared and social aspects of space. Bollnow finds that the constricting elements of architecture to be imperceptible through an aesthetic addition. They can cause a euphoria (261) that dominates the senses, and repaints the world. Years later, Descottes and Ramus seem to echo these sentiments: “As an architectural intervention, carefully choreographed sequences of chromatic light and shadows can provide an element of the unexpected in an otherwise traditional space” (46).
Pronounced ai-no-ma, the Japanese word for “reciprocating place” features the ideogram ma, a sun under a gate, which alludes to both the physical and felt components that create space (Nitschke).
Coda: A Reverie of Shadows

A scroll is hung in an alcove of a Japanese house. The calligrapher composed the picture through the practice of ma-ga-warui, or an appreciation of form compared to surrounding non-form. For the Japanese, calligraphy is not solely about a proficiency of character forms, but also a mastery of composition. According to Gunter Nitschke, an appreciation of sumi-e calligraphy requires an understanding of space-time. “It is not only the placing of form into space, but also the marking of rhythm in time — the traces of the movement and speed of the brush.” So this scroll, embedded with these principles, rests in the center of a Japanese home. Tanizaki finds an almost fractal like connection between the alcove and the calligraphy:

A Japanese room might be likened to an inkwash painting, the paper-paneled shoji being the expanse where the ink is thinnest, and the alcove where it is the darkest. Whenever I see the alcove of a tastefully built Japanese room, I marvel at our comprehension of the secrets of shadows, our sensitive use of shadow and light. For the beauty of the alcove is not the work of some clever device. An empty space is marked off with plain wood and plain walls, so that the light drawn into its forms dim shadows within emptiness. There is nothing more. […] This was the genius of our ancestors, that by cutting off the light from this empty space they imparted to the world of shadows that formed there a quality of mystery and depth superior to that of any wall painting or ornament. […] But for me the most exquisite touch is the pale white glow of the shoji in the sturdy bay; I need only pause before it and I forget the passage of time.

A room which composes itself around the circumstance of light, finds no lack of beauty if composition is attended to. The play of shadow and light a qualities of space which whisper subtly in a modern world filled with distractions and notifications. Throwing open the blinds, even when done metaphorically with electric light, reverts space to its singular physicality—a mere void.
References

Prelude, Introduction and Coda


Stevens, Quentin, and Julia Lossau. "Framing art and its uses in public space” The Uses of Art in Public Space. Routledge, 2014.


1 State of the Art


Reiss, Julie From margin to center: The spaces of installation art. MIT Press, 2016.


Works


VI Tool of North America. TrueCar L.E.D. Santa Monica, California, 2015.


2 Conceptual Framework


Lossau, Julia, and Quentin Stevens. The uses of art in public space. Routledge, 2014.


Reiss, Julie From margin to center: The spaces of installation art. MIT Press, 2016.


3 Experiments


4 Pre-Installation


Jackson, Davina (Editor) and Mary-Anne Kryiakou (Essayist). SuperLux: Smart light art, design & architecture for cities. Thames & Hudson, 2015.

5 Implications

Jackson, Davina (Editor) and Mary-Anne Kryiakou (Essayist). SuperLux: Smart light art, design & architecture for cities. Thames & Hudson, 2015.
Lossau, Julia, and Quentin Stevens. The uses of art in public space. Routledge, 2014.

**Visuels**


0.1b “Garage.” Photograph. https://c1.staticflickr.com/7/6129/5996353905_66e38b0436_b.jpg


0.1e “Overpass.” Photograph. http://www.aaroads.com/california/images710/atlantic_blvd_sb_app_i-710_01.jpg

0.1f “Parking Lot.” Photograph. http://www.loe.org/content/2016-02-05/CARS-big_parking_lot.png


1.2 Ibid.


1.4 Ibid


1.10 Ibid.
1.14 Ibid.
1.16 Ibid.

2.3 O’Donnel, Patrick J. Diagram. 2017. Content from From margin to center: The spaces of installation art by Julia Reiss.
2.4 Unknown. Photograph. https://68.media.tumblr.com/tumblr_lqh5x8qfK1qghk7bo1_l1280.jpg
2.5 O’Donnel, Patrick. Diagram. 2017. Content from The Uses of Art in Public Spaces by Julia Lossau and Quentin Stevens.
2.8 O’Donnel, Patrick J. Table. 2017. Content from Technology and the Lifeworld: From garden to earth by Don Ihde & Beyond Interaction: A short introduction to mediation theory by Peter-Paul Verbeek.
2.9 O’Donnel, Patrick J. Diagram. 2017. Content from ““Future user-product arrangements: Combining product impact and scenarios in design for multi age success” by Steven Dorrestijn, Mascha van der Voort, and Peter-Paul Verbeek.


2.11 Bean, Bill. Photograph. http://therecord.blogs.com/.a/6a00d8341c465d53ef0134860101eb970c-pi


3.2b Ibid.


3.4b1 Seurat, Georges (Artist). A Sunday Afternoon on the Island of La Grande Jatte [painting], 1884.
3.4d1 Hitchcock, A. (Director). North by Northwest [motion picture], 1959.
3.4e1 Michelangelo (Artist). The Creation of Adam [painting], 1512.
3.4f1 Wise, Robert (Director). The Sound of Music [motion picture], 1965.
3.4g1 van Gogh, Vincent (Artist). The Starry Night [painting], 1889.
3.4g3 O’Donnel, Patrick J. Photograph. 2017.


4.3 Ibid.


4.5 O’Donnel, Patrick J. Graph. 2017.


