

Toronto Metropolitan University
Performance at The Creative School

Subterranean Soundscapes
Sampling the Sound Palette of Toronto's Subway System

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25 April 2024

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Introduction & Background

When thinking about potential thesis project ideas over the past 4 years there has been one consistent theme that arose: transit. As a neurodivergent person, ever since a very young age one of my special interests has been trains, therefore a train-centric project seemed like a fitting way to end this chapter of my life. As a commuter, I have spent so many hours on the Toronto Transit Commission (TTC) and other transit systems that I had become desensitized to the noise, inspired by field recording I questioned what I could learn from taking the time to just listen at each station. What initially began as a plan to record inside the subway shifted as I wondered, what if we take away the train from the equation and focus on the spaces which house the subway?

Research

To establish the basics of the sonic elements within the project, I began by examining field recording work and urban soundscape studies. This pathway re-sparked my memory of learning about the World Soundscape Project from Simon Fraser University, a project piloted by Canadian composer R. Murray Schafer in the 1960s. From there I began reading his book *The Soundscape: Our Sonic Environment and the Tuning of the World*, the book explores the idea of an acoustic environment and how it has shifted over time. A chapter entitled *The Industrial Revolution* caught my attention and provided a lot of insight into how the world sonically shifted

at the introduction of the machine. A key area that contributed to the increase of noise is the development of rail, “As roads and railroads and flat-surfaced buildings proliferated in space, so did their acoustic counterparts in time; and eventually flat lines in sound slipped out across the countryside” (Schafer 78). The idea of sound spilling out into the parts of the soundscape that were once quiet or naturalistic was captivating and relates to the idea he poses of sonic imperialism. For example, “A man with a shovel is not imperialistic, but a man with a jackhammer is because he has the power to interrupt and dominate other acoustic activities in the vicinity” (Schafer 77). The idea of sound having power and authority in the perception of humans is evident in terms of elements in transit systems like horns or sirens alerting people of danger or disorder.

The idea of noise taking over once quiet spaces then shifted to the idea of noise pollution in subway systems. I began looking for other case studies of noise pollution and research from both Iran and China being some prime examples. In the example of Iran’s Iman Khomeini Intersection Station, there is mention of the dangers of excessive noise and the adverse effects of such exposure, “Hearing impairment, annoyance, sleep disturbance, and hypertension” (Ghotbi et al. 1097). It also touches on the effect of stations being enclosed versus open-air, “not only because of the noise caused by rail transportation systems but also as a result of the sound reflection in an indoor environment” (Ghotbi et al. 1098). In the example of China’s selected Guangzhou Metro stations, there is an additional focus on how vibration also factors into exposure on the subway. The findings showcase the range in sound pressure levels measured in decibels across the lines, highlighting factors for increased levels, “There are many reasons for this problem, among which curve squeal, high-speed squeal, and whistle are the main reasons” (Li et al. 4251). There is also reason for variations in horizontal vibration patterns provided

similarly, “The magnitude of horizontal vibration depends largely on the track conditions in which the train runs” (Li et al. 4252). There is not much mentioned about improvements or factors of mitigation specifically but both case studies allow for some insight into the factors that affect the noise and vibration levels in stations.

Then taking the dangers of noise in subway systems as a general idea it was then shifted to the context of the TTC. There was not much in terms of peer-reviewed academic sources on this specific topic but by using other subway system studies as guidance and some investigation some insight was provided. Thankfully there is a section of the TTC’s website that outlines the main areas of concern when it comes to noise and vibration levels and also how they are mitigating the levels where possible.

The first area is dubbed “Wheel Squeal” (TTC). which refers to the screeching sound that is made by the wheels. In terms of determining the cause it is evident that certain portions are more likely to produce this sound, “Most commonly, this squeal/screech occurs on curved sections of subway track” (TTC). Specifically stations like Union Station which are heavily curved face this issue. In terms of reduction/mitigation, the protocol is to lubricate the areas that are affected the most to prevent it where possible. Another area of concern is “Ground-Borne Vibration” (TTC). This primarily affects the older areas of the subway specifically on the Line 2: Bloor-Danforth stretch of track. There are a variety of methods used to prevent and monitor this issue, “These measures include: continuously welded rail, resilient rail fasteners, floating slabs and ballast mats” (TTC). In portions of the system, “Ground-Borne Noise” (TTC). is also a problem which is when areas near tracks act as amplifiers to the noise of the subway. Reducing this is harder as it would require the teardown and reconstruction of stations which would be time-consuming and expensive. Instead, they opted to build newer stations differently to prevent

this issue, “The design involves fastening rails to concrete slabs, which float on large rubber disks” (TTC). There are many more examples of factors that create noise on the TTC along with how they are being mitigated but this was formative to contextualizing how different structural factors play in the role of noise.

Project Planning

The planning of logistics and scheduling began during the month gap between semesters as I began to attempt to scale the project, gather information/equipment and determine the feasibility of the idea.

Beginning with a calendar I had planned to spend 13 weeks on the project with the following breakdown: two weeks of planning, four weeks of research, three and a half weeks of collection and three and a half weeks of analysis and processing to have a final product ready for the 13th week. I threw this out the window almost immediately with the project falling to the bottom of my priority list for a few weeks until deadlines were beginning to approach and I began working strenuously on it. The initial approach of spending fewer hours over various weeks would have been better for my stress levels and in the future I will be working to maintain this standard for myself.

I wanted to have the most discrete set-up possible that was portable in case of having to pack it up quickly and able to be used by a single person. I narrowed it down to three key elements: a Sony UX570 Digital Voice Recorder, my iPhone 12, and my Apple Watch. I purchased a relatively inexpensive Sony handheld recorder off of Amazon and this device truly surprised me with its capabilities, capturing stereo audio. My phone acted as both a camera for the various photos I took on the journey and also as a backup audio recording device which I thankfully did not have to use. Finally, my watch had two primary functions, as a means of

tracking the time and as a rough gauge of noise levels. It has a feature where it detects the decibel reading and if it surpasses normal levels it vibrates to notify me, while it might not be the most accurate it did assist me in determining loudness. I also brought myself a pair of earplugs just in case levels got too intense which I did not have to use after all.

Initially, I had planned to do all 70 active stations on the network and select streetcar platforms/loops, spending at least 10 minutes at each to capture audio and write observations. However, after some thought and time calculations, I cut it down to about 20 stations at a reduced duration. After scaling down the concept, then came the challenge of narrowing down which stations to use. I knew I wanted to cover both Line 1: Yonge-University and Line 2: Bloor-Danforth but I was not sure what segments to select to get a wide range of the stations the TTC uses. I began writing out a list of key stations I knew I wanted to hit, mainly starting with terminal and central stations for each line and then examining ridership reports as a factor. In the end, I was able to collect audio excerpts from 35 stations ranging from a minute to nine minutes across the network.

Safety was another element that was to be considered when I was planning this project, as the TTC has had its fair share of incidents involving passengers being attacked or harassed on platforms. As someone who has been physically attacked on the TTC before, I have noticed heightened levels of anxiety so I took this project as a sign to work on building up confidence in travelling again. I decided to travel during the daytime hours when there were more staff seemingly present as a precautionary measure. I also allowed myself to leave the area if I was feeling uncomfortable at all which happened a few times on the trip. Another measure I took for a few of the trips was bringing along someone to accompany me, this was a helpful element that made me feel so much more comfortable in my collection process. Overall the process was able

to show me that the TTC is not that scary after all and a lot of the time nothing goes wrong, helping me rebuild my confidence.

Process

I ended up spending 9 days in total gathering recordings with a few controls acting as a constant to prevent differentiation in the recording. All the audio was gathered on a weekday between the hours of 10 am and 4 pm, on days with forecasted highs above zero and moderate wind levels. This was the true challenge as I wanted to give each station a fair measure by applying similar constraints but Canadian weather can be so unreliable so there were a few days I had to simply reschedule.

The method of collection was to get on the subway at a specific station and then ride to the next station on my list, step directly off the train, align myself with the wall or center of the platform and then remain still for several minutes. There were a few instances where I had to move during the process, mainly due to safety concerns of being too close to the tracks or a member of the public interfering, but overall was able to stay fairly consistent. If I was unable to gather audio for any specific reason I also allotted contingency in the timeline to re-record as needed which happened a handful of times. The process was quite simple and had little to no interruptions, it became less of a task and more fun over time, especially with the integration of other people joining along.

Along my travels I realized that there was more time left so I decided to capture Line 4: Sheppard-Yonge all because of a GO-transit detour that took me to North York instead of Union Station one day. Additionally, I added other stations as I ventured, either ones that caught my eye or if I felt I had been sitting on the subway for too long without getting off I would just get off.

An area I had not considered in depth before was how paying for fares works with Presto when you stay on the train all day, as there were days when I spent hours at a time without exiting. Technically speaking I never left the paid fare area and therefore never did a formal transfer, but I would be lying if I was not fearful of being ticketed for expired transfers. I did not have any problems with this until the very last day of my recording where I was stopped by a TTC fare inspector who questioned me for my suspicious activity but ultimately let me go after some explaining. Overall though there were no major issues or disruptions just some passengers being curious as to what I was doing that caused some interruptions but nothing too chaotic or concerning.

The collection process went pretty smoothly overall with the biggest obstacle being my stubbornness and procrastination tendencies. Had I taken the time to hold myself to the target timeline I believe I would have been less stressed out in the last few weeks of the project.

Presentation Method

My main issue was figuring out how I wanted to showcase the work. Initially, I had thought about making it a fully interactive online experience but upon trying to write the code for a website I realized that I was in over my head and stopped. I knew I wanted there to be a level of interactivity for participants but was cycling back and forth on how to achieve this. It was while working on another project that I realized I could utilize a program I use almost daily (QLab) and allow participants to place themselves into the soundscape of whatever station they desired.

It began with taking the audio files I collected and uploading them from the recorder onto my computer running them through my digital audio workstation of choice (Logic Pro X) and editing them as needed. In terms of the edits, they were minimal as I wanted to maintain a more

raw aesthetic, it was mainly trimming and a little bit of EQ as needed. Then I took those files and uploaded them to QLab 4, upon naming them all I attempted to program my AKAI MPK Mini keyboard via MIDI to create that interactive portion. After some technical issues surrounding the parameters of MIDI and a lack of keys, I opted to shift to a computer keyboard as I was more familiar with the programming of hotkeys. I manually programmed each hotkey to a respective key on the keyboard and then took pieces of coloured tape and labelled the keys with the station names. In the final stage, it allowed participants to press any key they desired and immerse themselves in the audio of the station.

Additionally, during the collection process, I wanted to have some sort of visual component to showcase alongside. Initially, I wanted to have projections pop up that correspond with the selected station but I opted for a physical piece of media instead in the form of printed selfies that I took at each station. While formatting this I also decided I wanted to take some of the notes I took at each station and write out a little segment on a card to stick alongside the photos. This turned out to be a good solution to my concern about the lack of visual stimuli, I also opted to do some feedback questions that the participants could engage with about their favourite and least favourite stations.

CREATE Showcase

I was stationed within the Lighting and Sound Lab for the full duration of the showcase which allowed me to see how participants reacted to the exhibit and encouraged further discussions about the project. [This link](#) leads to a Google Drive that contains media from the process and exhibits itself. During the exhibit I had over 50 participants come to see and engage with the project, from varying backgrounds and levels of knowledge about the TTC. I would say that overall the participants enjoyed the exhibit, I had many people spend long amounts of time

playing with various keys and asking me questions/providing their thoughts on the project.

Having the interactive elements gave it a more personalized touch too as people flooded to the keyboard and questions.

During the exhibit, I received a lot of constructive feedback also from both people in the industry and outside that I would take into consideration if this project ends up happening again or with something similar. I also received feedback from peers and strangers alike after the exhibit about how much they enjoyed it and how unique it was. I think a huge factor in the engagement was the topic itself as most Torontonians have taken the subway at least once and have their thoughts on it.

Conclusion

In conclusion, this project has been very eye (and ear) opening and has allowed me to realize my potential as a sound artist. As someone relatively new to the design world, I deal with a lot of feelings of impostor syndrome and doubts about what I can do as an artist, this is further intensified by being in a male-dominated niche within production. Taking the knowledge I gained from my various classes over the years and applying it was inspiring to see how immersed I was able to get and just how deep my passion for this project ended up being. This project has re-sparked my passion for sonic arts and helped me to further develop my own creative process. What began as a silly train project has evolved into something I am proud of, has given me a deeper emotional connection to my work as an artist, and has inspired me to keep going in this field.

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