THE BEAT'S INTERIOR

by TAMAR PETERSEN

The Beat's Interior

Tamar Petersen

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Master of Arts
In
Creative Technologies

Thomas Tucker
Charles Nichols
Simone Paterson

1 May 2015
Blacksburg, VA

Keywords: Fine Arts, Architecture, Design and Decorative Arts

2015 © Tamar Petersen and Virginia Tech

The Beat's Interior

Tamar Petersen

ABSTRACT

The "Beat's Interior" seeks to answer the simple question: What does the inside of a beat look like? This thesis provides a solution as an audiovisual projection-mapping project inspired by the song, "Pyramids" by Frank Ocean. It explores the relationship between music and architecture. Influenced by scientific theories of cosmic space and the philosophical ideas of space and rhythm, this installation becomes an immersive experience within a constructed form.

Original video is mapped onto the skin of the dome using four projectors that are orchestrated through Madmapper. Eight individual parts of a single track are played separately on designated stereos located on the periphery of the room. Changes in the video and music are triggered by GyrOSC data filtered into Max/MSP/Jitter.

Acknowledgements

Thomas Tucker
Dr. Simone Paterson
Dr. Charles Nichols

JP Verheul
Virginia Comparini

Jud Froelich
Dongsoo Choi
Reza Tasooji
Tanner Upthegrove
Liz Ligouri
Sam Blanchard

Dane Webster
ICAT

Table of Contents

01 **Introduction**
03 **The Beat's Song**
04 **Acoustic Space**
04 **Milieu**
05 **Rhythm**
06 **The Dome as the Beat**
08 **Cosmic Space**
10 **Visual Process**
31 **Logistics**
36 **Conclusion**

List of Figures

1. Parti Sketch, 9.
2. Pyramids by Frank Ocean, 9.
3. Conceptual layout of the installation, 12.
4. The structure of the geodesic dome in plan view, 13
5. The unwrapped view of the geodesic dome with subdivisions, 13
6. The pattern of the fabric that creates the subdivisions in the actual geodesic dome, 13.
7. Accumulation of strings at the every point of space-time, 14.
8. At least six dimensions occur at each point of space-time, 15.
9. Pattern Template, 17.
10. One frame from video of sound effector, 16.
11. Pattern made within template based on the density of particles during that moment of the song, 17.
12. Using MASH in Maya, ambiguous landscape generated based off the pattern, 17.
13. Full visual process for one section., 18-21.
14. Collage 1, 22.
15. Collage 2, 23.
16. Collage 3, 24.
17. Collage 4, 25.
18. Pattern template subdivided, 27.
19. Subdivided Pattern 1, 28.
20. Subdivided Pattern 2, 29
21. Subdivided Pattern 3, 30.
22. Subdivided Pattern 4, 31.
23. Subdivided Pattern 5, 32.
24. Subdivided Pattern 6, 33.
25. Subdivided Pattern 7, 34.
26. Subdivided Pattern 8, 35.
27. GyrOSC pulls compass data and sends to Max/MSP/Jitter over a network, 37.
28. Max/MSP/Jitter composes original video into a single 5-layer video player, 38.
29. MadMapper with divisions of video sent to each projector, 39
30. The floor plan showing location of projector, 39.
31. Room layout for music, 40.
32. Max/MSP/Jitter Patch for assigning each track to a specific speaker and scaling the volume based on compass data range, 41.
33. Geodesic dome on ICAT Day, 42.
34-35. Projector and Geodesic Dome, 43.
36-37. Up-close of skin on geodesic dome, 44-45.
38-39. Detail of skin attached to dome, 46.
40-41. Entry into geodesic dome, 47.
42-43. Inside the geodesic dome, 48.

Introduction

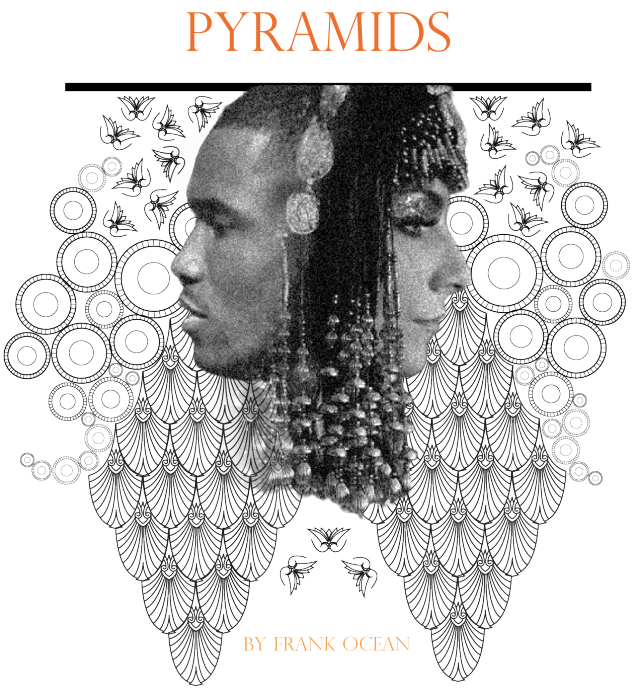
"Music was my refuge. I could crawl into the space between the notes and curl my back to loneliness."

- Maya Angelou

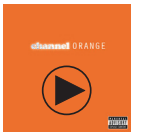
Music is where I go to turn my pissed into happy, my sad into soulful, my upbeat to utter giddiness, my rage into fuel and my hate to… a mild dislike. When finding myself in music, I seek out the heavy subwoofer* booms *and the rhythmic* cats *of the kick drum. I step inside the beat, and it is transformative. I enter as one thing and leave as the other. Music is my sacred space, but the beat is my favorite place.

Now consider this: if sound is space and the beat is place, then what does the inside of the beat look like? The purpose of the "Beat's Interior" is to answer this question, and it does so as an audiovisual projection-mapping project inspired by the song, "Pyramids" by Frank Ocean. The concepts of this installation draw from scientific theories of cosmic space and the philosophical ideas of space and rhythm to create an immersive experience within a constructed form.

The Beat's Song



1. Parti Sketch



2. Pyramids by Frank Ocean
Album: Channel Orange
Released: 2012
Label: Def Jam

The visualization of the beat requires understanding the space in which the beat exists. What is the beat, and how does exists within that space? To start, we refer to the actual song. "Pyramids" is a nearly ten-minute musical excursion through the downfall of the black woman from ancient Egyptian times to modern-day. It lyrically jumps between modern and ancient settings, but the transition between these space-times is made possible by the " ' . . . smattering of electro-house synths, Michael Jackson influenced pop melodies, spaced out electronic segues, UK bass breaks, saxophone, and guitar solo courtesy of John Mayer.' "[1] The rich network of sounds makes this " 'an ambitious song with multiple moves.' "[2] And through this network, Frank Ocean primes the understanding of the beat with ideas about multidimensionality and cosmic space.

1-2. "Pyramids (song)." Wikipedia.org. May 5, 2015. Accessed May 8, 2015. http://en.wikipedia.org/wiki/Pyramids_(song).

Acoustic Space

Sound is inherently spatial. It creates a detectable presence by indicating location, direction and movement. However, acoustic space is different from visual space. According to McLuhan,

"Acoustic space is multidimensional, resonant, invisibly tactile, 'a total simultaneous field of relations.' Where visual space emphasizes linearity, acoustic space emphasizes simultaneity – the possibility that many events can occur in the same holistic zone of space-time."[3]

This is where the beat exists.

Acoustic space is chaotic. Sounds have the ability to overlap and penetrate each other while still maintaining their own distinctions. These interactions do not necessarily fuse sounds together in the way that points in visual space either fuse or remain separate.[4] Acoustic space allows for fluidity, which is made possible through milieu.

Milieu

Milieu is French for surroundings/medium/middle.[5] It is a condition. In acoustic space, these conditions occur when sounds move within the same direction or dimension, and this occurrence is cyclical. In this way, milieus are vibratory.[6] They can only exist as the relational conditions of sounds that occur within the same bloc of space and time. Milieus are the *in-between* composed as both the absence and presence, the before and after, the here and there of whatever sounds in the acoustic space that happen together. They are transitions between the relationships of sound, which has the potential to produce the harmonies of music.

Thus, the landscape of acoustic space is a network of sound relationships, and movement within this landscape happens through milieus. Traveling from one milieu to another, the listener happens upon sounds that have been spliced, cut, overlapped, warped or silenced from the last milieu. There is no hierarchy or order, only the increasing potential for

disorientation as the listener becomes inundated with sound.

Here enters rhythm.

Rhythm

Rhythm is the cognitive acoustic pattern perceived by the listener. It ties critical moments of milieu together. This happens transdimensionally across milieus, making the difference between the moments just as important, if not more, as the repetition.[7] These rhythms form connections that frame milieus and provide structure in acoustic space. According to Elizaebth Grosz,

"The frame separates. It cuts into a milieu or space. This cutting links it to the constitution of the plane of composition, to the provisional ordering of chaos, through the laying down of a grid or order that entraps chaotic shards, chaoid states, to arrest or slow them into a space and a time, a structure and a form where they can affect and be affect by bodies.[8]

Ultimately, rhythm defines a place. It is a place within acoustic space. It is a place within acoustic space that has been identified by the listener. And this *identification of place*[9] qualifies rhythm as a dwelling, giving it the potential to house memories, thoughts, and feelings specific to the individual who seeks refuge in it.

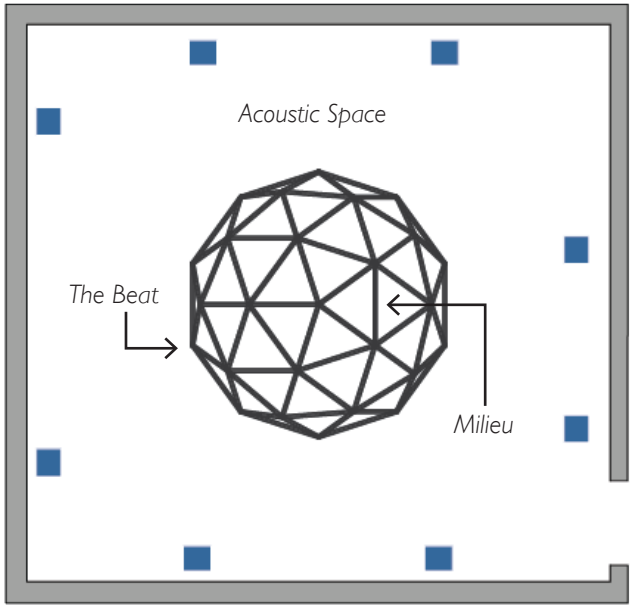
This is the beat.

3-4. Davis, Erik. " 'Roots and Wires' Remix: Polyrhythmic Tricks and the Black Electronic." *In Sound Unbound Sampling Digital Music and Culture*, edited by Paul Miller. Cambridge, Mass.: The MIT Press, 2008. 54.
5. Murphie, Andrew. "Milieu, Rhythm, Refrain, Territory." Adventures in Jutland. September 8, 2013. Accessed May 8, 2015. http://www.andrewmurphie.org/blog/?p=426.
6. Davis, Erik. " 'Roots and Wires' Remix: Polyrhythmic Tricks and the Black Electronic" 59.
7. *Ibid*, 58-60.
8. Grosz, E. A. *Chaos, Territory, Art: Deleuze and the Framing of the Earth*. New York: Columbia University Press, 2008. 13.
9. Ten Hoope, Dave. *On Place And Space - The Pragmatism Of Existentialism*. 1st ed. 2010. Web. 8 May 2015. 9.

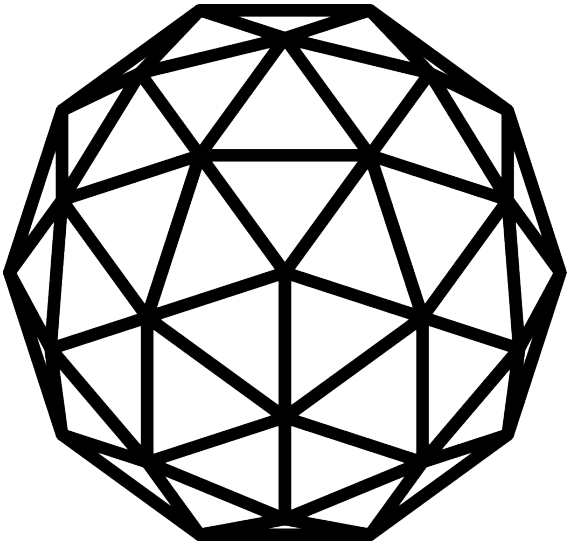
The Dome as the Beat

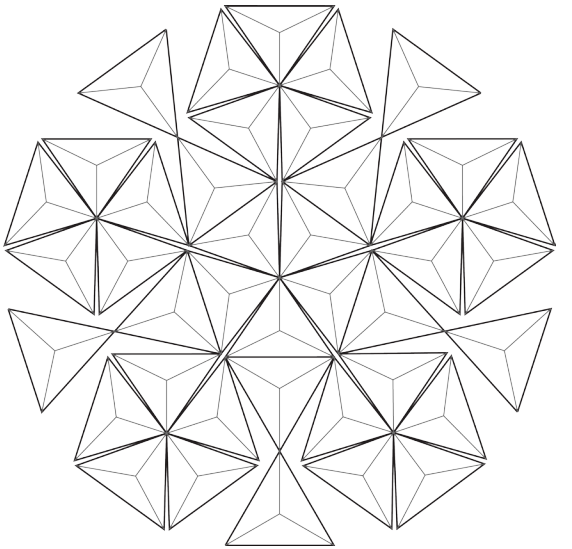
The geodesic dome in this installation is the beat. The placement, the structure and the skin are essential to its physicalization. The installation is setup so that the dome is situated in the center of a room where a surround-sound stereo system plays continuous music. The dome acts a specific place within the acoustic space (the room) to experience this music. Once inside the structure, the user has the ability to control both the sound and visuals based on his/her position. The interaction with the installation generates a personal experience ascribed to this specific place.

More specifically, the geodesic dome creates a literal frame/structure within the room. The architecture of the dome is reinforced by the design of fabric. The pattern of the fabric subdivides the structure into more triangles that dictate the way the visuals are framed and arranged.

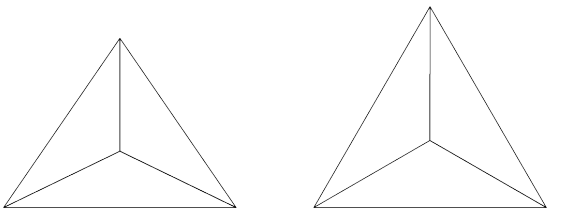


3. Conceptual layout of the installation



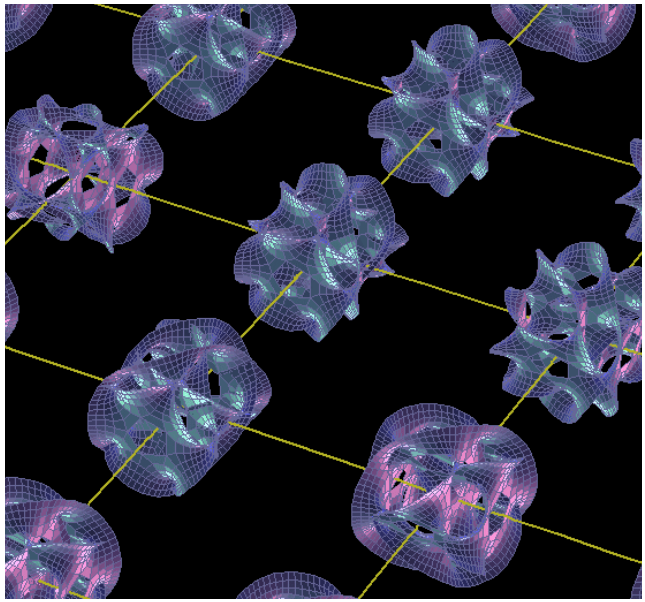


(Left) 4. The structure of the geodesic dome in plan view. (Right) 5. The unwrapped view of the geodesic dome with subdivisions (Right bottom) 6. The pattern of the fabric that creates the subdivisions in the actual geodesic dome.



Cosmic Space

Now that the space and behavior of the beat have been defined, we look to cosmic space for aesthetic direction. The fluid otherworldly electronic sounds in "Pyramids" automatically recall the connection between electronic sounds and cosmic space. Beginning with the electronic tonalities that scored *Forbidden Planet*, the 1950s UFO movie sound tracks has forever ingrained the link between synthetic tones and outer space into our culture thinking.[10] Its popularization in the Counterculture assigned electronic music as the primary mode for traversing the inner human space, which became synonymous to cosmic space. Even later, the synthesizer was considered "to be a trans dimensional biofeedback device; by generating invisible landscapes through mostly invisible circuits, these machines seemed to lead listeners within themselves, into disembodied states of consciousness that mirrored the emptiness of deep space."[11]

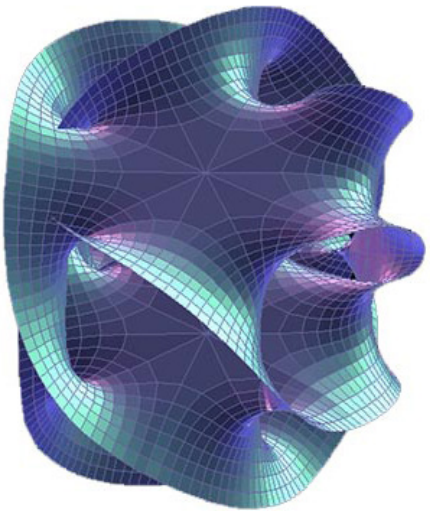


7. Accumulation of strings at the every point of space-time. Source: http://www.particlecentral.com/strings_page.html

11. Davis, Erik. "'Roots and Wires' Remix: Polyrhythmic Tricks and the Black Electronic" 55.
12. "The Elegant Universe 1 of 3 Einstein's Dream," YouTube, 56:04, posted by "Scientific Unity," Jun 21, 2012, https://www.youtube.com/watch?v=UV_X2B5OK1I.
13. "The Elegant Universe 3 of 3 Welcome To The 11th Dimension," YouTube, 55:50, posted by "Scientific Unity," Jun 21, 2012, https://www.youtube.com/watch?v=36tGKrWY4QE.

Though described as empty, these electronic-musically induced states are not intangible. The Theory of General Relativity describes space as a fabric that can warp and stretch. It defines space using three dimensions plus time. This theory is comparable to visual space, whereas String Theory expands on this traditional notion of space, suggesting that multiple dimensions exist as extremely tiny strings at every point of the fabric of space-time.[12] These hidden dimensions allude to alternate dimensions and parallel universes, giving the intangible interdimensionality associated with electronic music a scientific basis of physicality.

The conglomeration of strings provides the strongest point of reference for the visuals. The six dimensions of string produce a distinct form. The form determines the shape of a smaller string, and that shape produces an essential particle of the universe's atomic constitution. This theory is analogous to how the shape of an instrument determines a specific sound.[13] This metaphor is key to generating and animating the visuals of the installation.



8. At least six dimensions occur at each point of space-time. This image is an important reference for developing visuals of this installation. Source: http://www.crystalinks.com/stringtheory.html

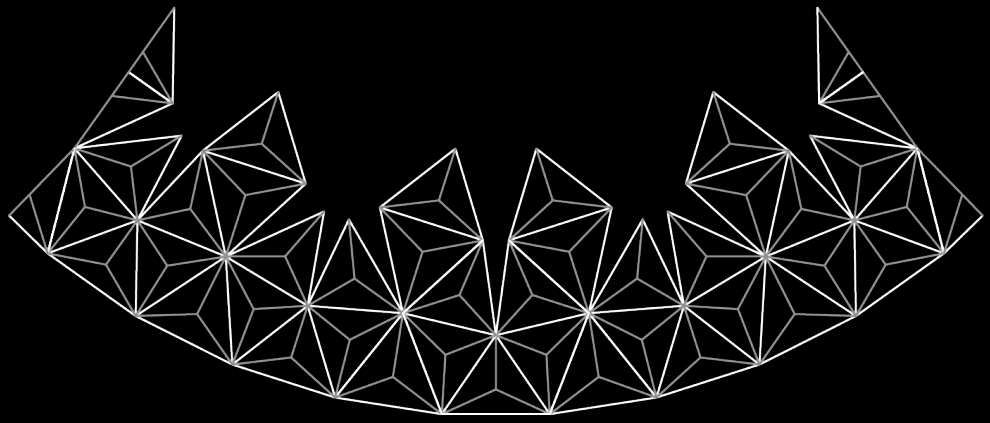
Visual Process

STRATEGY

The intention of the visuals is to simulate a sense of travel through multiple dimensions as it relates to "Pyramids." By referencing the metaphor between music and String Theory, the strategy for making the visuals was to isolate particular moments in the song, create a visual representation of each moment, layer them, and visually morph them into each other. The act of layering the visuals specifically references the six dimensions of string at each point of space-time. The morphing between the layers recalls the movement through milieus in acoustic space. This overall strategy generates unique images that are only possible through combining and morphing these layers. In other words, the images that emerge are completely relational and specific to the individual perceiving them.

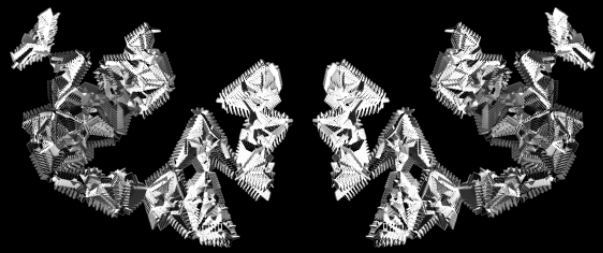
A sound effector was used to visualize "Pyramids," and specific frames from the video were isolated to generate an "acoustic landscape. One iteration includes 8 layers as shown in the following, and this process was performed as 8 different iterations.

10. One frame from video of sound effector



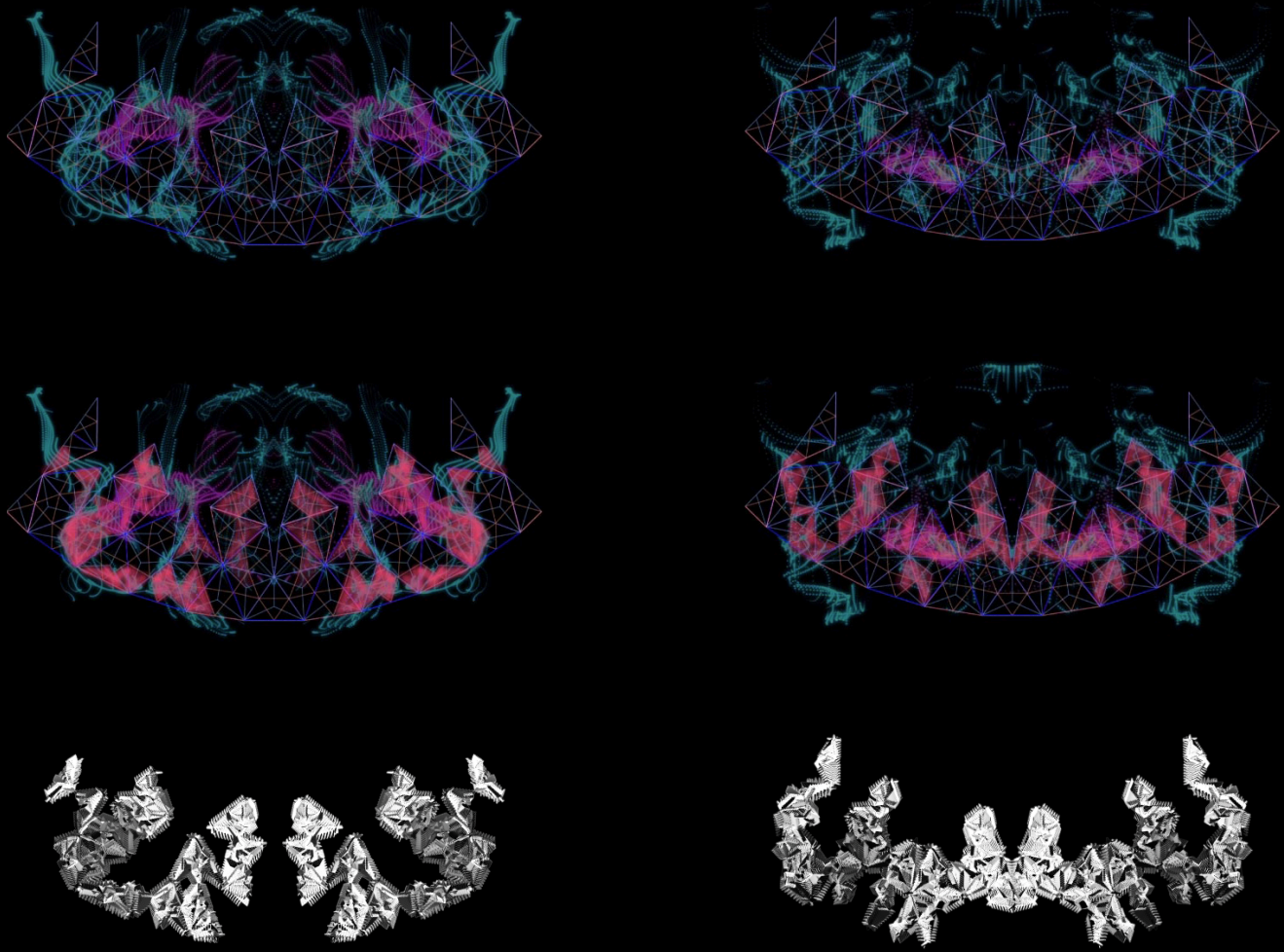
9. Pattern Template. The pattern shown to the left was used as the template for developing the visuals. The unwrapping of the dome in this particular way was more accommodating to creating and organizing the video for projection.

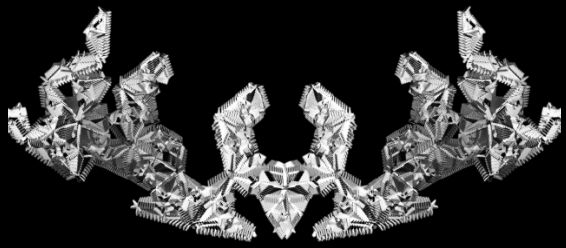
11. Pattern made within template based on the density of particles during that moment of the song



12. Using MASH in Maya, ambiguous landscape generated based off the pattern

13. Full visual process for one section.





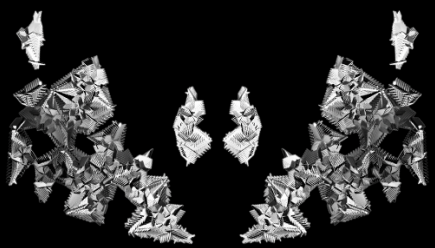
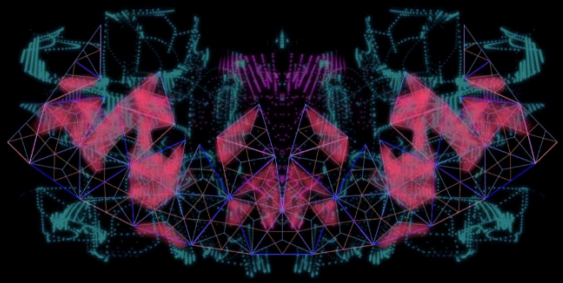
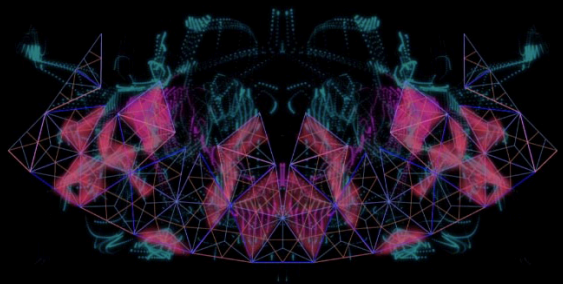
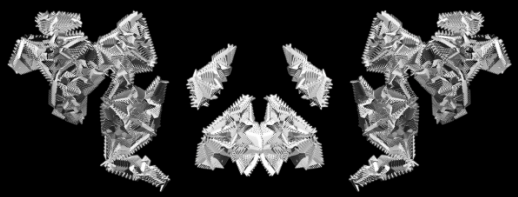
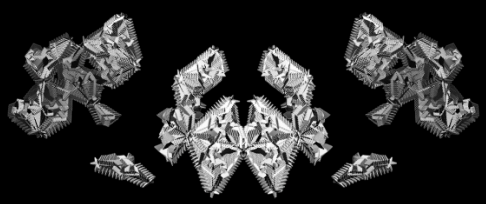


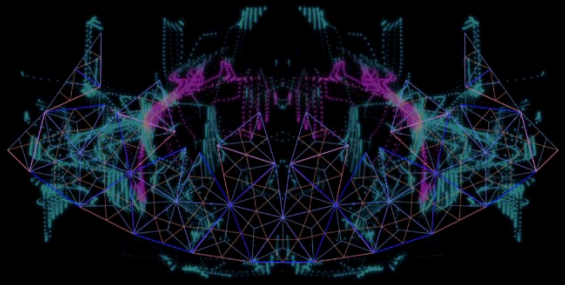
Image 13 continued.

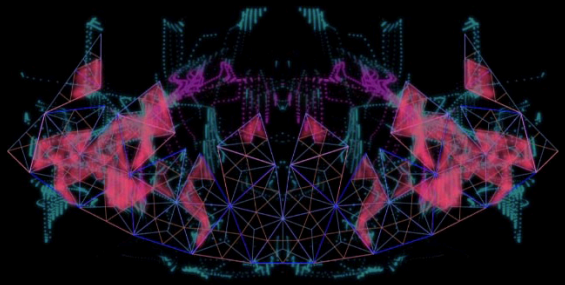


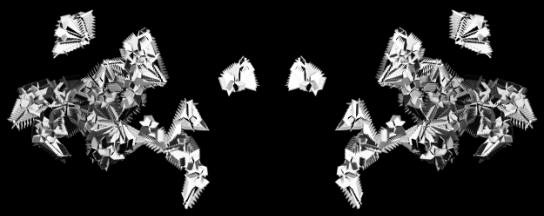


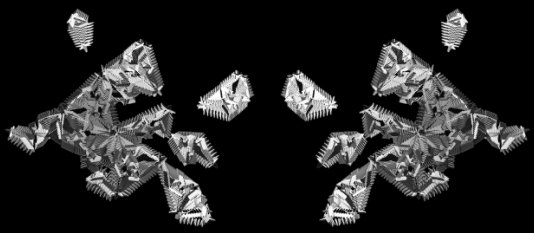












FOR THE CONTENT

The collages provide subtle imagery that relates to the content of the lyrics in "Pyramids." The message of the black woman's downfall is conveyed through juxtaposing the representation of women in classical art and the modern-day representation of women in mainstream culture. The duplication of certain images touches on feminist issues related to sexual empowerment versus sexualization and vulnerability versus victimization.

14. Collage 1

15. Collage 2

The following collages are the architectural representation of the message in "Pyramids." The left collage shows classical architecture indicating wealth and power. The right collage shows prison architecture which showcases isolating and cold architecture through the lack of decorative details.

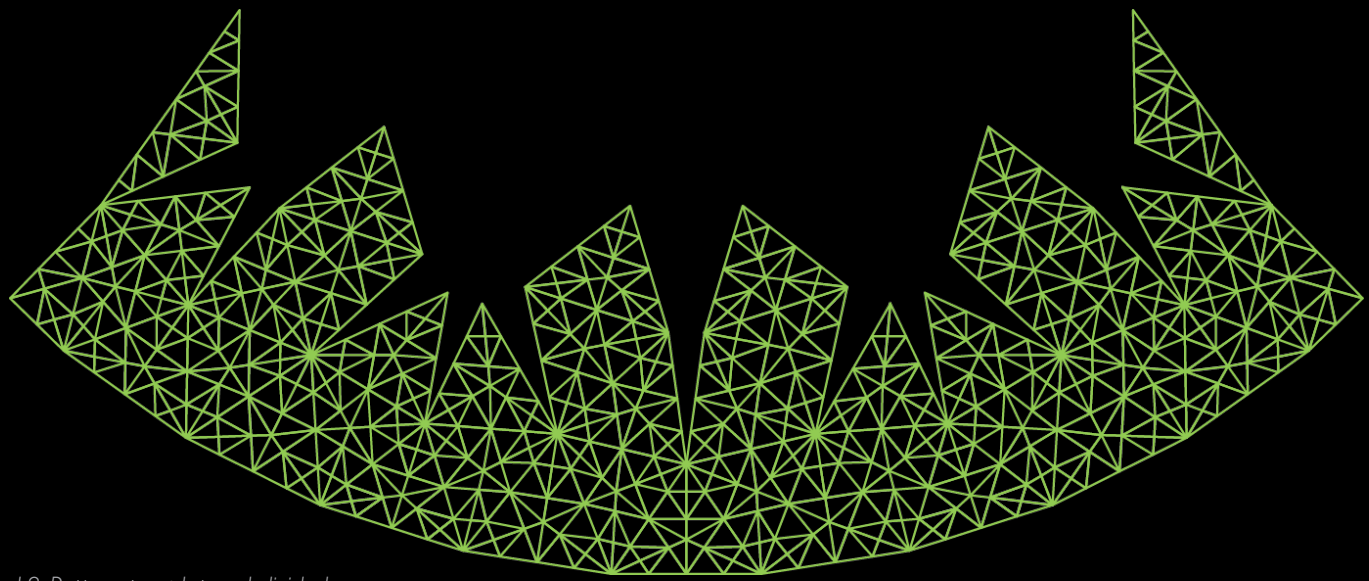
16. Collage 3

The purpose of these specific collages is also to infuse abstract imagery with existing architecture. By combining abstract images with realistic images, there is more opportunity for the viewer to recognize forms within the visuals that are unique to him/her during exploration of the installation.

17. Collage 4

REINFORCING PATTERN

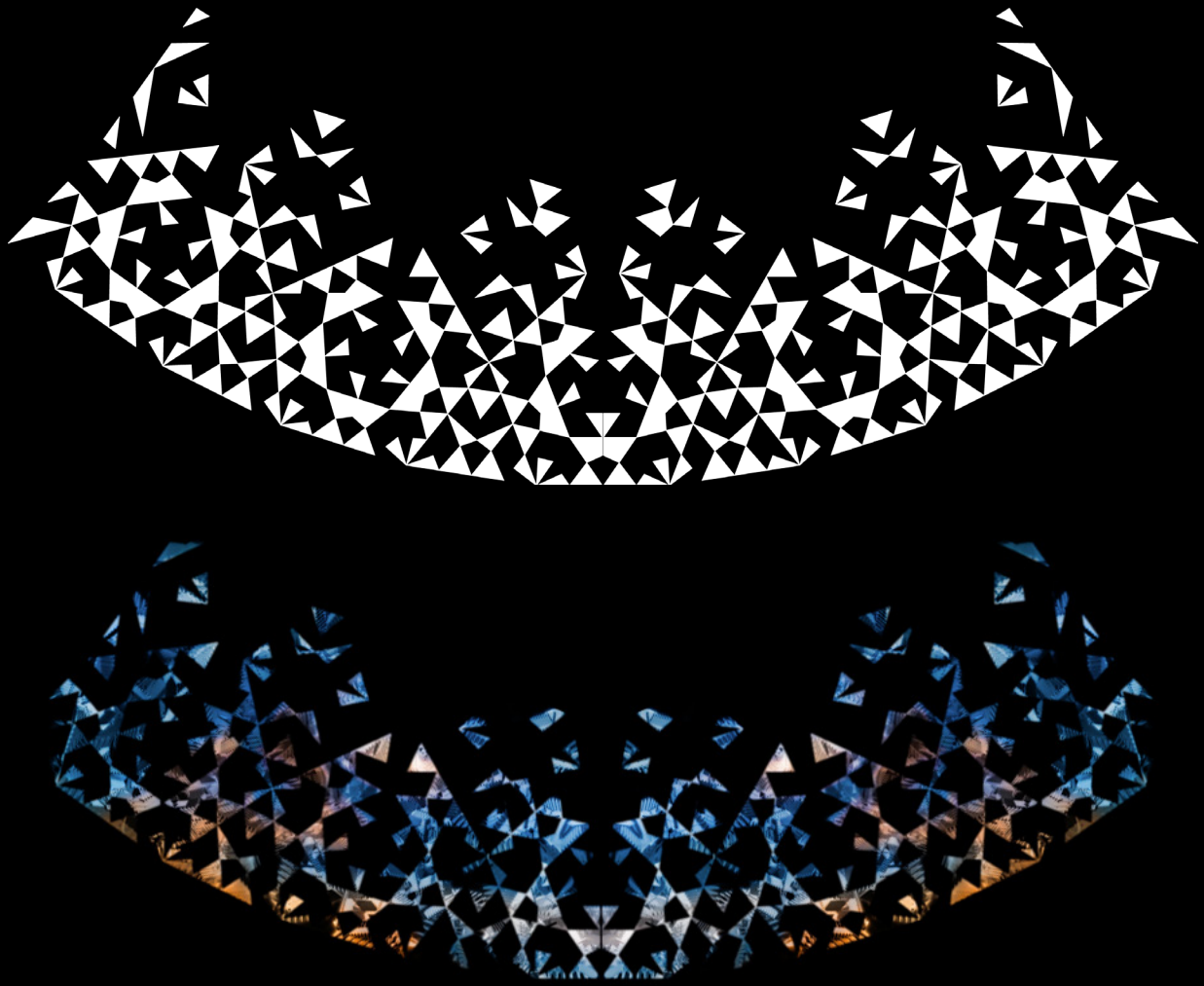
A colorful layer of pattern is incorporated into the visuals as a way to reinforce the concept of structure. The patterns derive from the subdivided template of the geodesic dome template, as shown below. This particular layer emphasizes the grid structure of the dome and adds another visual element to assist the viewers in finding places in the projections.



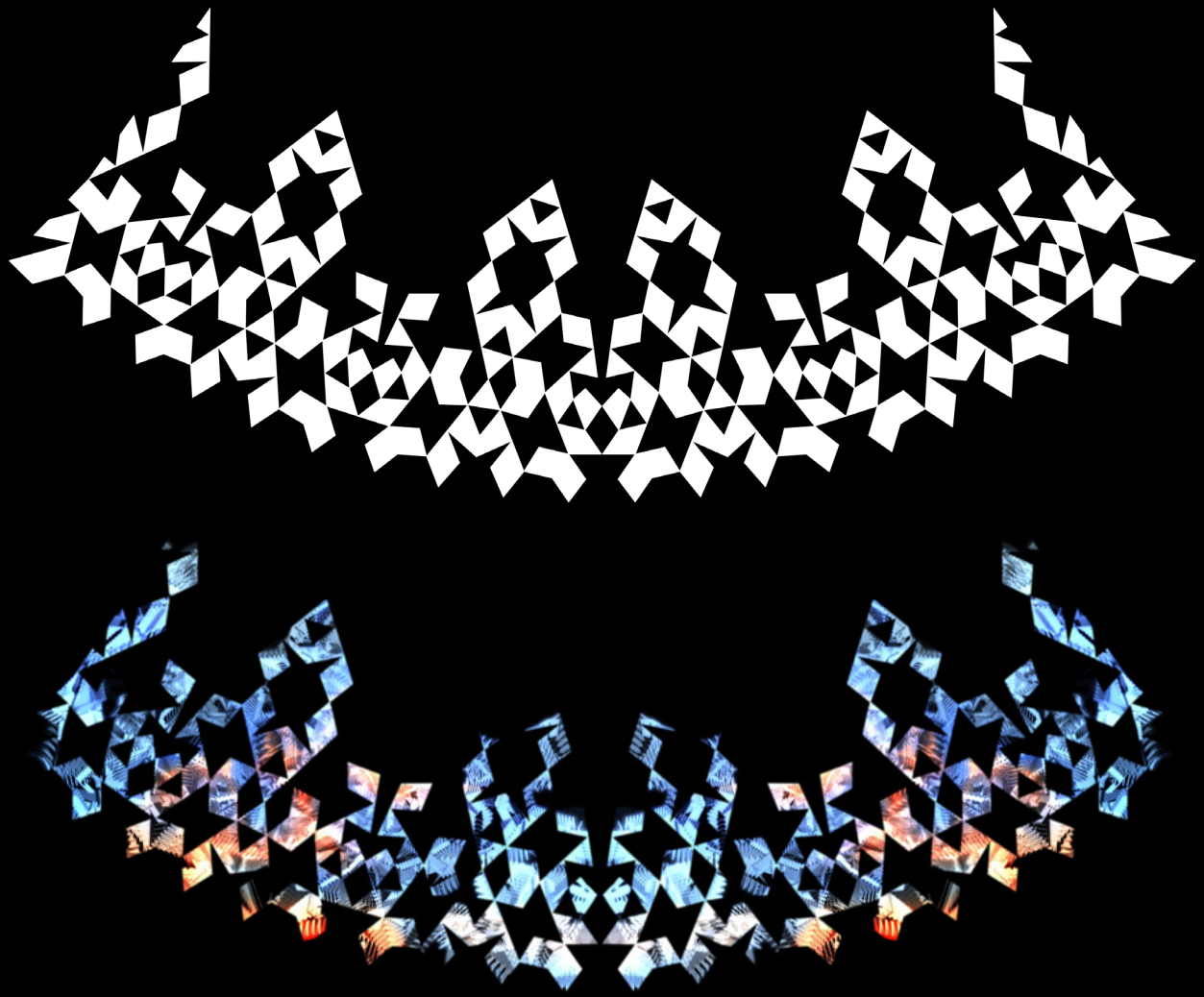
18. Pattern template subdivided

19. Subdivided Pattern 1

20. Subdivided Pattern 2



21. Subdivided Pattern 3

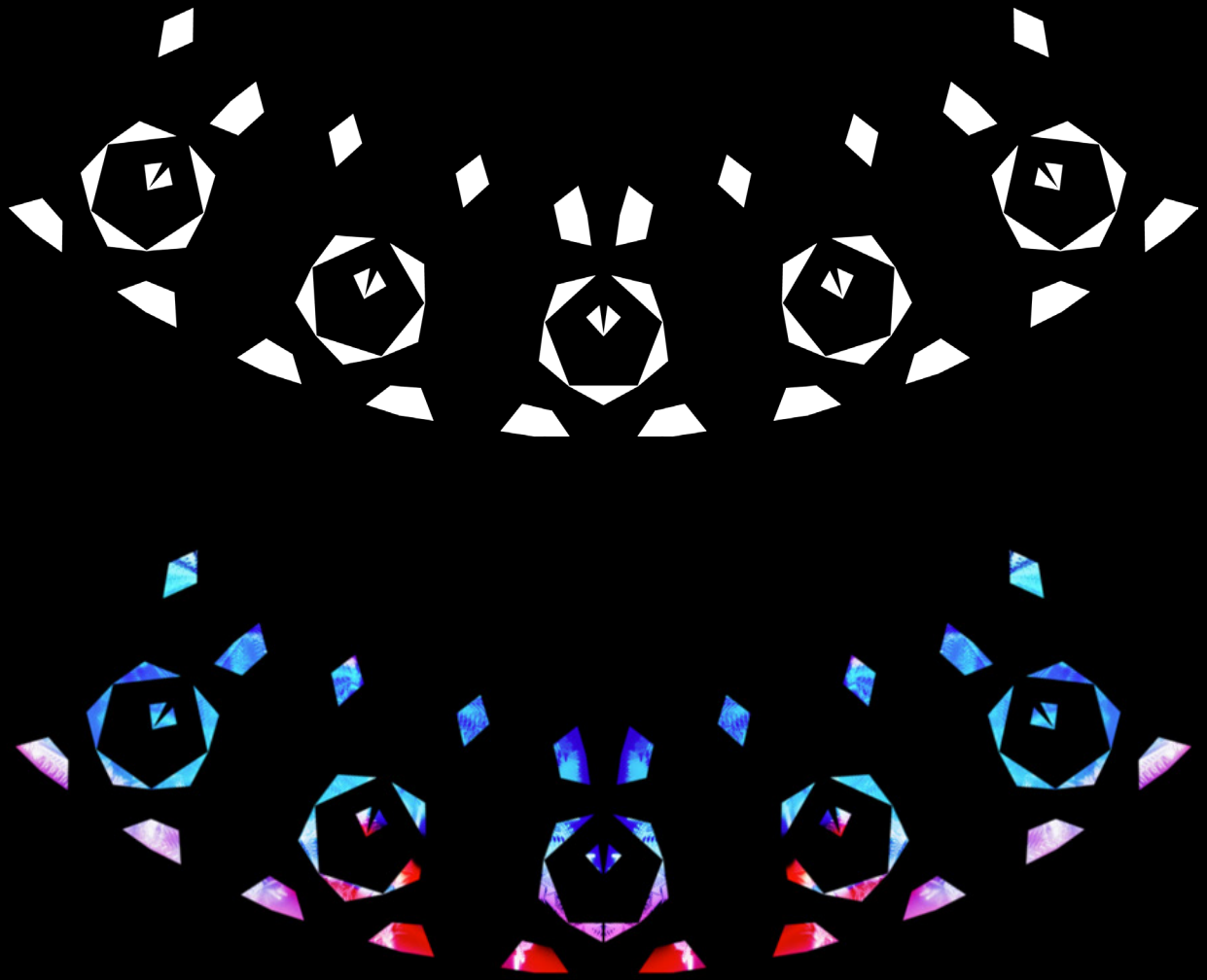


22. Subdivided Pattern 4

23. Subdivided Pattern 5

24. Subdivided Pattern 6

25. Subdivided Pattern 7



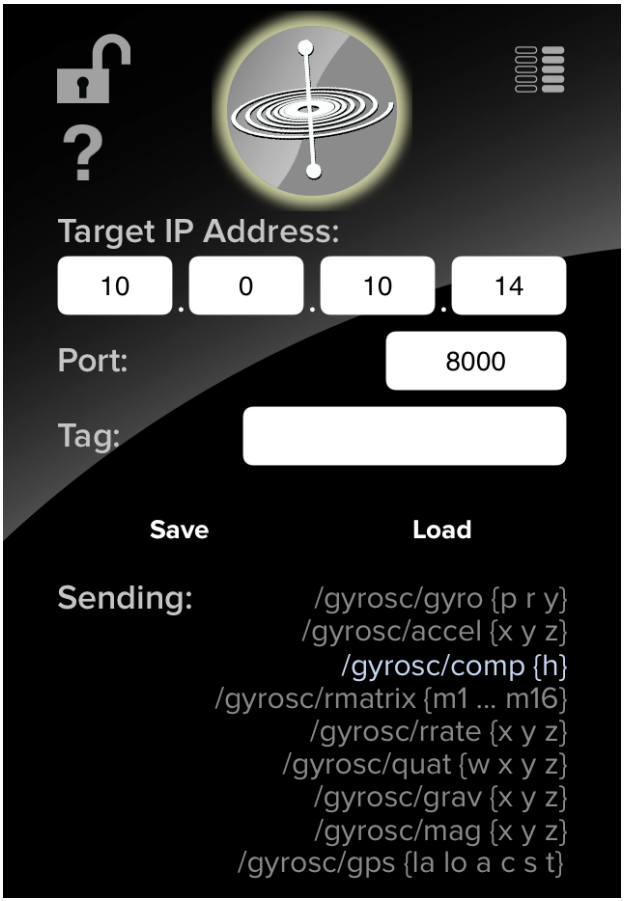
26. Subdivided Pattern 8

Logistics

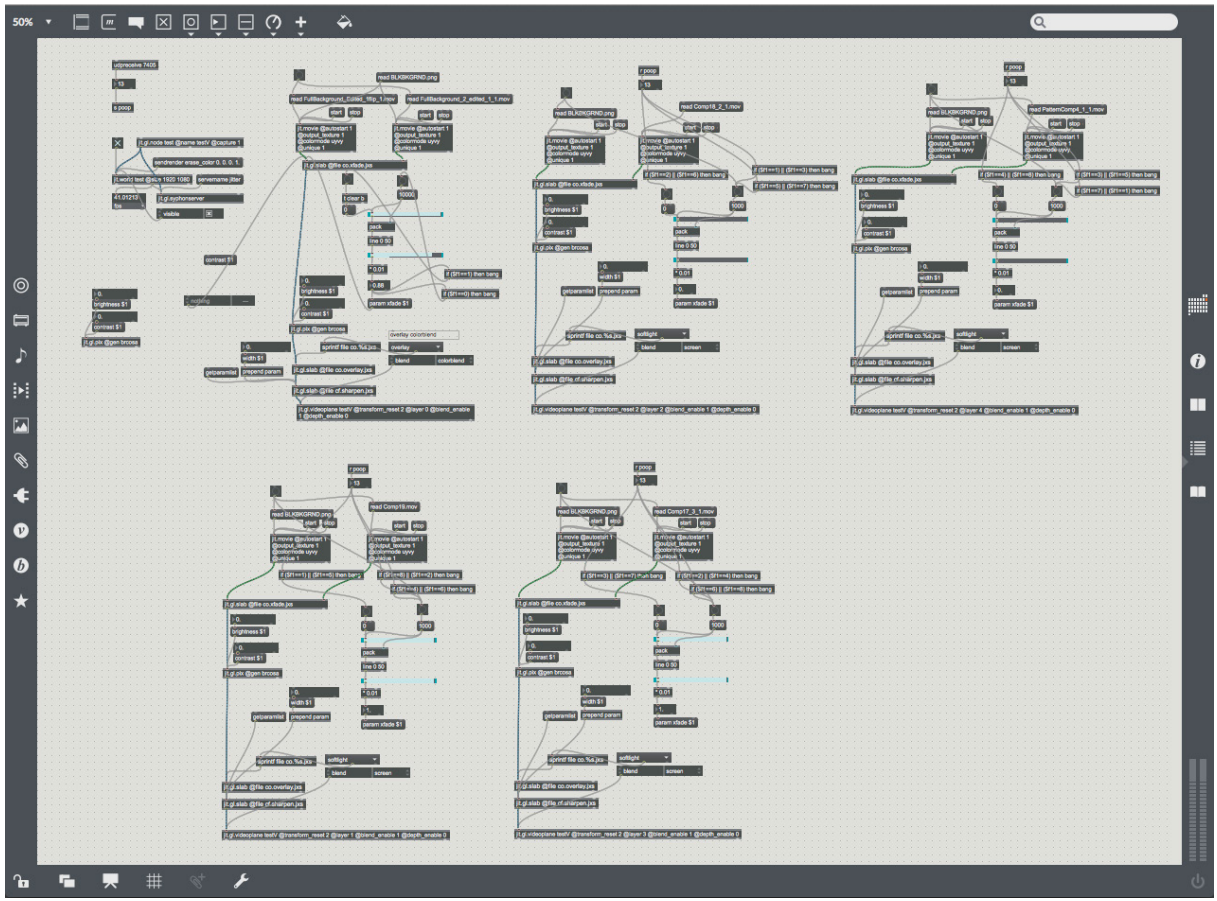
PIPELINE FOR VISUALS

GyrOSC > Max > Syphon > Madmapper > Four Projectors

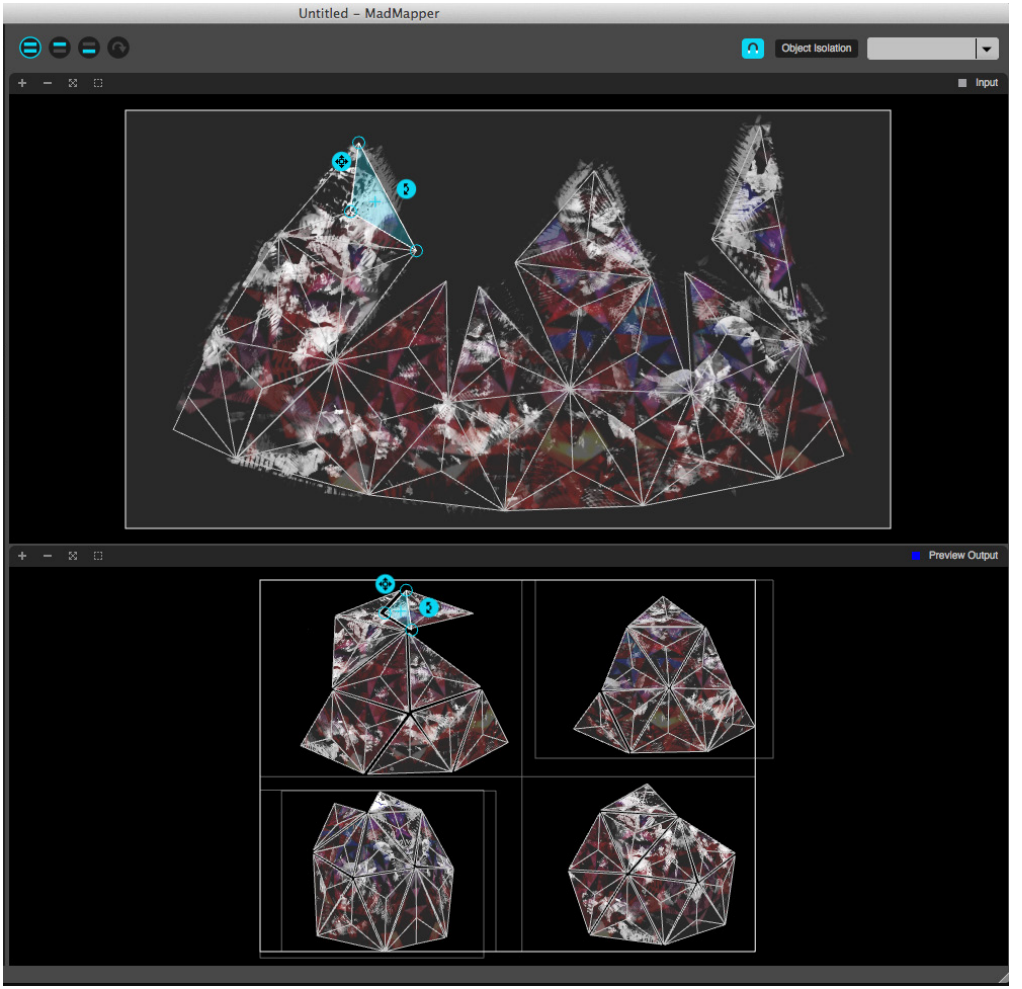
Compass data pulled from the iOS app, GyrOSC, is sent to Max/MSP/Jitter from the device over a wireless ad-hoc network. The patch in Max/MSP/Jitter sets up five video players that are layered on top of each other in one video window. The video composed in Max/MSP/Jitter is sent to MadMapper via Syphon where the video is orchestrated to be sent to four different projectors.



27. GyrOSC pulls compass data and sends to Max/MSP/Jitter over a network

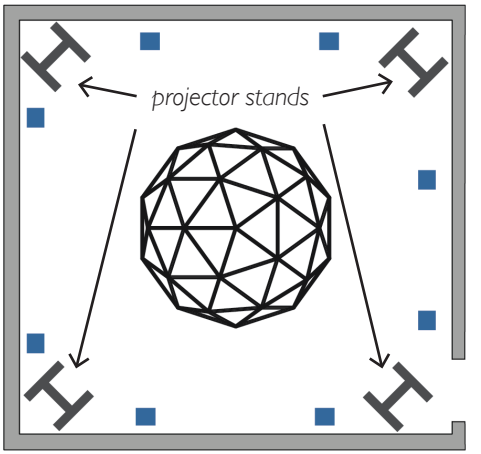


28. Max/MSP/Jitter composes original video into a single 5-layer video player



Video from Max/MSP/Jitter is sent to MapMapper and then projected through four projectors.

(Left) 29. MadMapper with divisions of video sent to each projector. (Below) 30. The floor plan showing location of projector.

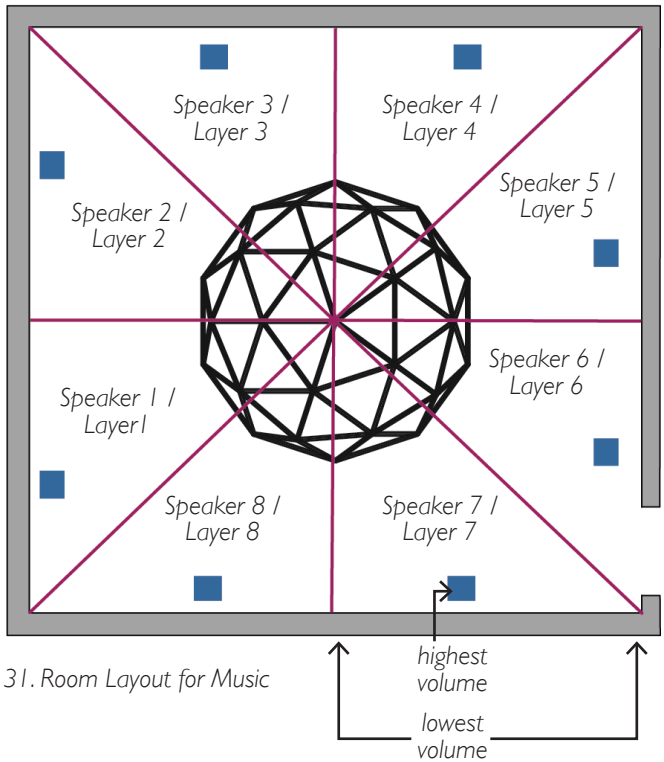


PIPELINE FOR MUSIC

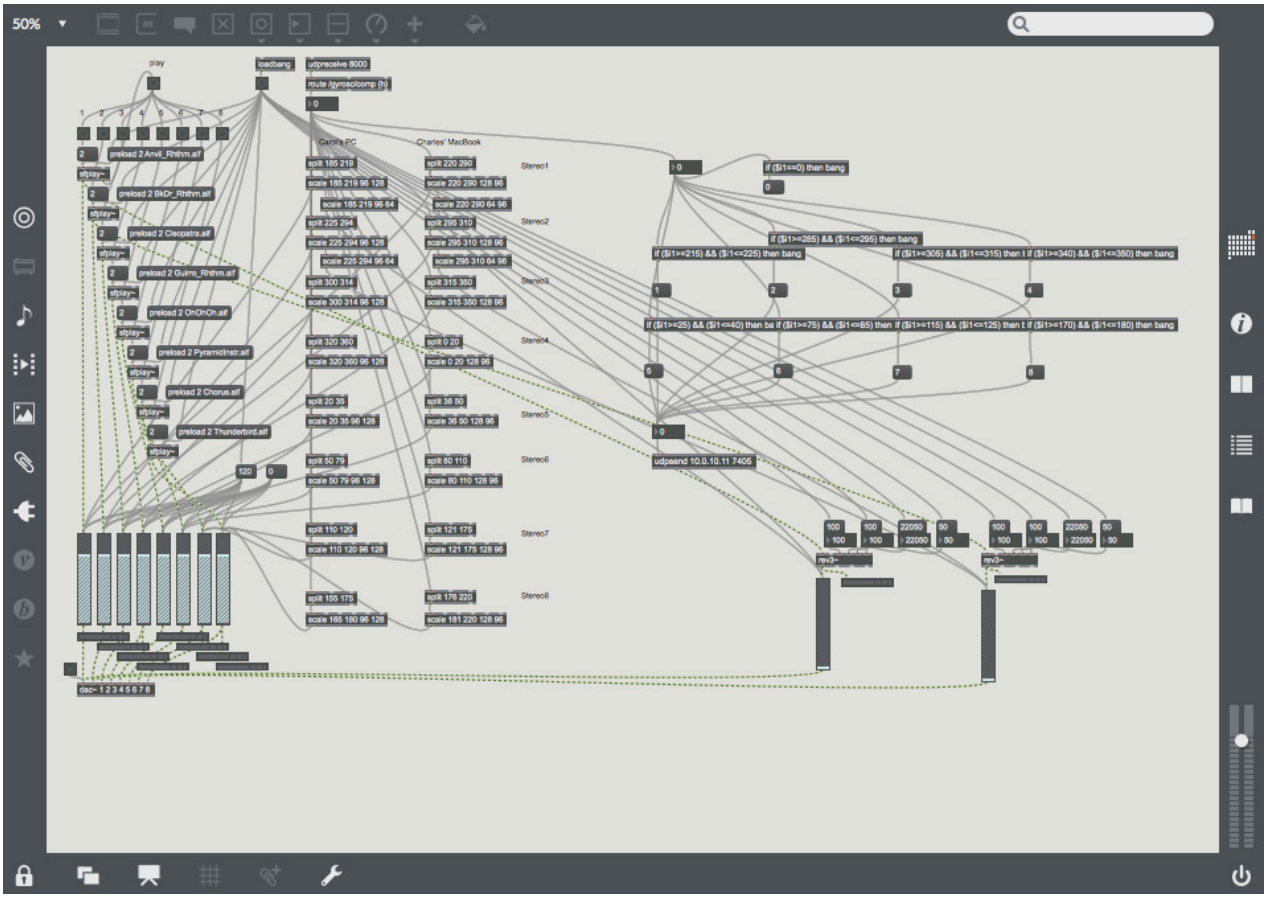
GyrOSC > Max > Stereo System

The Max/MSP/Jitter patch allows for 8 layers of a single track to be played simultaneously on a continuous loop. Each layer is assigned to a specific speaker.

As the user positions the device with the GyrOSC app in a specific range, the volume of the speaker within that designated range will change. The closer the device is pointed in the direction of the speaker, the louder the volume will become.



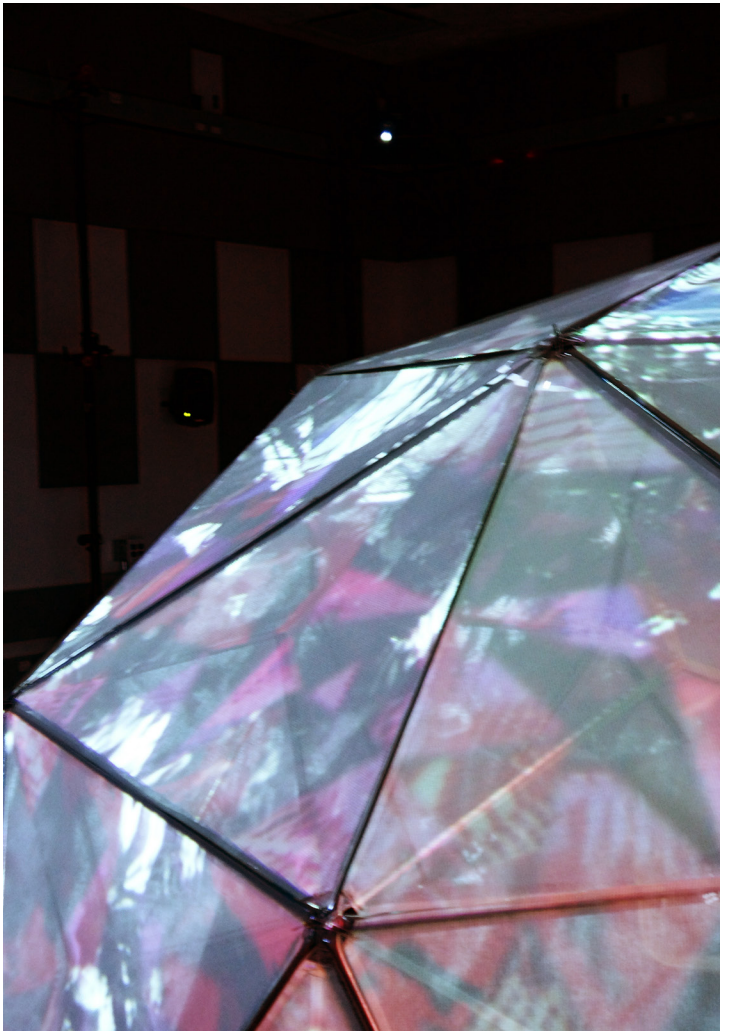
31. Room Layout for Music



32. Max/MSP/Jitter Patch for assigning each track to a specific speaker and scaling the volume based on compass data range

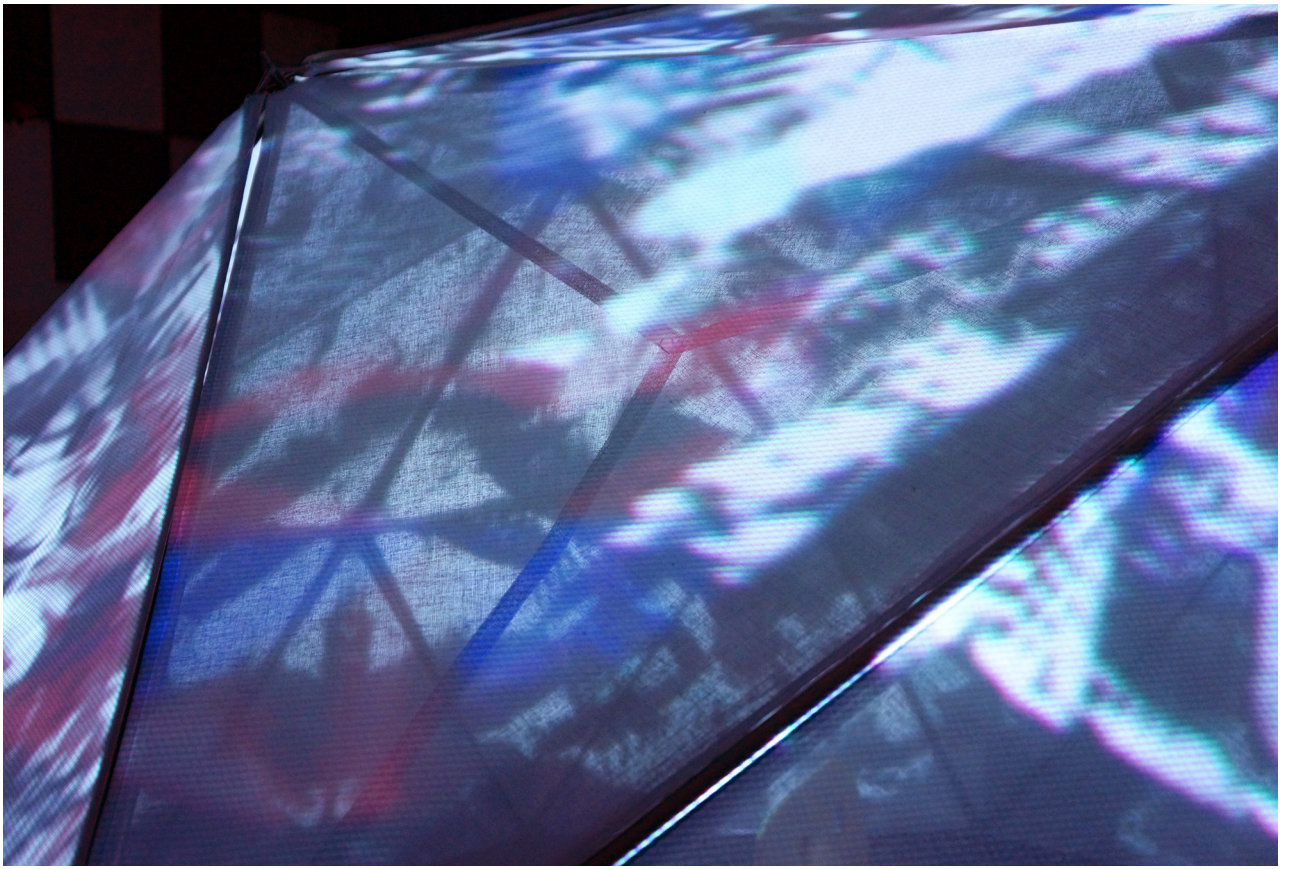
Conclusion

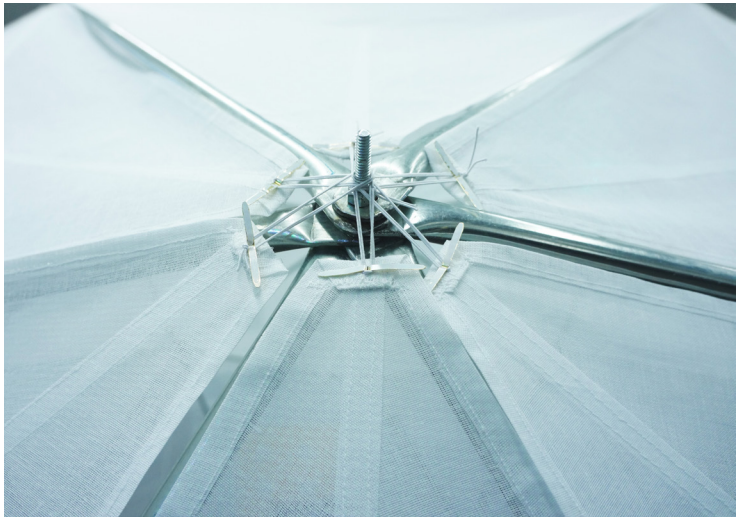
33. Geodesic dome on ICAT Day

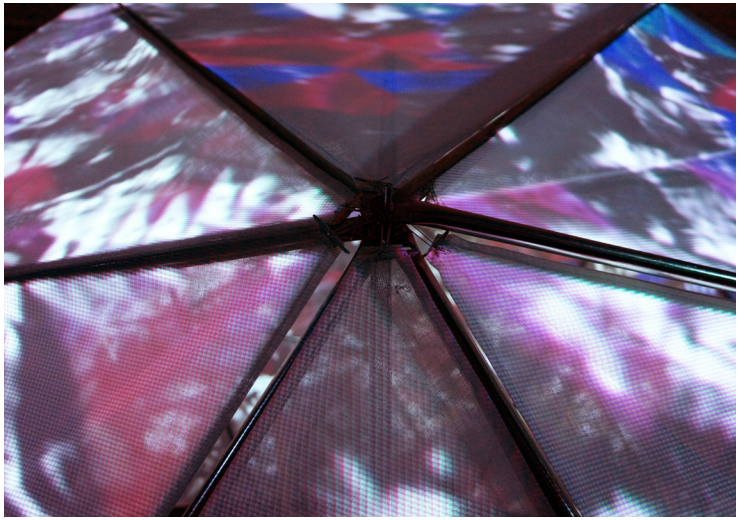


34-35. Projector and Geodesic Dome

36-37. Up-close of skin on geodesic dome

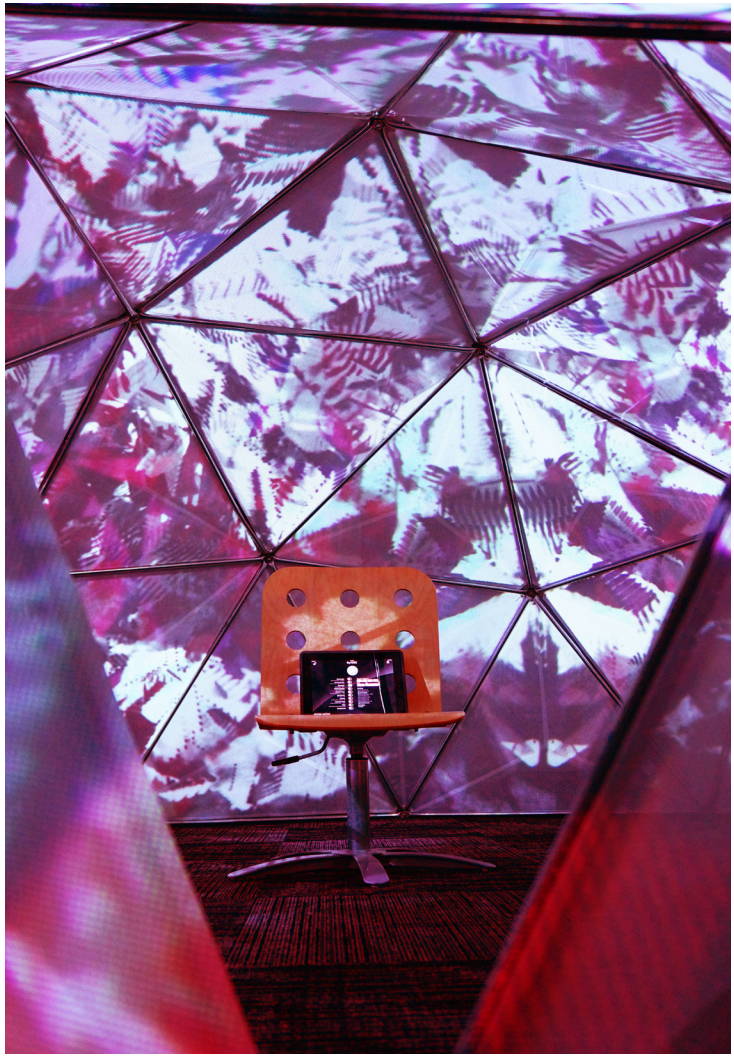






38-39. Detail of skin attached to dome

40-41. Entry into geodesic dome



42-43. Inside the geodesic dome

Bibliography

Davis, Erik. " 'Roots and Wires' Remix: Polyrhythmic Tricks and the Black Electronic." In *Sound Unbound Sampling Digital Music and Culture*, edited by Paul Miller. Cambridge, Mass.: The MIT Press, 2008.

"The Elegant Universe 1 of 3 Einstein's Dream," YouTube, 56:04, posted by "Scientific Unity," Jun 21, 2012, https://www.youtube.com/watch?v=UV_X2B5OK1I.

"The Elegant Universe 3 of 3 Welcome To The 11th Dimension," YouTube, 55:50, posted by "Scientific Unity," Jun 21, 2012, https://www.youtube.com/watch?v=36tGKrWY4QE.

Grosz, E. A. *Chaos, Territory, Art: Deleuze and the Framing of the Earth*. New York: Columbia University Press, 2008.

"Pyramids (song)." Wikipedia.org. May 5, 2015. Accessed May 8, 2015. http://en.wikipedia.org/wiki/Pyramids_(song).

Murphie, Andrew. "Milieu, Rhythm, Refrain, Territory." Adventures in Jutland. September 8, 2013. Accessed May 8, 2015. http://www.andrewmurphie.org/blog/?p=426.

"The Music and SFX of Forbidden Planet," YouTube video, 3:22, posted by " Rob Abernathy," April 22, 2012, https://www.youtube.com/watch?v=YSFolLcyqAU.

Ten Hoope, Dave. *On Place And Space - The Pragmatism Of Existentialism*. 1st ed. 2010. Web. 8 May 2015.