Spring 2017

Materializing Light

Lirong Tan

Follow this and additional works at: https://surface.syr.edu/architecture_theses

Part of the Architecture Commons

Recommended Citation
https://surface.syr.edu/architecture_theses/402

This Thesis, Senior is brought to you for free and open access by the School of Architecture Dissertations and Theses at SURFACE. It has been accepted for inclusion in Architecture Senior Theses by an authorized administrator of SURFACE. For more information, please contact surface@syr.edu.
MATERIALIZING LIGHT

LIRONG TAN
ADVISOR: AMBER BARTOSH
SPRING 2017
SYRACUSE UNIVERSITY
Artificial Light, especially volumetric light can be materialized and transform the existing ruin. Specifically, I would choreograph the interaction between people and light to exaggerate, or dramatize the tragic feeling of Hiroshima Memorial Dome.
Revitalizing the Past

There are things that belong to the past. They contain treasurable memories but no longer fit in contemporary world. There are many ruin sites in major city centers as Tokyo, Rome or Beijing. They are isolated from contemporary urban life, and often being debated whether to preserve it as it is, or tear it down.

The thesis introduces light as a solution to revitalize the ruins while minimizing physical constructions. Artificial light, especially volumetric light can be materialized and transform the existing ruin. Since light is a material in between physical and virtual realm. It can be designed to revitalize the space, while minimizing physical constructions that might damage the historic site. Through revealing, hiding or introducing additional information, the designer can refurbish the past and present to the contemporary.

Light as a mask of transformation

On the left is a piece of Mark Rothko’s mural painting, the color was faded 50 years after commission, and adjusted with projecting an additional layer

On the right is a 3d version of Rothko’s mural. It’s the Tribute in Light Installation in remembrance of 911 attack.

Inspired by both approaches, the thesis aims to not only restore parts of Hiroshima Dome’s appearance, but also introduces experiences of laughter and playfulness to lessen the tragedy.
1. The experience of light can be categorized as perception, movement, and interaction.

2. Light can be used as materials to create forms. It can paint a composition on existing walls.

3. In terms of movement, artists UVA has created the installation call momentum, which is an array of pendulums swing back and forth and allows people experience the rhythm and time.

What I find the most interesting is the direct interaction between people and light, as this is what distinguishes light from other materials.

1. Light at eye level dispels people from certain area, while the soft light can be inviting;

2. A wall made of light can be walked through, but it can channel the flow of people

3. Mirror effect: strong light projects the silhouettes of human shadows on the wall, creates a stage of people and provokes self-awareness
Dune

DUNE is a public interactive landscape that interacts with human behaviour. The rituals of nature and technology is consummated of layer amounts of time that brighten according to the sounds and rhythms of passing visitors.

Evoking through several contexts, DUNE 4.1 enhances social interactions in the public pedestrian Maastunnel commissioned by Rotterdam City of Architecture. The 60-meter DUNE 4.2 situated on the Staalplein in Rotterdam (NL) uses less than 60 watts of energy. Within this setting, Rotterdammers often enjoy their walk of light, DUNE is an interactive landscape of light placed in the dark. During 2015 on the occasion of the 10th Art Biennale of Sydney with its hundreds of interactive lights and sounds, DUNE explored radical in a radical relation to urban space.

Specifications:

2005-2012. Modular system of height: 50cm, width: 60cm, variable heights: hundreds of LEDs, sensors, speakers, interactive software and electronics; variable up to 400 meters.

Line

A point extended becomes a line; with properties of length, direction and position.

- Associated light sources: tactile, laser.

Spazio permeabile

Barcelona's Casa Bernarda plays with light and space to create his impressive installations:

"His site-specific installations are based on triangular forms where lines pass through walls, floors, lobbies and even between buildings. Each installation has its own precise viewpoint, from which it can be seen as a two-dimensional form, following principles similar to axiomatic illusions."

Dune: A kind of lights

Vanishing Point

"Vanishing point: employs perspective on both real and virtual axis to re-stage, re-define and re-present an undefined area. The immersive installation is united with visual artists in executed using lasers which project lines through space from an arbitrary vanishing point, resulting in the creation of different volumes, divisions and masses. It’s a kind of spatial illusion where you experience the light. The Vanishing Point is installed on the concrete boundaries of space; you can experience the light."

Materiaux: black, white, laser, light.

Your making things explicit

"Bernardes I don’t think of the words as being about something finite or defined. I think about each word as a sentence in a conversation. So I am both interested in the actual sentence and the broader conversation. There are many things.

Line

A point extended becomes a line; with properties of length, direction and position.

- Associated light sources: tactile, laser.
**Waterlicht**

*WATERLICHT is the dreamlike landscape about the power and poetry of water. As a virtual fluid, it does not allow the water to reach without human intervention.*

*Innovation is a natural part of the DNA of the Dutch landscape through its clear and constructive thinking, yet we are still keen to leave something for us.*

*WATERLICHT consists of easy lines of light made with the latest LED technology, software and lenses. Originally commissioned for the Dutch Hotelier Water Board (NPD & LVM), the artwork has now travelled to the Museum van de Archeologie, first Melbourne in Paris, France and (MOC) Scotland in the Netherlands.*

*WATERLICHT will continue its journey to create more water awareness.*

**Line Describing a Cone**

*Line Describing a Cone is made from a beam of white light emitted from a thin projector positioned at one end of a darkened room. Passing through the projector is an annular film of a foil, Resulting in a light that, when in place, gradually rises up and becomes a complete circle. Over the course of fifty minutes the film of light begins to circulate.*

*The beam of light on the floor gives the appearance of a threedimensional hollow cone. At first dramatic the smoke machine gives the beam of light greater density, making it appear almost tangible.*

**Corridor**

*Two parallel currents of water are in a completely dark, long room. They are made of drops of water, which fall from the roof into two parallel pipes. The currents of water form a conical reservoir that is made of metal bars. The water can reflect the corridor across the internal walls. White light makes the falling drops of water seem as if they are distant, through smoke, fog, and the even between buildings.*

*Materials: Metal, water, nozzles, hose, pump, 24 strobe lights*

**Beauty**

*A vertical cone spanish of fine steel from the ceiling of a darkened room through the beam projects a spotlight. From certain perspectives, a diamond can be seen in the falling water. It shifts in intensity or disappears as the viewer approaches or moves away.*

*Materials: Spotlight, water, ceiling wood, hose, pump*
**Plane** (illuminated from center)
- A line extended becomes a plane. With properties of length and width, shape, surface, and position.
- Associated light sources: LED light, often achieved through casting on real, sheer, smoke etc.

**Volume**
- A plane extended becomes a volume, with properties of length, width and depth, form and space, surface, orientation and position.

**Mirror threshold**
For cccccc, photography is a way to explore abstraction and the physical limits of image-making. His conceptually driven photographic work is centered on ideas of visual perception and metamorphosis, as in the “horizon” series, where he used the unexposed ends of film rolls as negatives, creating using bands of color with a stark division between dark and light, or in other series affecting mirrored surfaces to record light. Only recently, he has begun exploring the human figure, in a series of black and white images that highlight negative spaces as positive pass through contours, in addition to photography. Wolff works in installation, creating abstract patterns in black and white maple dust, printed canvas, and projections on urban environments.

**Atmosphere**
- The light penetrating in the space: Stimulating tone or mood of a place.

**Feelings are facts**
In this project, Flasson introduces condensed bands of artificially produced fog into the gallery, stimulating with an artificial light spectrum, creating using mirrors of real, glass, and blue fluorescent lamps. The illusion in light is not something we feel in nature, however, as one walks through the space, the lights and motions experience become real.

**Corner**
- The space at the angle between converging lines or walls which meet in a point.

**Corner Shallow Space**
A Turrell Corner Shallow Space is created in a corner, at the light creates an illusion of a three-dimensional object. Working out of a small studio in the area of Venice, California in the early 1970s Turrell began to explore work with projected light, as seen in the document now below. Setting up a slide projector mounted to the ceiling of the room, a platform, Turrell experimentally experienced with conventional, 8mm color film, creating to a seemingly solid three-dimensional volume of brilliant light.
Corner

- The space in the angle between converging lines or walls which meet in a point.

Corners, Barriers and Corridors

In terms of corner installations, a sequence of four related constructions - initiated by Barnett Newman in 1947 - are on show for the first time since Rasín’s 1977 solo exhibition at the Green Gallery, New York, as an act of provoking, wall-mounted discs that are combined into a triangle shape in the corner of the room. The series is an example of Rasín’s lesser-known,truncated light boxes - initiated by a man, George Miller’s 2 - born 1972.

Mirror

- A reflective surface creates visual illusions of space.

Weather

In this installation, The Weather Project, representations of the sun and sky dominate the sequence of the Turbine Hall. A fixed road penetrates the space, an imposing in from the environment outside. Throughout the day, the roof accommodates 12,000,000 Formations, before dissipating across the space. A glance overhead to see where the real sky escapes reveals that the ceiling of the Turbine Hall has disappeared, replaced by a reflection of the space below. At the far end of the hall is a giant semi-circular form made up of hundreds of mirror frequency lamps. The air, repeated in the mirror overhead produces a sphere of shining iridescent lighting the real space with the reflection. Generally used in street lighting, mirror frequency lamps are used at such a mirror frequency that colours other than yellow and black are invisible, thus transforming the visual field around the area into a vast aureole landscape.

Materials: Mirrofrequency lights, projection box, light machines, mirror foil, aluminium, and acid-etching.
There are four different types of light. The ambient light is considered as the most basic form of light. The second tier is projection, or surface treatment, including digital projections, shadow plays, silhouette shows, as well as gobos, which is a dark plate or screen used to shield the lens from light. Essentially projection enlarges designated information, but sometimes diminishes the presence of light itself. The third kind of light is volumetric light, which is also the primary focus of the thesis. Beginning with primitive shapes such as cone and extrusion, designers are able to create more complex geometries.

The last kind of light is animated light, which adds a fourth dimension to space and allows one form to morph into another. I attempt to animate the light through controlling the track of light sources, or controlling the size of cone shape through using oculus. When combining animated light with planar projections and volumetric light, unexpected coherences between mass and rays can be produced.
Shades of Hiroshima are not real shadows, but carbon imprint of human bodies that permanently etched on stones or concrete, caused by the heat of explosion.

Genbaku Dome was built in 1915 as an industrial promotion hall, and is the only building survived from atomic bomb. It locates at the northeast side of Hiroshima memorial park. It faces Ota river on its west. It locates in a commercial district and currently surrounded by tourism spots accompanied by restaurants.

The main entrance of the original building is from the west, but now it is protected by fence preventing damage from people.

The remaining structure includes one story wall on its west and east side, free-standing walls contains two cylinder spaces and rectangular volumes. The only part above head is the steel frame dome, and there's no floor slabs remain. Reinforcing steel frames are inserted to support the structure from a typhoon or an earthquake.

The opportunities I see from the site includes:
1. To reconstruct the front façade with light
2. The building is entered through underground channel to control circulation of people and reduce damages.
3. The open courtyard can be doing ground interventions and covered with mesh to receive light.
4. The path can be inserted through the window openings without touching it.
The final design will be tested through

1. Models of both small scale and mock-ups to describe the experiences
2. Pepper’s ghost device to collage the physical site model with phantom images.
I’ve chosen to use screenplay as a tool to describe the sequence of interaction with light. Then the spatial experience can be combined in a sectional view. Design is developed through moving back and forth between the screenplay and the holistic section.
The Hiroshima Memorial Dome in the daytime is a ruin representing the tragedy of Hiroshima. After the sunset, there’s something different going on. The broken building seems to be recovered and you can see a new face made of light. The ground is surrounded by mirrors reflecting the city skyline. You are attracted by it and decided to visit.

However, you couldn’t find the entrance, it is surrounded with the mirror and you can find only the reflection of yourself in the mirror. When you about to give up, you found an illuminated line on the ground.
Walking down the stairs, you reach the reception room. The room is filled with haze. There’s a light source buried in the floor projecting a cone to the mirror on the ceiling. The light reflects and form a mushroom-shape canopy. People all gather under the canopy waiting. You can roughly figure out the size of the room but you decide to get in the canopy as well because it makes you feel safe in space you can see.

After walking along the river for 3 minutes, you see stairs going down very bright.
Suddenly the canopy goes away, leaving everybody in complete darkness. And you feel the room is slightly shaking. Is it an earthquake? You are afraid. As you are complaining how unreliable light is, you hear a voice. Someone calls himself a guide and you are told this is a fallout shelter. What just happened was a bomb attack. "How absurd." You think.

"Follow me!" The guy opens a door at the back of the room. The strong light hit your eyes so bad and you think you will be blind.
Behind the door seems to be stairs going down. “You have to live underground in mineshaft until the radioactive elements go away. But don’t worry it won’t be long.”

You are still covering your eyes with hands. You realized the light is at your eye level. All you need to do is to bow and look down. You discover the stair is painted with mural of the dome.
Finally, you now stand on the ground. You are facing a wall. Behind you are people playing the courtyard and there’re shadows projected on the wall. You discover the gravestone at the bottom of the wall, reminding you how thin the line is between life and death.

“People decide to build with light.” The guide explains. “After the attack, they don’t trust any physical materials. Light doesn’t fall on your head. They replace walls with light to define space.” Now you understand why there’s light always at your eye level. As the ceiling becomes lower, you must crawl.
You walk around the building and there’re shades painted on the ground marking the corpses. You are terrified at first, until you discover the outline of a Pikachu. “I don’t like bombs at all. They killed my favorite cartoon character.”

Keeping walking and you are literally stand in the façade. There’s a path pierces through the building and you walk on the ramp.
The circulation ends at the scene of emergency staircase. It won’t be functional in a bomb attack, but it is certainly a good stage setting.

Now you are in the dome. The steel frames are coated with LED lighting. There’re core shape balloons floating in air look like a-bomb falling.
05

YOUR CHANCE ENCOUNTER

Since light is such an ethereal substance that interact with the solids in a unique way, also because the movement of light adds the fourth dimension to the existing, animation appears to be the most appropriate tool that empowers the designers to investigate the complex behavior of light. The animation investigates the possibilities that light can be materialized and transform the physical ruin site.

URL for final video: https://youtu.be/l2sjpQNAHAg

THE FRONT FACADE

The Hiroshima Dome along remains a tragic piece during the day, after the sunset, there’s something different going on. The front facade is revived with projection light. Through symmetrical patterns applied on two wings of the ruined façade, the triangular module system re-establishes the wholeness of building face.
Walking down the stairs, you reach the reception room. The room is filled with haze. There’s a spotlight buried in the floor. It projects a cone shape up to the mirror. The light rays reflect back to the floor and creates a canopy. There are skylights at the side producing a secondary screen. You want to step inside the canopy, walk around it, and touch the light.

The ground intervention traces the contour of building shadow from Aug 06, 1945, 8:16 am, when the bombing took place. The openings turn into recessed light buried in the ground. The shadow is represented using black gravel in contrast with soil.
HIROSHIMA SHADES

You now stand on the ground. You are facing a wall. Behind you are people playing the courtyard and there’re shadows projected on the wall. You discover the gravestone at the bottom of the wall, reminding you how thin the line is between life and death.

THE TUNNEL

There’s a long tunnel behind the door. The space is filled with faint light shafts, mixed with stronger light cones from above. You feel like walking in a mineshaft.
THE FIREWALL

At the north end of courtyard is the fire stair constructed against the concrete wall. Another layer of fin shape light is added outside of the stair. The fins gently move inward and outward as the concrete wall is breathing.

THE COURTYARD

The courtyard also covered with fog. Volumetric light creates various shapes and spaces. Coincidentally people gather under soft canopies while avoiding stronger light beams. There are trusses hanging spotlights above the head, creating light pavilions for people to rest and talk. There’s a light corridor against the wall formed by an array of light beams.
SHADES ON THE GROUND

Going up on the ramp, here again is a literal reference to Hiroshima shades. Each spot light is a tribute to a life. The transformation of light spots has the same pace of human breathing.

LIGHT FOREST

Walking toward the south of courtyard, there’s a balcony sticks out from the ruin and cone lights project from below. You can lie among the forest of light watching light spots changing their cone sizes.
In the dome are sky lanterns floating in the air, being dragged by strings on the ground. As the lanterns float against gravity, they strengthen the verticality of space. They also lighten the heaviness of the ruin and give a sense of hope.
Instead of having the bracings cast dark shadows on the wall, they are dematerialized through replacing the shadows with white illuminated crosses.
THE BIRD-EYE VIEW

The ground intervention traces the contour of building shadow from Aug 06, 1945, 8:16 am, when the bombing took place. The openings turn into recessed light buried in the ground. The shadow is represented using black gravel in contrast with soil.