University of Utah
UNDERGRADUATE RESEARCH JOURNAL

POST SONICA: SPECULATIVE DESIGN WORK IN SOUNDSCAPES AND PLACEMAKING

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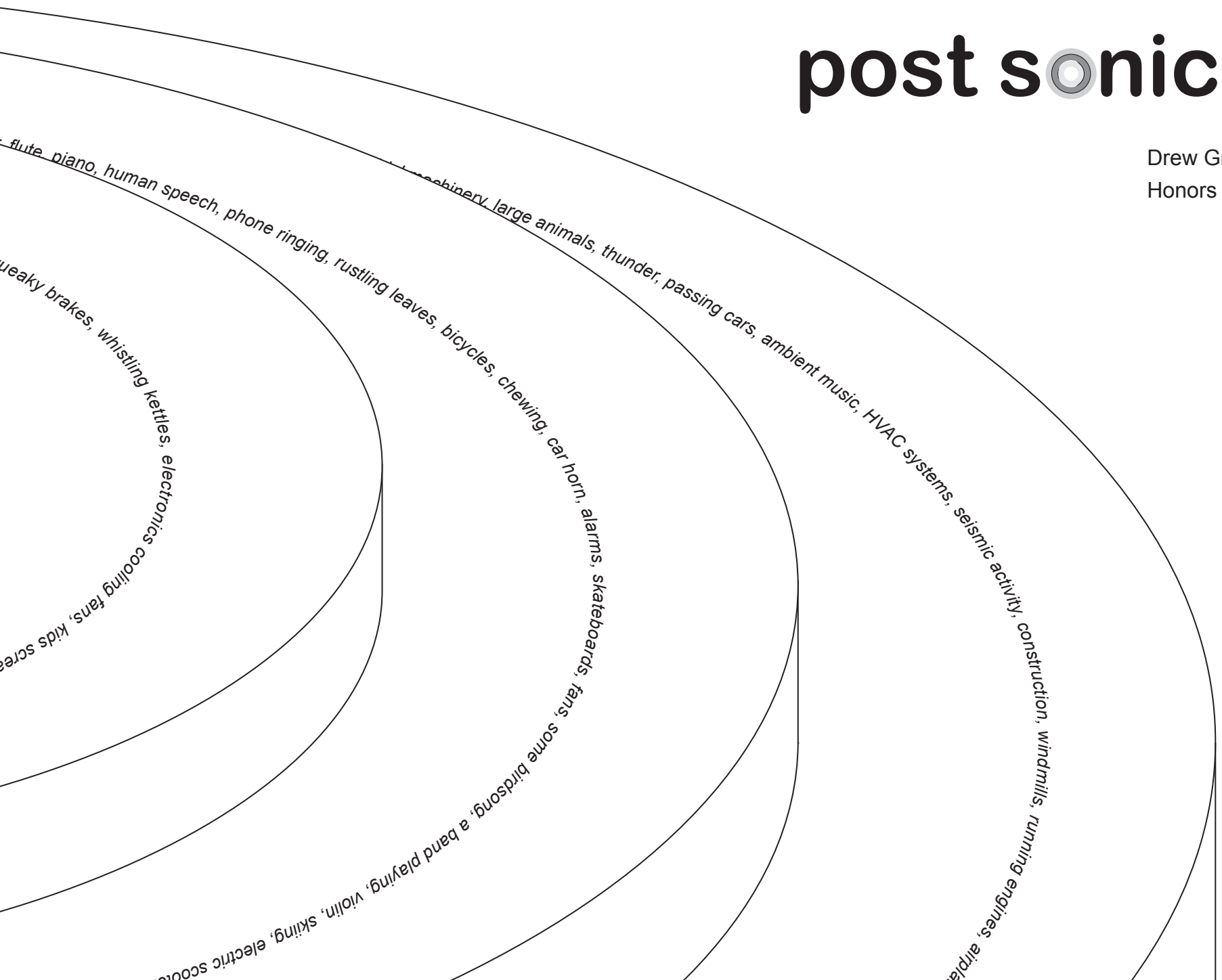
Department of Design

post sonica

Drew Green
Honors Thesis



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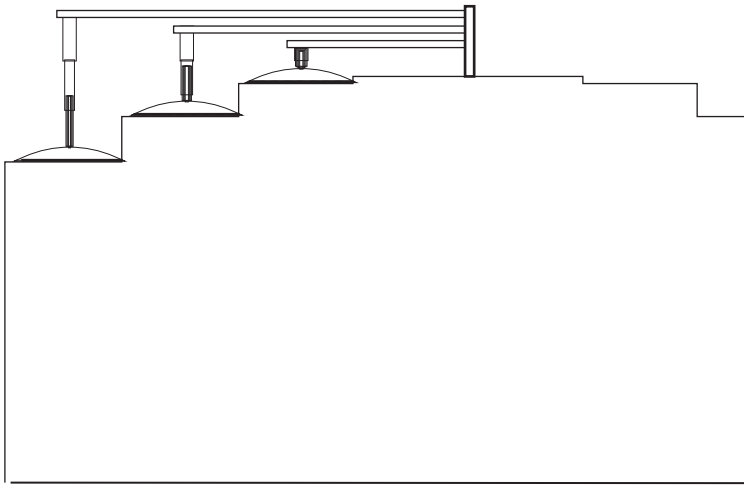
post sonica

[1]*after*

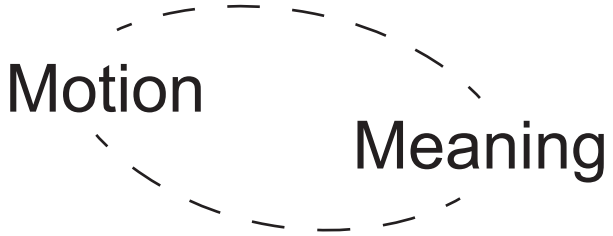
[1]*of sound or relating to sound*
[2]*promptly; at once*

Post Sonica: a speculative design project that cultivates community and sense of place within the city soundscape.

There is a rich history of soundscape reverence and reflection in Utah. From Messiaen to Ussachevsky, scholars and composers alike have been inspired by the state's sonic environment. Using these individuals' reflective works as a muse while simultaneously incorporating R. Murray Schafer's insights on soundscapes, I performed a sound sample study across Salt Lake City. Analyzing my samples led me to design a public installation that explores the ways in which our sonic environments affect daily life at the intersection of time, sound, and place. User engagement is necessarily bidirectional; as passersby are moved to interact with the device, their moment of reflection is captured and physicalized by the spinning arms. In this way, post sonica is a reminder of a community's fundamental interconnectedness and the ever-present soundscape that functions as a backdrop for it all.

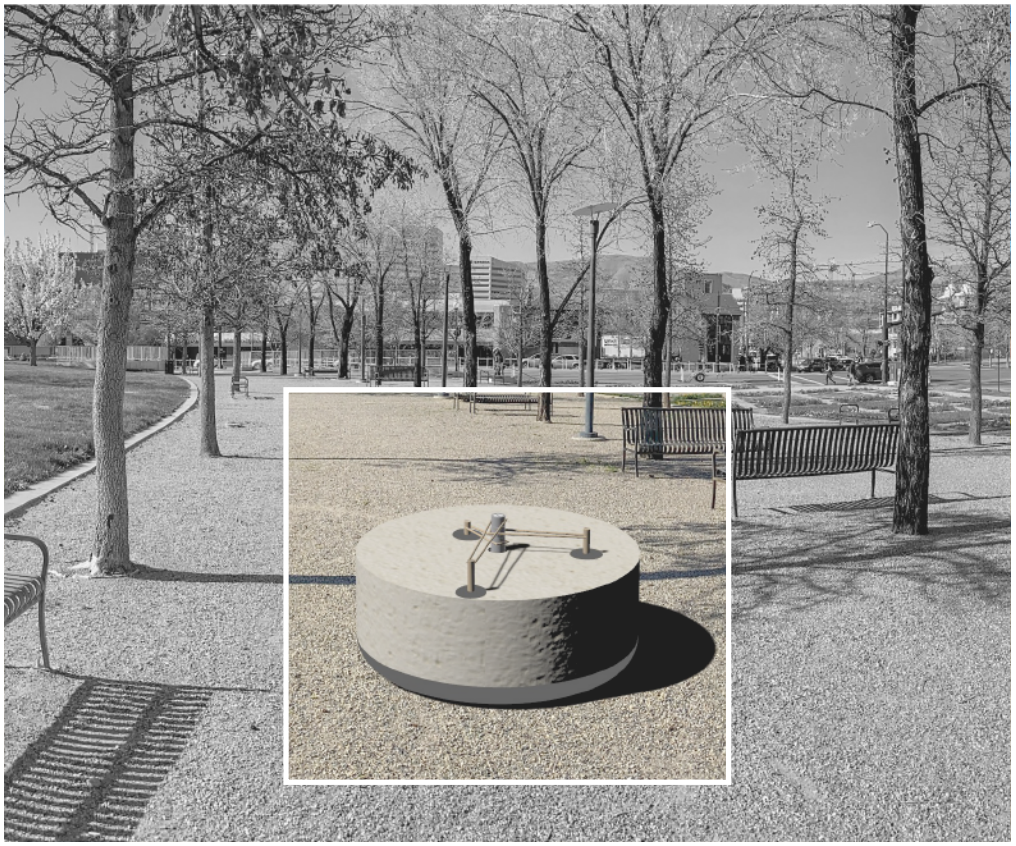


01_function + form



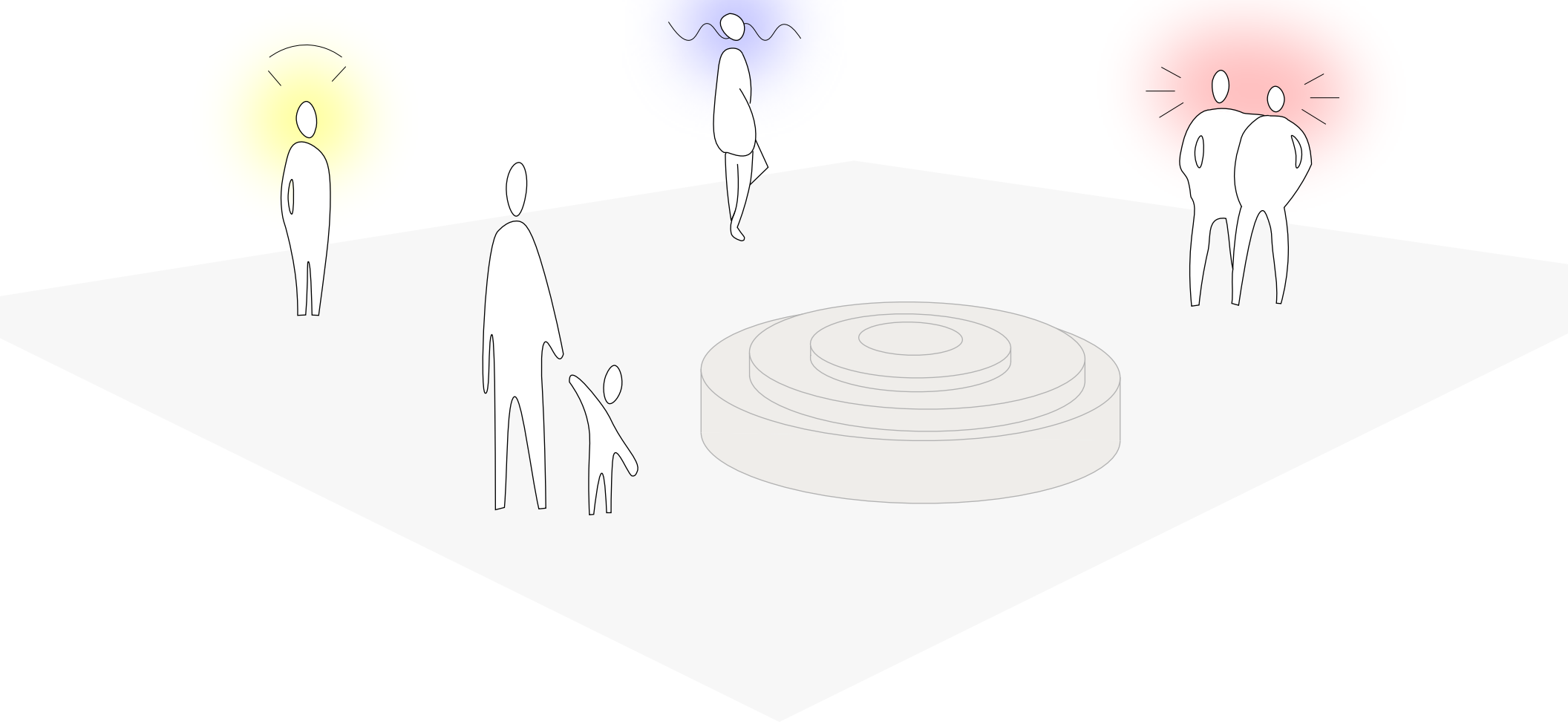
Responsive spinning arms transform sound into motion at variable speeds in response to the strength and pitch of the sounds around them. Abrasive pads at their ends impress a physical record of a dynamic sonic identity into permanence on the granite base below.

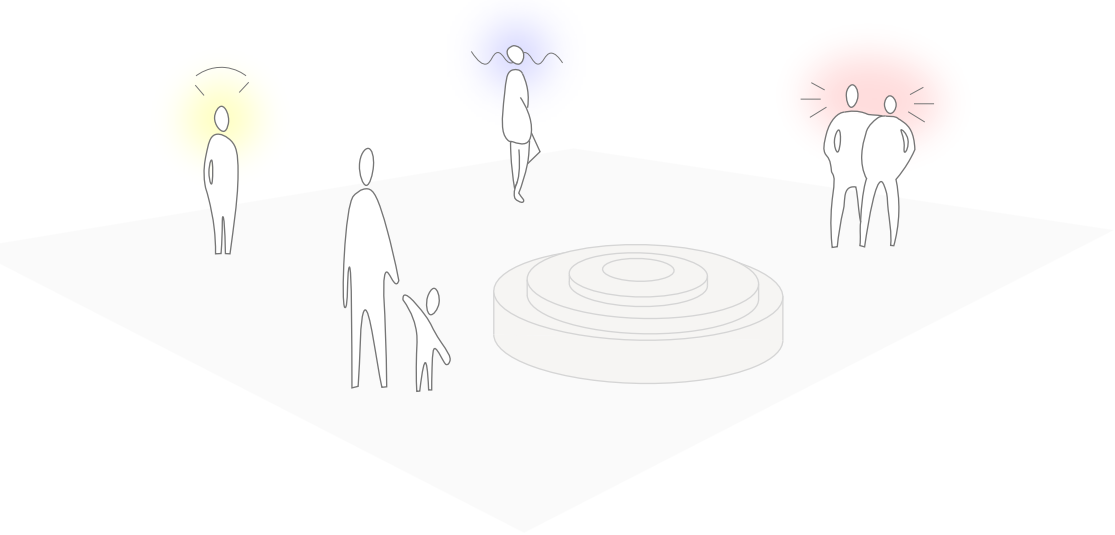
The system challenges the ephemerality of soundscapes and inspires community members to evaluate their relationships with the sounds that surround them.



Experience

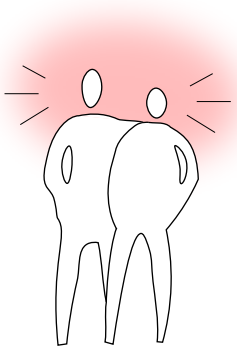
The installation is meant to be interpreted and engaged with on an individual basis. Here are a few possible ways in which people might connect.





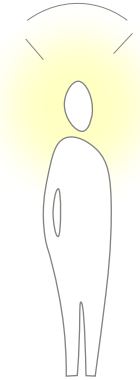
“Daily Driver”

This “user” lives in the area, and regularly passes by post sonica. She notices the subtle changes in the form, which cause her to think deeper about her own relationship with the city and sound. She sometimes enjoys simply listening with the machine as it physicalizes the soundscape in real time. Seeing firsthand the literal impact that sound has on post sonica, she considers the mental impact that the sounds of her environment have on her. She especially enjoys seeing how the installation has changed after big sonic events like parades or concerts.



“The Artist”

This describes anyone who makes an extra effort to interact with post sonica.They are intrigued by the historical significance of leaving a permanent mark on the work. In the same way one might carve their initials into a tree or sign their name on a check-in, these people add to the scene by leaving their legacy. Although this leaves the traditional territory of a more passive view of soundscapes, it is an interesting study in how we can shape a sonic environment.Think: choirs, bands, speech-givers, poem-readers.

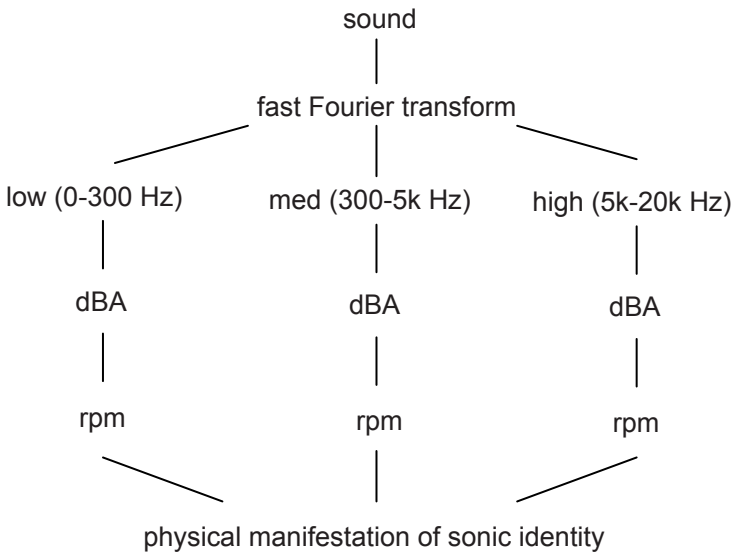


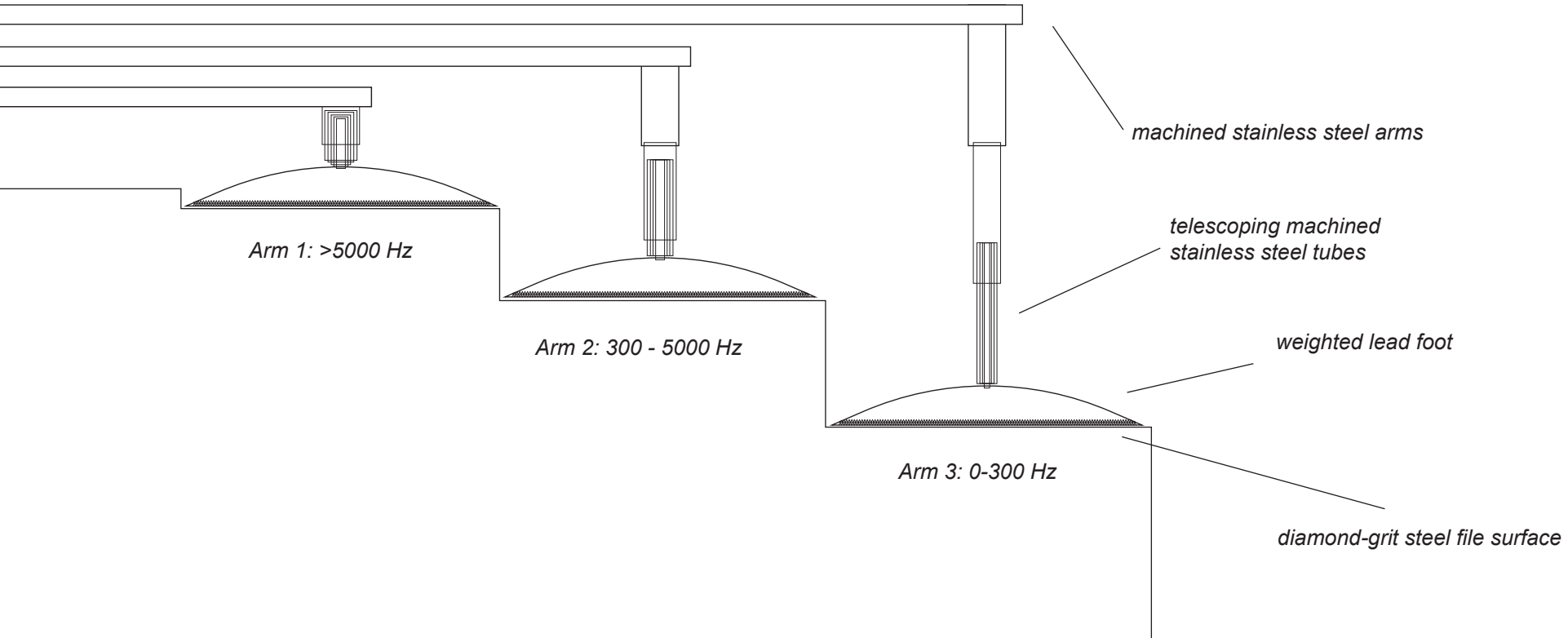
“Tourist”

Comes to the city and visits post sonica. Althouhg this person lacks the long-term perspective of somone who lives in the city they are nonetheless able to gain an appreciation for the sonic history of the place.The work makes them consider all of the sounds that shaped the work, and by association, shape the city, people, and distinct sense of place. Through reflection, the visitor is now able to connect more deeply with this place than they otherwise might have been.

Mechanics

The arms' rotations are governed by the sound around them. The system divides the soundscape into three frequency bands: low, medium, and high. Each arm is assigned an Hz range and the decibel level of that signal at a given moment dictates rpm. For example, a 70dBa whistling kettle will cause Arm 1 to rotate at 2 rpm. This translation process is accomplished by a python program running a bandpass filter to create frequency bands from the original audio input, measuring the dB of each band, and directing three DC motors accordingly.

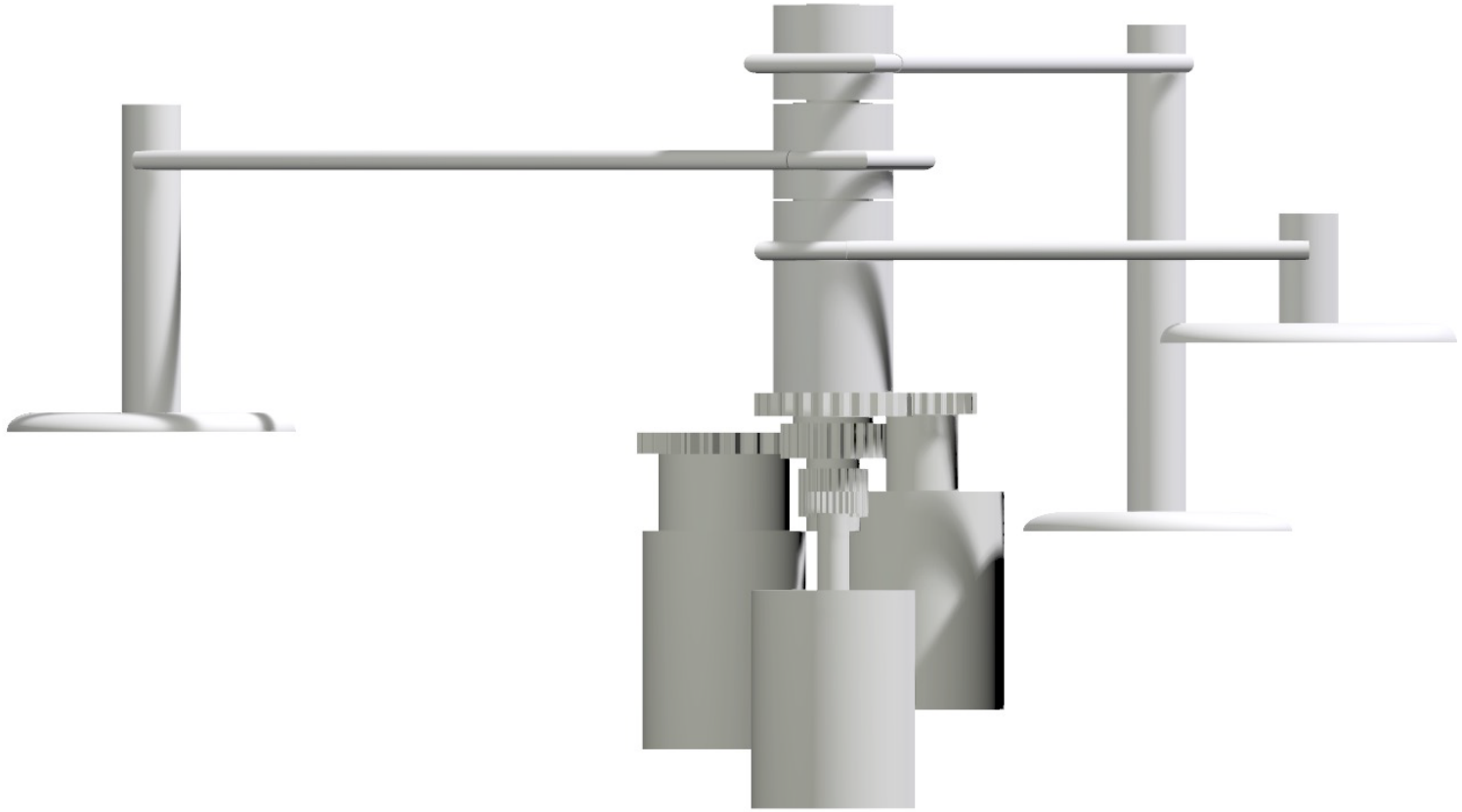




Sound to Stone

The following equation represents how the three distinct frequency bands will be converted into revolutions per minute. The model below illustrates the central driveshaft and offset gearing system

$$rpm_{(\text{each second})} = 0.1\left(\frac{\text{sum dBA}_{(\text{each second})} \times 100}{\text{frequency range}_{(\text{low = 300, med = 47k, high = 15k})}}\right)^{3}$$



02_theory

Existing bodies of research and design have informed every stage of this process. Post sonica draws a through-line across urban ecology, soundscape theory, signal processing, data abstraction and physicalization, and speculative design.

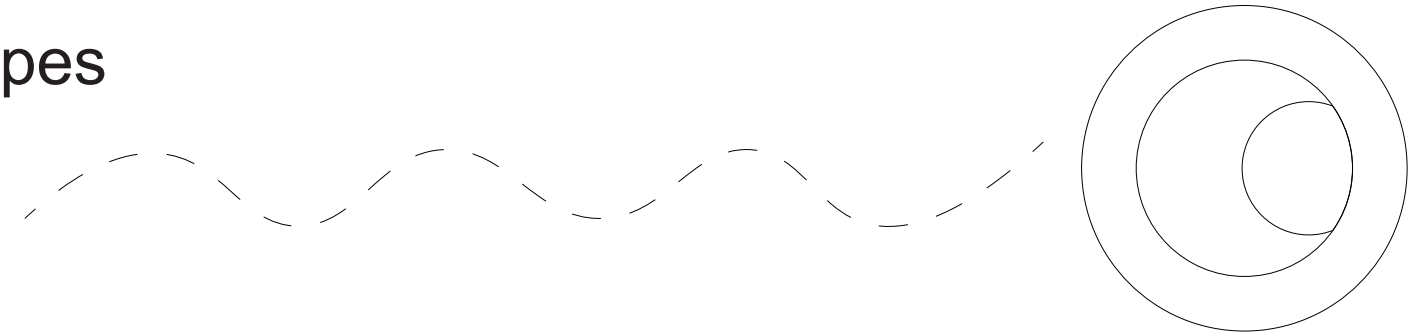
Urban Placemaking

Generally speaking, the term “placemaking” refers to the ways in which we shape the urban environment to emphasize relationships among “individuals, communities, and urban spaces” (Wyckoff, 2014). When specific steps are taken to design meaningful spaces in our cities, it becomes easier to connect with one another through shared experience.

In his book, Happy City, urban ecologist Charles Montgomery reviews a wide range of studies on this subject. When looking at physical aspects of a city, the author finds that the messages encoded in architecture and systems can [either] foster a sense of mastery or helplessness.” This suggests that the more elements we can introduce into the cityscape that leave residents informed and aware, the more self confidence they might feel. Should post sonica cause people to connect more deeply with their city’s sounds and develop a greater sense of understanding and mastery in this arena, the entire community stands to benefit. Moreover, the author adds that the “most important” aspect of a city is how it “moderates our relationships with other people” (Montgomery, 2013). The ability to trust in one’s community and confide in friends and family has a monumental impact on life satisfaction. Post sonica centers around interaction and perception, altering the relationships we have with the sounds that the people around us make. Moreover, it can move people to connect with one another by highlighting the fact that we all hear a similar soundscape as we move through a place.

Lastly, Anton Ehrenzweig’s concept of “utter watchfulness,” a state in which a person can “pay equal attention to everything at once, omitting nothing and at the same time emphasizing nothing” does well to capture a reaction that post sonica has the potential to generate. One might easily become spellbound by the spinning arms, finding it easy to process and appreciate all sounds at once as a symphony of equals. Urban ecologist Tony Hiss argues that upon engaging in such a state, we take on a “fluid body boundary,” wherein our sense of self becomes less well defined, increasing our ability to coexist and connect with others (Hiss, 1990).

Soundscapes



A soundscape is a perceptual construct. Setting it apart from simple sound, the Organization for Standardization defines the term as an “acoustic environment as perceived or experienced and/or understood by a person or people in context” (ISO, 2014). This interpretation piece is key to soundscapes, as it is the sociocultural element that differentiates them from noise and attributes them to a specific location. Since sound is so fleeting in nature, it can be difficult to observe a soundscape in its entirety without focusing completely on the task. Though we move between and contribute to many different soundscapes daily, we tend to selectively focus on the sounds that have the most direct effects on us, like people talking. When we make a habit of this, we lose out on the opportunity to perceive our sonic environment as a unified whole, reflect on the impact that the sounds we haven’t been focusing on have had on us subconsciously, and make deeper connections to the places we call home.

While skeptics might argue that the soundscape has little bearing on everyday life and community outside of sounds used for direct communication, a large body of research suggests otherwise. In fact, living in a poor quality soundscape has been seen to increase stress levels and irritability considerably, while those with direct access to peaceful, highly regarded soundscapes benefit when it comes to the ability to relax and get work done (Lercher, 2016).

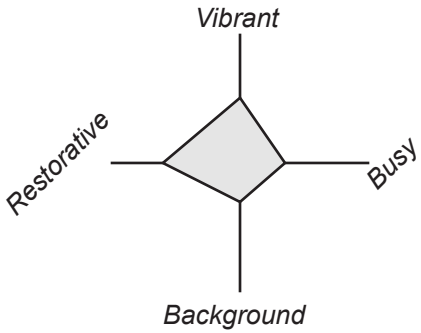
In his seminal text on soundscapes, scholar R. Murray Schafer delves into ways in which to analyze them. The author advocates for quiet, intent listening, along with reflection and analysis that categorizes sounds hierarchically according to how prevalent they are in a given environment, as well as how much of an impact they have on the listener. Phenomena such as soundmarks (a sound that is unique to/for a community), keynotes (sounds influenced by an area’s geography and environment), and signals (sounds that communicate a message directly to the perceiver) all unite to build a complex sonic environment open for many different interpretations. Though the sounds we hear may be alike, it is each community member’s unique perception of them that creates a soundscape.

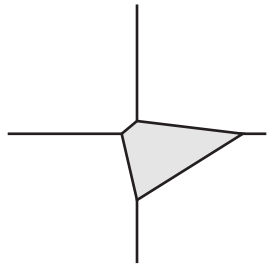
Case Study: Salt Lake City

Neighborhood	Latitude	Longitude	Primary Sour	Sound 1 distance	Sound 1 Freq.	Sound 1 Intensity	Secondary Sound	Sound 2 dis	Sound 2 Frec	Sound 2 Inte	Tertiary Sour	Sound 3 dist	Sound 3 Frec	Sound 3 Inte	Quaternary S	Sound 4 dist	Sound 4 Frec	Sound 4 Inte	Ground Material	Notes	Sound 5	Sound 5 dist	Sound 5 Frec	So
Sunnyside East	40.7516275	-111.84464	Cars	100	8	7	Birds	75	5	4	Wind	0	4	3	People Talkir	150	1	1	Grass	Calm with regular car interruption				
University Dorms	40.7677689	-111.83226	Building HVA	50	10	5	Construction	150	5	5	Water drain	50	8	3	Birds	200	3	2	Asphalt	Busy but not bustling				
Presidents Circle	40.7650121	-111.85115	Cars	100	8	5	leaves on the grou	4	5	4	Construction	200	5	4	People Talkir	100	2	2	grass	Just removed roar of city carss				
Federal Heights 1	40.7769378	-111.85069	Wheelbarrov	70	7	7	Cars	200	8	3	Flagpole	70	7	3	Siren	400	1	2	Concrete	Hollow roar of the city				
Federal Heights 2	40.7748879	-111.843	Cars	10	5	8	Snowfall	0	10	2	Construction	400	4	3	City Roar	400	10	1	Asphalt	Occasional car ripping by, otherwise construction and city ro				
Central City	40.76635	-111.88233	Construction	60	8	8	Cars	30	7	7	Crosswalk	130	6	4	People Talkir	100	3	4	Concrete	Dominated by construction and the sound of snowfall. Little				
Central City Lib	40.7599473	-111.88333	Construction	100	10	8	Cars	50	7	7	Trax	60	1	6	Pigeons	5	8	4	Pebbles and dirt	Adjacent construc	Cyclist	20	2	
Avenues Residential	40.7817847	-111.8714	Cars	10	6	7	City roar	400	10	3	Birds	70	3	3	Wind	0	2	2	Concrete	Not much going on besides regular traffic				
AvenuesPark	40.773302	-111.88185	Cars	30	7	5	Rain	0	9	8	Birds	50	6	3	Churchbells	400			Pebbles and dirt	Cars and rain are sometimes tied in their impact, with cars l				
Capitol Hill Park	40.777048	-111.88597	Cars	40	7	6	Water feature	200	10	3	People Walk	5	3	4					Asphalt Walkway	Cars are regular, but the sound of the water balances things				
Capitol Hill Residentia	40.7822289	-111.89633	Cars	20	8	6	Distant Highway	400	10	2	Birds	70	4	3	Plane	400	1	2	Concrete	Busy stopsign intersection filled with car sound, pockets of t				
Downtown (City Creel	40.7678682	-111.89087	Cars	10	4	7	People	10	6	6	Music	60	10	4	Crosswalk	100	3	2	Concrete		Trax	20	2	
Downtown (residentia	40.7621062	-111.89702	Tolling bells	70	9	6	Cars	10	5	7	Dog walkers	40	2	2					Concrete	Somewhat eery bells/chimes playing. Perhaps its something				
Poplar Grove Residen	40.7585549	-111.91784	Highway Din	300	10	4	Cars	20	4	6	Planes	400	5	3	Dryer	50	8	3	Mulch	Planes are surpris	people	50	2	
Jordan River Park	40.7562496	-111.92266	Highway Din	400	19	2	Cars	60	2	3	River	10	9	1	Wildlife	30	2	2	Wooden Bridge	Stillness and som	Planes	400	2	
Sunnyside East Resi	40.748424	-111.83678	Cars	15	7	7	Snowfall off of tre	10	8	3	Planes	400	1	2	Birds	200	4	2	Concrete	Quiet street with a decent amount of traffic. I feel like there				
East Bench Public	40.7483939	-111.81074	Cars	30	3	6	Rain gutters runni	20	10	4	Kids Playing	30	5	3	Plane	400	2	3	Rubber	Quiet street, small playground and sledding hill. The park is				
East Bench Resi	40.7364724	-111.81343	Birds	60	8	4	Cars	50	3	6	Man shovelir	150	3	4	Plane	400	2	3	Asphalt	Very tranquil place. Many different bird sounds echo throug				
Foothill Resi	40.7358943	-111.8281	Foothill din	100	10	4	Birds	70	5	2	Cars	15	2	7	plane	400	2	3	Concrete	Quiet street aside	Person	70	1	
Foothill Public	40.7385651	-111.82776	Foothill din	100	10	4	Cars	30	3	6	Planes	400	2	5	Birds	70	3	2	Mulch	Cute little park next to a school. Planes can come to domina				
Sugarhouse Public	40.7226176	-111.85263	1300 + Highv	100	8	4	Cars	30	4	6	Kids Playing	60	8	4	Geese	70	2	2	Grass + Snow	Sledding! Kids ou	Dogs	60	2	
Downtown Sugarhous	40.725467	-111.86176	Cars	15	9	8	Pedestrians	5	3	4									Concrete	The amount of cars is overwhelming and makes it difficult t				
Sugarhouse Resi	40.7297863	-111.864	Birds	50	8	5	Cars	10	2	6	Highway din	400	10	1	Bell chime	70	5	2	concrete	Shockingly peace	Planes	400	2	
Ballpark Resi	40.743761	-111.89634	Highway Din	300	10	5	Birds	80	5	2	Trax	100	2	5	Plane	400	2	3	Concrete	Constant din of tl	Cars	15	3	
Ballpark Public	40.7326796	-111.895	Highway Din	300	10	5	Forklift and wareh	100	3	6	Birds	100	2	2					Grass	The highway noise mostly masks that of planes, while the la				
Industrial	40.7326001	-111.91131	Railroad xing	70	10	6	Trains	70	5	8	Cars	15	7	7					Asphalt	Loud loud so loud. Trains are loud, bells are loud, whistles a				
Glendale Public	40.7369032	-111.92259	Train Whistl	400	6	5	Highway din	400	10	3	plane	400	2	3					Grass	Quiet but does not escape the highway din and railroad whi				
Yalecrest Resi	40.7473758	-111.85282	1300 Traffic	200	7	5	Birds	70	6	4	Cars	15	5	7	Kids playing	150	4	4	Concrete	Relatively quiet street, but very much in the soundpath of 13				

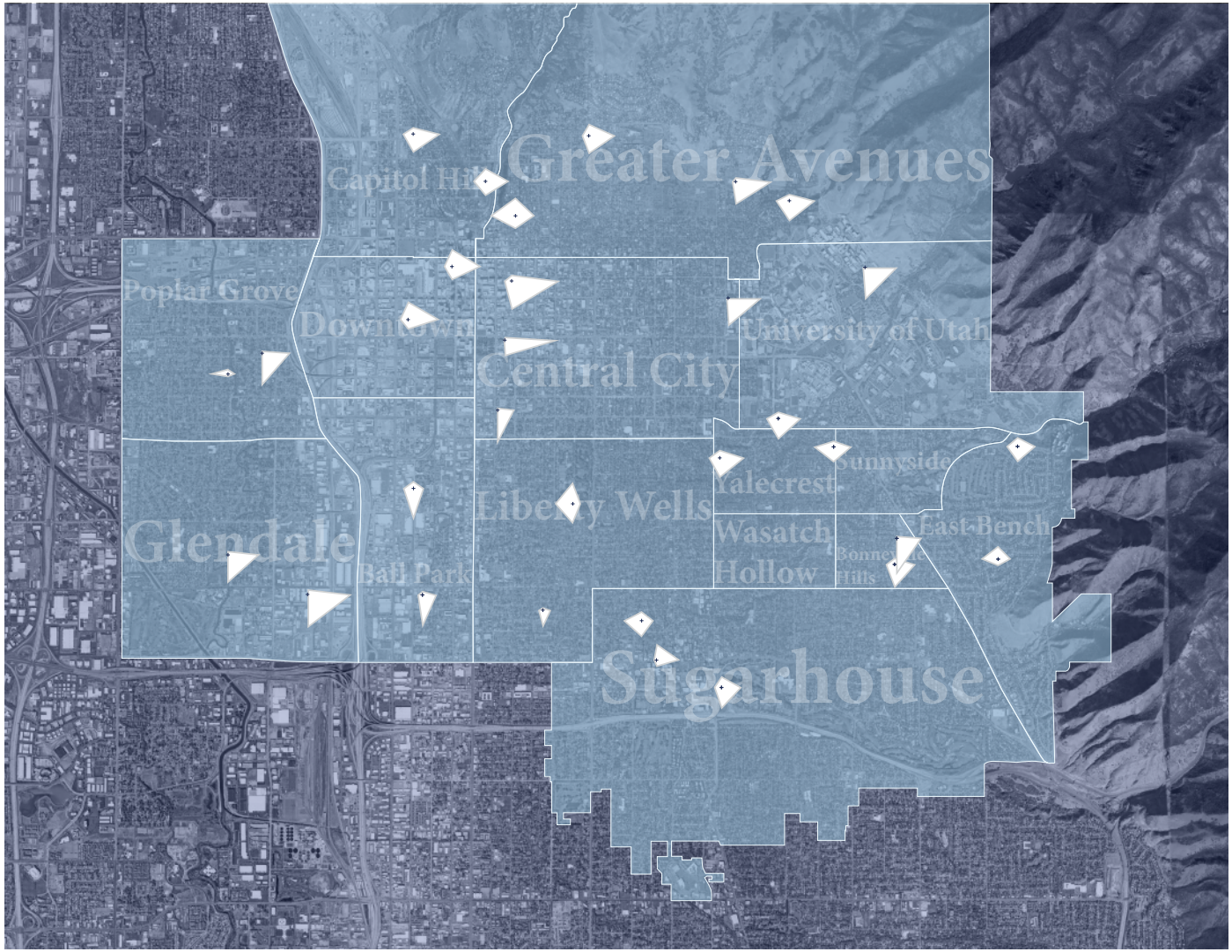
Building off of what I'd learned from Schafer and others about the importance of soundscapes and evaluation, I decided to collect sample data in neighborhoods throughout the Salt Lake Valley. Once I had collected 5 minute sound bytes from over 30 locations and recorded my observations and analysis, I needed to group and analyze my data for comparison. The purpose of this informal study was not to set a "be-all end-all" classification for the soundscapes in Salt Lake City, but rather to experience what it is like to listen intently to a wide range of soundscapes and attempt to quantitatively assess the differences between them.

My work here was informed by Axelsson, Nilsson, and Berglund's Principal Components Model of Soundscape Perception, which led me to evaluate my samples based on four dimensions: restorativeness, business, vibrancy, and background, which are closely tied to those curated by the research team in Soundscape Perception: pleasant, unpleasant, eventful, and uneventful (Axelsson et.al, 2010). The following diagrams and map catalog my experience of each soundscape.





Case Study: Salt Lake City



The soundscape study took me across the city, and over the course of making the various recordings and observations, I developed a more complete understanding of what it means to experience a place through sound. Different neighborhoods' sonic characteristics shone through as a source of unique independence.

Additionally, I noticed the ever-present link between sound and motion. For me, I must stop moving completely in order to become a fully attentive, passive observer of a soundscape, as opposed to another contributor. This process made me more aware of the challenges of soundscape appreciation, as well as the opportunities it provides for attention restoration and self reflection.

On Physicalization

“The city, however, does not tell its past
but contains it like the lines of a hand,
written in the corners of the streets,
the gratings of the windows, the
banisters of the steps...every segment
marked in turn with scratches,
indentations, scrolls.”

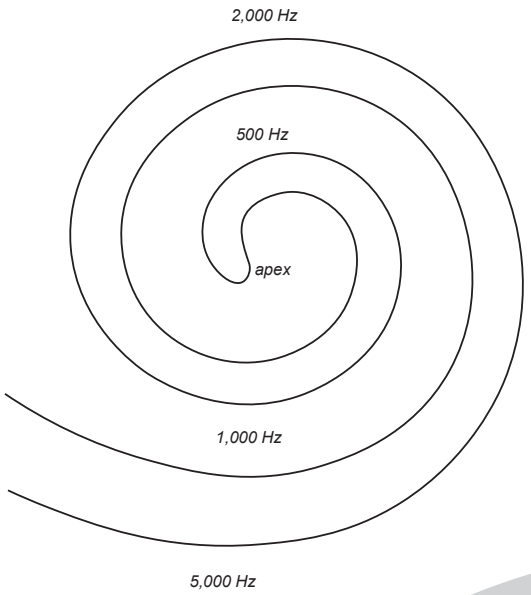
- Italo Calvino, *Invisible Cities*

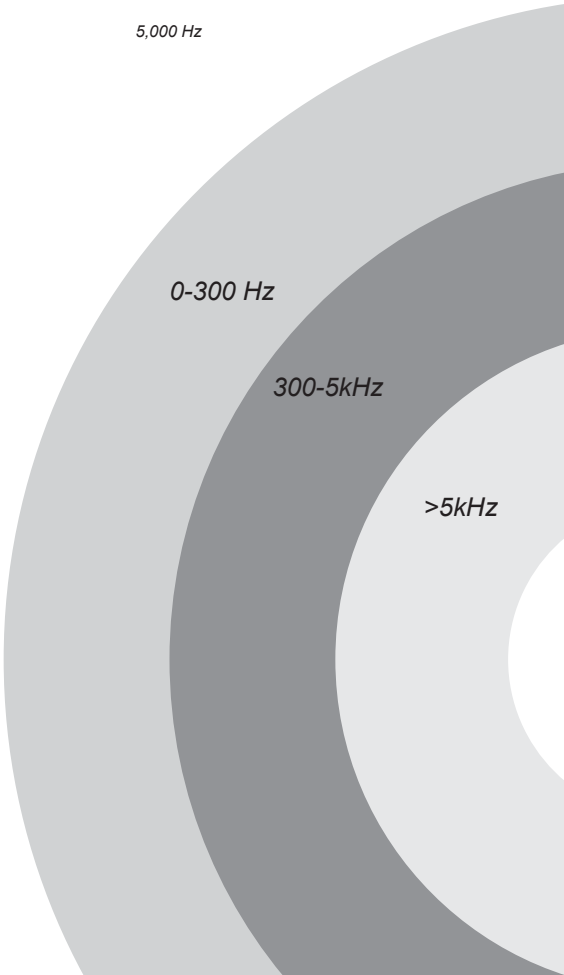
On Physicalization

Having gained insight into the practice of soundscape observation and study, I was excited to introduce this concept to a broader audience. Looking for existing elements of place that build community, I found that physical manifestations of history and time play a significant role in the way we perceive a place's character. For instance, a shiny, worn doorknob subtly represents the thousands of people that have passed through that entry, giving the user a sense of historical context and shared experience. It is in this space that I feel soundscapes lack representation, as they do not leave a tangible mark in the same way that more physical phenomena do, but yet affect our perceptions of the city and connection to the community just as much, if not more.

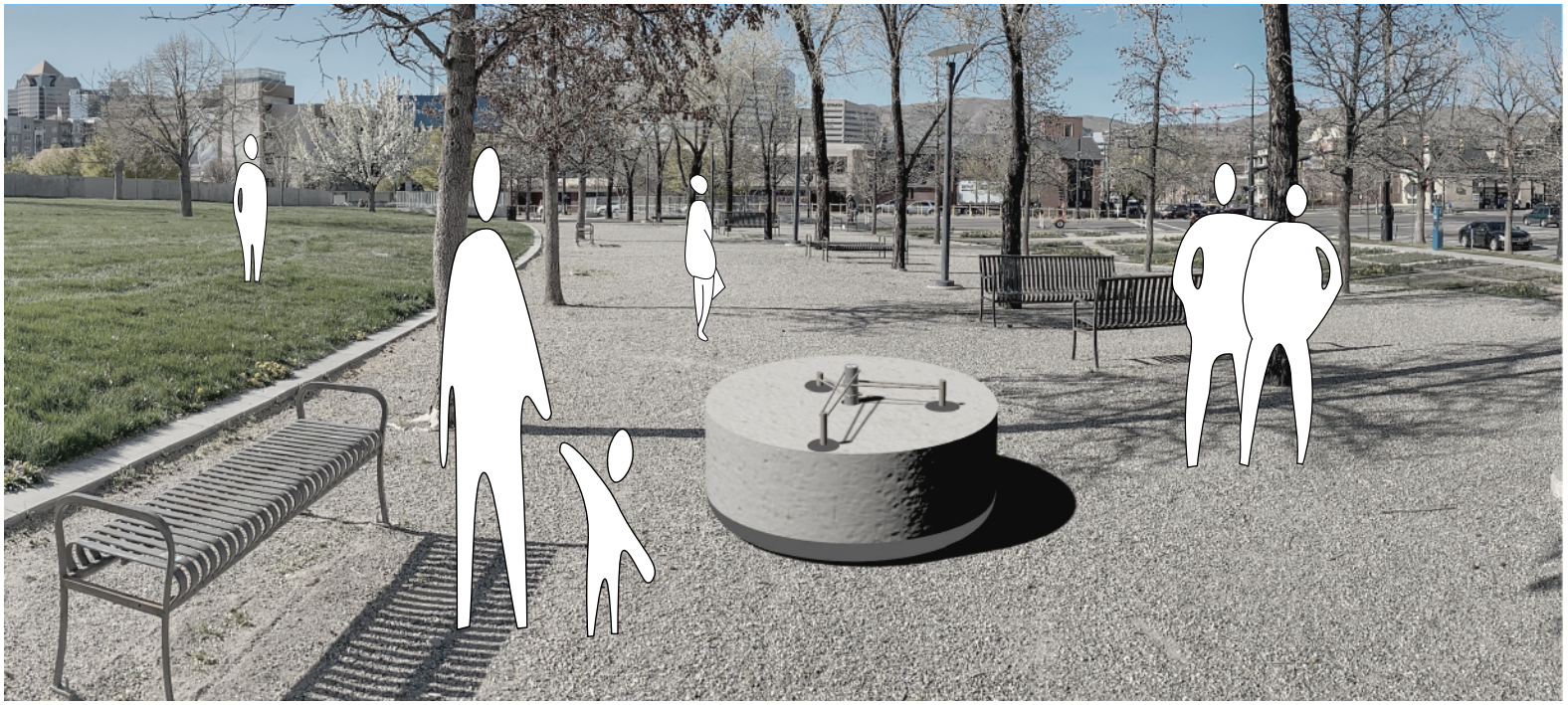
Existing precedents of data physicalization suggest compelling opportunities abound in this medium. For example, in their article on the subject, Jansen et.al explain how physicalization exploits our "active…,spatial…,[and] intermodal perception skills" to make data more accessible to a wider variety of learning modes and more engaging for all. There are few who would rather look at a graph on a screen instead of walk through a physical representation of it in person. Furthermore, once we have increased the accessibility of the data itself, we have also created an entire experience around observing this data. Such an experience is shared by audiences, bringing them together over common ground.

In order to physically represent both the present soundscape in parallel with sonic history, I first looked to human anatomy. The cochlea process soundwaves in different areas along its curl based on their frequency. Upon "unrolling" a cochlea, one can chart where different frequencies register from high to low in a straight line. That set an interesting precedent for a way in which to divide different elements of a soundscape. Beyond just that, though, cilia (sound-receptive hair cells within the cochlea) actually wear down with use over the course of one's lifetime (Pickles, 2012). That means that all the sounds we hear leave a physical imprint on us, and the frequencies we hear most (and loudest) make the strongest mark. From there, I chose to abstract this sound reception into a circular motion to allude to the passage of time.





03_conclusion



To conclude, the post sonica project proposes a unique way to build community and sense of place around soundscape and shared experience. Once the project is installed, it begins to carve away an abstract representation of a location's sonic identity. If this were ever to be fabricated and installed at full scale, it would be fascinating to study how the installation impacts a community's concept of soundscape.

At its core, the work is meant to encourage connection and conversation about how the sounds we hear every day affect the communities we live in.

Looking ahead, it is interesting to consider how data and observation can continue to play a role in the practice of placemaking at any scale.

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