THE DOME: A CASE STUDY FOR GENERATIVE SOUND IN PUBLIC ART

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ABSTRACT

This paper presents our recent design and realization of the Dome. This work is an immersive, interactive public artwork, permanently located in Downtown Scottsdale, Arizona. It features algorithmically generated sound and light that, through the use of multi-layered cycles, extends the notion of the public marking of time through sound. It engages a broad public audience through the integration of conceptual themes of regional and global importance, and the implementation of audience interactive elements. We present a thorough description and analysis of the Dome as a case study, as it offers a replicable, tested model for the use of computer generated sound and light in future public art projects.

1. INTRODUCTION

With the advent of inexpensive and often readily available delivery mechanisms, the scope of public art has expanded to include a wide range of methodologies and outcomes. For example, there have been a number of radio broadcast and more recent internet projects, including our own work [1, 2], that reach a wide public audience. Newer ubiquitous technologies, such as cell phones, have also served as a platform for public sound art [3].

However, for the purposes of this study, we restrict ourselves to a conventional definition of public art and examine the challenges posed by the realization of physically situated works that are directly accessible and freely available to public audiences. Public art in this scope is housed outside of traditional art settings and is intended to engage a public audience that might not otherwise seek art experiences. Furthermore, as this work does not live in a virtual or broadcast context, it is dependent on site-specific circumstances in the physical world.

There has been extensive prior work with art that seeks new forms outside traditional contexts. For example, Chico McMurtrie’s recent work, Growing Rain Tree, serves as an example of engaging kinetic public art that speaks to a broad audience and integrates expressive technologies [4]. The work has proven to be robust, but it does not face the challenges of an outdoor exhibition environment.

Sound artist and composer Max Neuhaus has undertaken a number of outdoor sound installations [5, 6]. While these pieces generate environmentally sensitive sound experiences in outdoor contexts, they do not provide a mechanism for audience interaction.

Artists such as Ned Kahn have utilized sound as a medium in permanent installations [7] that leverage naturally occurring sound production mechanisms. This work has been influential in our own conception of approaches to public sound art. However, this work is not audience interactive and does not address the logistical challenges posed by the use of electronic sound production mechanisms. Our own prior work in interactive sound art [8] serves as a basis for this current project, but this prior work did not fully engage the synthesis of immersive sound and visual environments.

2. CHALLENGES

The realization and presentation of interactive sound art in the public sphere poses important challenges for artists. Sound art is finding increasing acceptance in the culture of galleries and museums as artists, curators, and directors have sought to find new strategies for the presentation of this work. Nonetheless, even in the relatively controlled atmosphere of these venues, audiences can find sound art to be a challenging experience as it undermines many of the norms and conventions of exhibition attendance. Furthermore, interactive art has proven to be sometimes vexing and frustrating to even the most experienced audiences in a museum [9]. In this light, exhibition conditions outside a traditional gallery setting can be viewed as having distinct advantages and disadvantages. On the one hand, audiences will not be bound by expectations of traditional venues. On the other hand, the artist can make no assumptions about the audience’s familiarity with the domain of interactive sound art, and artists must generate work that is sensitive to this context.

Public art exhibitions in outdoor environments demand an acute environmental awareness. Sound art work in particular must be embedded in the sonic context without overwhelming the existing soundscape. Extensive work has been undertaken to identify sources and attributes of noise pollution in our communities [10, 11]. This research reveals that society’s perception of the role of the source can play a large part in the identification of sound as a nuisance. Public sound art, as an unusual element in the environment, must be particularly sensitive to both noise levels and qualities of sound to avoid becoming a source of distraction or annoyance for the public.

In addition to considerations of audience impacts and reactions, the unique funding structures and
circumstances of public art demand flexibility in both the design and realization of new work. In projects funded through municipal grants, public art administrators and review panels often exert a limited curatorial role that is focused on the facilitating the artists’ vision and the needs of the public they serve. However, public art that is funded through private development or mixed private/municipal sources can face additional pressures. Private developers must consider commercial interests in the realization of public art works. These potentially include the leasing of retail spaces, the sale of private residential units, the impact on sales and/or the role of artwork in generating positive visibility and press coverage for such developments.

Public art must be designed and realized with careful attention to unique exhibition dangers. Specifically, weather and vandalism pose risks to this work, and electronic components are particularly vulnerable to both factors. Legal liability issues including public safety and regional building and electrical code requirements are also brought to bear on art presented in a public area rather than a gallery. These considerations were central in the design of this new work, but this discussion is beyond the scope of this paper.

3. SITE DESCRIPTION

3.1. General Description

The dome is a neoclassical structure approximately 5 meters high, with a diameter of 5 meters, supported by 8 columns. It has an open architecture that allows pedestrians to pass through, and features benches mounted to its columns. It is located in a small plaza in front of a mixed commercial-residential complex on Main Street in Downtown Scottsdale, Arizona.

3.2. Arts District

The Dome is in a central location within a thriving arts district with over 80 art galleries, the Scottsdale Museum of Modern Art, several small theaters, and a myriad of restaurants, cafes, and bars all within a few blocks. Thus, while the Dome is outdoors, the usual street traffic will include a high percentage of people in the area specifically to see art. Thus, the piece benefits from an audience of people whose assumptions and expectations regarding art are potentially more in line with a standard gallery visitors than the typical public audience.

4. USER EXPERIENCE

As a user approaches the installation site in the early evening, they will first see a wash of shifting light that reflects from the inner roof of the dome and onto the supporting columns. As they walk closer, they might see and hear an array of water misters that casting a fine-spray mist into the dome volume. Now, the shifting light patterns take 3D shape within the volume of the dome as the visitor is drawn to further investigate the installation. Within five to ten feet of the dome, the visitor will hear a light ticking sound that accelerates and decelerates in a fashion similar to the light show in the dome. Once inside, they discover that this ticking is spatially swirling about the inside of the dome, crossing overhead in varying patterns of intensity, rhythm, and location.

At the moment the time reaches a new hour, the user hears the sounds of a nearby church bell, and the dome environment shifts with new sounds and lights yielding a fixed sky-blue color on the ceiling of the dome, complemented by recorded ambient sounds of water, wind in leaves, and distant bird songs. The visitor’s ear is drawn to similar and contrasting sounds present in the surrounding urban and desert environment.

Soon, the visitor notices pushbuttons on each of the four pairs of pillars supporting the dome. Pressing one, the environment shifts to the sound of a synthesized pulse, that references the water sounds of the previous environment, but now behaves in a fashion similar to the first ticking sounds, darting around the space and shifting in intensity and timbre as it moves. This sonic behavior is contrasted by a gradually cross-fading light that circles the inside of the dome structure. Pressing
another button, the sound shifts again to a low rumbling presence. Here, the sound could be a low breath, or a distant thunder. Low light levels, and a breath of misters create an enveloping environment within the dome. Again, the visitor’s attention is drawn to the sounds of distant cars passing the dome as these ambient environmental sounds pass through their consciousness.

Soon, another visitor arrives at the dome, and the two explore the work together, pressing buttons at alternating intervals to ‘play’ the dome in both sound and light.

Returning to the site on a later date during the afternoon, the visitor has a similar sound experience, though now within the context of a more active retail and restaurant environment. In the afternoon sunlight, the lighting shows are not visible to the visitor. However, standing inside the dome and looking up to the ceiling, they see the illumination of constellations as single points of light enabled by the insertion of fiber optic rods that bore through the roof.

5. CONCEPTUAL FRAMEWORK

Here, we describe a number of site specific and regional considerations that have informed the conception and realization of this work.

5.1. Role of Public Sound in Marking Time Cycles

Sound in the public sphere is often associated with the marking of time. Church bells toll to announce services on a weekly cycle, and to mark special events in the life of the church community. Similarly, with the calling of adhan through public address systems, Muslims are called to prayer through a daily cycle. Finally, clock towers are a prevalent public sound, marking the hours of each day as they toll. When designing the formal role of sound in this public artwork, we were mindful of these abstract references. The soundscape around the installation site is marked by such sonic indicators. For example, within audible distance, a nearby clock tower chimes each hour and half-hour. Similarly, a regular trolley service with a distinct brass bell arrives at the installation site every ten minutes throughout the day and late evening.

With these conditions in mind, we have designed the Dome to function as an abstract clock that marks the passage of time in idiosyncratic ways and at multiple time scales. Time cycles are articulated at seasonal intervals as the density of visual, sonic, and mister effects are programmed to change depending on the time of year. They are articulated at daily intervals as the Dome structure creates a metaphorically inverted sky with constellations showing through the roof during the sunlight hours, and active, bright light shows in the night. Finally, time is marked at the level of the minute as an algorithmic schedule of sonic events unfolds each day, generating a dynamic yet precise clockwork.

5.2. Environmental Metaphors

The Dome is situated in the heart of downtown Scottsdale, Arizona. As part of the greater Phoenix metropolitan area, Scottsdale is one of the fastest growing communities in the United States. Like many similar cities in the western US, this explosive population growth is placing great pressures on the region. The limited water resource to supply the greater Phoenix area is a topic of critical importance to the area and exemplifies many current discussions regarding urban and environmental sustainability. The region is surrounded by a harsh desert climate that is being annexed by outlying municipalities. This rapid urban expansion places many areas at the nexus of debates regarding environmental conservation and urban growth. Finally, much of this recent growth is driven by emerging technologies and fueled by an influx of technology industries into the region.

This broader context underlies the conceptual framework for the Dome. Through the selection of sound samples and synthesized soundscapes, we reference water as a critical topic in the public discourse. Our creation of sonic environments that span from natural settings to those that are wholly and obviously digitally synthesized, we reference the intersection of natural and urban environments.

Finally, as the classic architectural structure of the physical dome is infused with emerging digital technologies in the form of interactive sound and light, the work embodies many of the dichotomies of the digital age. We have endeavored to create a work that clearly articulates these concepts in a fashion that is accessible and intelligible to a broad public audience.

6. DESIGN AND IMPLEMENTATION

6.1. Project Team

The design team consists of the authors who bring expertise in the areas of sound art, algorithmic composition, interactivity, lighting design, and public art. The team collaborated in a variety of ways over the course of the project. Smith led the project and oversaw the equipment installation, design, and implementation of the lighting systems. Cuthbertson and Birchfield designed the system integration and executed all programming and sound design on the project. Lundquist worked with all parties involved, participated in the critical assessment of the project as it developed, and assisted with the design and installation on site.

The Dome was designed and realized over the course of one year, culminating in its public dedication in the Spring of 2007. The work was commissioned by a team of private developers working in collaboration with the City of Scottsdale.
6.2. Physical Structure

The physical structure of the dome is integrated into the overall architectural scheme of the streetscape and building complex which it fronts. It provides a space where people can congregate or sit on benches in the shade. The open architecture of the dome encourages passers-by to walk through the structure rather than around it. The architecture also promotes a feeling of safety, as its concave shell structure “contains” viewers without confining them.

6.3. System Architecture

One of the defining features of the project is the location of the dome in relation to most of the control equipment. The dome is located in a plaza on the sidewalk in front of a complex of buildings. Most of the equipment is installed in an air-conditioned equipment room located within a complex of buildings approximately five hundred feet from the dome. The audio amplifier and the LiteTouch control devices were utilized for this project specifically to address the long runs between inputs, controllers, and outputs.

6.3.1. Visitor Interaction Inputs

Eight buttons are mounted, one on each of the supporting columns within the dome. The buttons are mounted approximately 4 feet off the ground, and are situated to be highly visible and easy to access. Each button is programmed to change the lighting and sound within the dome.

6.3.2. Algorithmic Control Elements

Main Control Computer: a Pentium 4 based computer running custom software written in Max/MSP. This software manages all high-level aspects of the dome functions, and also generates all audio output for the system.

Color Kinetics Light System Engine (LSE) [12] that handles all the low-level lighting. The control computer sends signals to the LSE indicating which lighting show to display, and the LSE sends the lighting show information out to the lights in the dome via Ethernet.

The LiteTouch Compact Controller [13] is used to manage input signals from the buttons, and output signals to the mister pump. This is a product typically used for commercial and high-end lighting and home automation control. The LiteTouch Compact Controller is connected to the control computer via RS-232. Button-press signals are received by the computer, and coded signals are sent to the device over the same line to turn on and off a relay which controls the mister pump, which is housed in a separate room.

Audio equipment: The audio output is produced directly by the controlling computer, using custom audio synthesis modules written in Max/MSP. The audio is output through a RME Hammerfall audio interface and a Crown CS4200 4-channel amplifier. A 70V constant voltage transmission system is used to accommodate the long distance between the dome speakers and the control room.

6.3.3. Outputs

Audio: 4 speakers are mounted at equal spaces in an array around the perimeter of the inside of the dome. The speakers are positioned twelve feet above the sidewalk and angled down at thirty degrees.

Lighting: Color Kinetics LED strands are mounted in a cove along the inside rim of the dome, directed up into the center of the dome. These are mounted such that the lights themselves cannot be seen. Viewers see only indirect lighting as it bounces off the inner surface of the dome.

Misters: an array of fine-spray water misters are arranged around the bottom rim of the dome, pointing into the center. The misters produce a fog-like effect within the dome when turned on. A prevalent feature of...
public spaces in Arizona, these misters provide cooling during the summer.

6.4. Sound Design

The nature of installation site demands that the composition of the sonic work be integrated and complementary to with the overall soundscape, yet sufficiently distinct and immersive such that it will draw visitors to the site and sustain their interest while in the Dome. Furthermore, the City of Scottsdale has an ordinance prohibiting the use of amplified music in residential areas. The mixed nature of the site allows our work to generate amplified sound, yet the close proximity to residential condominiums necessitates extra precaution to ensure that the work is not a source of noise pollution.

Through the use of diverse, interactive sound, we have sought to articulate the underlying conceptual ideas and thereby engage the general public. The generation of sound in the Dome arises from an algorithmic process that ensures a constantly shifting sound environment. Nonetheless, we have sought to create an idiosyncratic and shared sound experience for all visitors. This balance is achieved through the manipulation of a limited set of immersive sonic environments and a dynamic set of behaviours that act upon these sounds.

6.4.1. Sound Classes

We have implemented four sound environments:

1. Recorded ambient sounds
2. Synthesized low rumbling sounds
3. Synthesized water sounds
4. Synthesized ticks

Recorded ambient sounds were collected by the authors from ambient environments similar to those surrounding the site, but differentiated in subtle ways. These include (1) the sound of wind in trees and a distant bird call from a rural European site, (2) sound of diesel truck driving across a cobblestone street, and (3) a small, gentle stream. Our intent with the selection of these samples is to create environments contain plausible sonic events given the installation site, but challenge listeners to give careful attention to the subtle differences inside and outside the Dome soundscapes. For example, although attentive listeners will discover that the recorded bird call is not native to Arizona, given it’s presentation above the head and at an amplitude that is integrated within the environment, the ear is often fooled. Similarly, when a recording of a passing truck is heard through the speakers, the listener can discern that this is not typical of the adjacent street, but given the close proximity of cobblestones on Main Street in Scottsdale, and the presence of a nearby trolley stop, it is a plausible presence in the space. Finally, water is not a feature of the surrounding desert environment. However, water features and fountains are prevalent in the surrounding Scottsdale area, and this reference expresses our theme of the intersection of urban and natural environments.

Synthesized low rumbling sounds are synthesized through a series of filtered noise generators [14] and are projected at a low amplitude such that they are felt more as a presence than a point source in the Dome. This sound references the low tones of water, distant engine sounds, and thunder. In this way, the rumbling sounds are plausible elements in the overall soundscape of the Dome, but with the addition of behaviours described in Section 6.4.2, they engage the listeners’ attention in a new way.

Synthesized water sounds are generated through granular synthesis of pink noise. This sound environment is comprised of isolated sound events with varied density of events, frequencies, and timbres. When the density of events is relatively low, the effect of this sound environment suggests that water is dripping throughout the dome. However, the timbre of the sound is clearly electronic in nature. Thus, listeners are drawn to this sound which is clearly not sampled from nature; yet references the recorded sounds of water and the theme of environmental sustainability.

Synthesized ticks are impulse trains algorithmically composed to create a sound environment that is clearly digital in origin. Similar to the behaviour of the mimicked water drips, these click spiral spatially about the inside of the Dome, shifting in density of events and character of the impulses. This sound class is intended to provide a contrast to the surrounding environment, setting it in relief in order to elicit a heightened sensitivity to sound. The character of this sound environment draws the listeners’ attention to the digital nature of the installation, and expands the sonic imagination to encompass the hybrid physical/digital environment of the Dome.

6.4.2. Sound Behaviors

The generation of each sound class at any given moment in time is dictated by a set of breakpoint functions that control global synthesis parameters. The parameters include the density of events, rate of articulation, amplitude, frequency, and spatial location. These functions unfold over time spans ranging from one minute to four minutes and thereby shape the formal composition of each sound class. These curves have been composed through an iterative process of auditioning and revision by the authors. Each parametric control function has a different duration and is rarely in phase with other functions. As a consequence, while the algorithm is fully deterministic, visitors can experience the work for minutes or hours, never hearing the same composition. Still, the cyclical nature of the repeating functions creates a meta-
pulsation that is intelligible to the ear. These complementary notions of a never-ending stream of time that is built atop a set of embedded repeating cycles, expresses our concept of a unique clockwork in the piece.

These behaviours serve to generate emergent forms as described above, but they also aid in expanding the listener’s experience of this composed work within the larger soundscape of the site. Specifically, the four sound environments described above delineate a spectrum of sound that spans a range from plausible to wholly artificial in the context of the installation site. While the recordings of birds and wind can often deceive the ear to question if the source is in the Dome or in an adjacent tree, the sound of accelerating impulse trains is unique to the digital realm of the Dome. However, when a rapid sequence of behaviours act upon the sounds of birds and wind, this sense of origin is distorted. For example, when that same bird call begins to spatially spiral around the inner ring of the Dome, attentive listeners will realize that the sound source is synthesized. Similarly, when the synthesized water drops are accelerated and decelerated, the listener quickly identifies that this is not a recording of water, but something fundamentally different. The application of these behaviours expands the palette of the generated sonic environment of the Dome and enriches the listeners’ experience at the intersection of the natural and digital worlds.

6.5. Lighting Design

Since the dome is outdoors, lighting is dramatically different depending on the time of day.

6.5.1. Daytime Lighting Effects

Hundreds of short lengths of fiber-optic cables penetrate the dome surface, running from the roof of the dome completely through to the inside ceiling of the shell. Each cable transmits sunlight striking the upper surface of the dome to the shaded inner surface. En masse, these appear as constellations of points of light on the inside of the dome. As the sun tracks across the sky over the course of the day, the brightness of the fiber-optic “stars” change in relation to the position of the sun. This effect subtly highlights the constantly changing lighting conditions of the day and foregrounds the spatial nature of the solar cycle.

6.5.2. Night-time Lighting Effects

The Dome lights emerge just before sunset each night, so that the lights are on and are gradually revealed as the sun sets. The lights stay on from 30 minutes before sundown until midnight when the lights, misters, and audio all shut down for the night.

The lighting effects are built as discrete sequences, using Color Kinetic’s Show Designer software and loaded onto the Light System Engine. At present, there are nine lighting shows designed for the Dome. Each show utilizes different movement characteristics, colors, and lengths of time.

These shows were designed in parallel to the audio, and parameters in the audio, such as spatialization, amplitude, timbre, intensity, and density have visual analogs in the localization, hue, saturation, brightness, motion, and overall shape and color scheme of the light.

6.6. Interactivity

In Sections 6.4 and 6.5 we describe the generative mechanisms for sound and light in the Dome. In addition we have implemented a layer of interactivity that allows visitors to have an active role in the creation of sound and light.

Given the challenge of designing an interactive sonic work for a broad audience of users, we have endeavored to create interactive musical structures that are intuitively meaningful to listeners, and reflect the thematic content of the installation. Nonetheless, we also intend to ensure some measure of shared experience across all visitors who might experience the work at any given moment. Finally, we endeavored to design an
intuitive interface that would yield immediate results for a new audience that will most often have had little exposure to the conventions of interactive media art. In designing the interactive interface of the work, we considered the use of a number of embedded elements including beam breakers, proximity sensors and microphones. These sensors could afford passive interactivity with the work whereby the presence and movements of users could drive sound transformations. However, in consideration of our goal of providing a transparent and accessible interface, we chose to implement an array of push buttons that, although restricted in the kinds of possible interaction, do require active, conscious participation from users.

Figure 6. User pressing one of the eight buttons mounted on the columns.

A total of eight pushbuttons are located around the perimeter of the Dome, two on each pillar of an entry path. Each button is mapped to trigger a particular light show. In a similar fashion, each pair of buttons will trigger a particular sound class with a spatial location that is co-located with the button press. These mappings are fixed, and are designed to assure that visitors will readily understand the direct link between their action and the resulting environmental response.

This layer is design to afford two forms of interactivity. First, visitors can simply interrupt an ongoing generative sequence in order to call a particular sonic and visual response. This is a “selection and reflection” mode where a particular preferred response is elicited. Second, visitors can take a more active role as they “play” the Dome. In this form of interactivity, users can run from button to button, or collaborate with other visitors to throw the sound across the Dome and create sequences of sonic and visual events.

6.7. Default Time Cycles

The entire piece is built around the concept of natural cycles. Each of the outputs is built around different kinds of cycles, ranging from events lasting seconds to minutes to days and seasons. In this section, we discuss the different cycles built into each of the outputs. As described above, the sounds and lighting vary according to cyclical schedules. Additionally, the misters are controlled according to a meta-cycle. These cycles are central to the concept of the piece, and position the Dome as another public clock, albeit in an expressive form.

6.7.1. Audio Cycles

The audio is enabled at 9:00am and shuts off at midnight each day. Over the course of the day, the amplitude slowly ramps up from very quiet and barely audible in the morning to relatively loud and very discernable at 8:00pm, and then back down to a moderate level by 10:00pm before shutting off at midnight.

As noted in section 6.4.2, the audio elements are built around cyclically varying parameters, so that identifiable passages will be repeated but will be out of phase with other parameters each time they repeat, thus producing an ever-changing form. These parameters repeat on cycles of from 1 minute to 4 minutes.

6.7.2. Lighting Cycles

The LED Lighting shows are only enabled after sundown. The notion of an inverted day/night cycle is an important feature of the Dome. During the day, the Dome is somewhat inactive as audio levels low, and the lighting is not operating. The simulated constellations draw the viewer’s attention to the day/night cycle and to the changing spatial characteristics of the sunlight.

The gradual changes in sunlight effects, and inactivity of the dome lights during the daylight hours mirrors the inactivity of the animals of the region (including the human residents) during the hot summer days. Activity for many animals begins as the sun sets. In similar fashion, as the sun sets at the site each evening, the Dome begins to come to life. Sounds emerge more prominently and the Dome lighting grows active and elicits attention. As light leaves the sky, the ceiling of the Dome is illuminated, creating and immersive, dynamic environment.

6.7.3. Mister Cycles

The misters have two functions: (1) to diffuse and diffract the lighting effects of the dome, providing three-dimensional volume to the lighting effects, and (2) to provide cooling during the hotter months. Because these functions are linked to both season and time of day, the misters operate on schedules that change depending on the season and the time of day. During the warmer months of May through October, the misters operate day and night, in order to provide cooling for daytime viewers. The misters begin operation at noon, and turn on and off each half hour for a variable amount of time which is based on the time of day, the time of year, and the day of the week. As the days get hotter (based on average temperatures obtained from weather records for
Scottsdale), the misters stay on for longer periods of time. At night, as temperatures drop, the misters stay on for shorter time periods. During the late fall, winter, and early spring months, the misters only run at night, up until midnight, and run for very short periods of time, since cooling is not needed and longer runs begin to cause condensation on the dome surfaces.

During their daily cycle, the misters operate at regular intervals, coming on each half hour. Thus, they provide regular clockwork that grounds the rhythm of the Dome and provides a solid base for the more fluid and interactive sound and light cycles.

7. EVALUATION

Given the transient nature of the audience and the open structure of the public forum, evaluation of public art is particularly challenging. In the first weeks since the public dedication of the work, we have undertaken qualitative evaluation based on observation of audience behaviors, informal discussions with visitors, and review of regional press coverage.

Regarding the overarching sound design, we have been pleased with audience feedback. Listeners have reported moments of disorientation when they are unable to discriminate between the recorded samples played in the Dome and those present in the ambient environment. Visitors have reported that they are drawn to the synthesized sounds that are unfamiliar, but sonically engaging. One listener in particular remarked that the synthesized water sounds reminded him of falling water droplets, but thought that they fell from an imaginary faucet. Both while inside the Dome and upon leaving, listeners report a heightened awareness of their sonic environment and an increased sensitivity to the details of sound as they discriminate between synthesized and naturally occurring sources.

We have not received any complaints that identify the Dome as a source of noise pollution in the area. Rather, the sound remains quite isolated within the interior space and has been tuned with sensitivity to the patterns of activity at the site.

We have been less pleased with the interactive layer of the work. While we have observed that visitors will spend time listening and viewing the generative environments, they rarely utilize the interactive buttons. At present, visitors do not receive any guidance regarding these elements, and in future work we will work to make the buttons a more visual presence in the work and explicitly guide visitors to explore their function. Finally, we intend to archive the times and frequency of each button interaction so that we can develop a model of user activity surrounding the space that can be correlated with seasonal activities and the environments synthesized in the Dome.

To date, the installation has received favorable press coverage in regional newspapers. Reviewers note that the work is an asset to the mixed-use site and that visitors and residents provide enthusiastic feedback.

8. CONCLUSIONS AND FUTURE WORK

We have presented the Dome as a case study in the design of generative and interactive public art. We have discussed the conceptual framework for the piece and have described the modular design of hardware and software components. We have outlined the use of cycles that unfold at varied time scales, and described the outcomes of this approach to public art. Our preliminary feedback has been overwhelmingly positive as the work has been embraced by the regional community.

Given the complexity of the installation, a great deal of effort to-date focused on robust system design and the integration of each technology. Nonetheless, given the scalable design of the system, new sound and light elements can be readily programmed to extend the system. In future work we intend to utilize the Dome as a platform for the creation of new immersive environments and as an interface for the public audience. We envision this ongoing iterative cycle of revision as an overarching cycle of rebirth whereby the work is wholly transformed in stages over the coming years.

9. REFERENCES