Improving the Experience for People with Mobility Issues in Urban Open Spaces in Montréal to Increase Inclusivity

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Abstract

Improving the Experience for People with Mobility Issues in Urban Open Spaces in Montréal to Increase Inclusivity

Fateme Roozi

Urban open spaces play a pivotal role in the vitality of a city. It is imperative that these areas are designed to accommodate all members of the community. Among the groups deserving special consideration in urban planning are the elderly, individuals in wheelchairs, and parents with strollers, as they often encounter challenges related to mobility that hinder their access to public spaces.

This study endeavors to enhance the urban experience for individuals with mobility issues in Montreal's open spaces, thereby fostering greater inclusivity. The research aims to pinpoint areas of concern and overlooked aspects within these spaces, with the overarching objective of enhancing comfort and accessibility for individuals with diverse needs.

Through the development of prototypes and informative diagrams, this research seeks to illustrate practical solutions for mitigating barriers encountered by our target demographic in real-world scenarios. By observing public behavior in Montreal's urban spaces, we aim to provide actionable insights for urban designers, architects, and policymakers.

Ultimately, this research is poised to make significant contributions to the creation of more inclusive and accessible public spaces, catering to the needs of an aging population and promoting the well-being of all citizens.

Keywords: Mobility, Inclusivity, Accessibility, Urban spaces, Stairs, Navigation, Montreal, Aging

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Chapter 1: Introduction

Introduction

Among the primary focus groups in this project, elderly individuals stand out as particularly important. As the world's population continues to age, it is becoming increasingly important to consider the needs and experiences of elderly individuals in urban spaces. It should be noted that people over 65 years old might be considered elderly and one of the most pressing concerns for many elderly individuals is limited mobility (Sonmez Turel et al., 2007). According to Statistics Canada, about 20% of Canadian adults live with a disability, facing challenges such as limited accessibility in their daily lives (Hansen, 1985). In the near future, based on Rick Hansen's data, this number is expected to increase. Disability can arise from natural aging or accidents, and it's important to remind ourselves that we all may face a disability or have to use a wheelchair at some point in our lives. Therefore, it's crucial to ensure our communities are accessible to all, enabling everyone to participate fully in society (Hansen, 1985). One of the important places that can easily affect people's activities is urban spaces (Shan et al., 2018). And the quality of this designed environment can influence people's living experience and their quality of life (Wang et al., 2022). One of these built environments is public spaces in cities that have recently attracted the attention of designers and researchers. Public spaces can be used for individual or group activities. As Jan Gehl discovered about cities that are much like books that have grammar such as streets, footpaths, squares, and parks, and they all share some common features, such as walkways, and benches that can provide the framework that allows cities to thrive and function effectively (Gehl, 2010). Additionally, public spaces usually have physical and virtual elements like paving or lawns as well as vegetation that can facilitate various activities. The key characteristic of public spaces in this research is that they are generally open and accessible to everyone (Carr et al., 1992). But the conventional role of urban spaces as a place for social interaction and community gatherings has been diminished, endangered, or eliminated (Gehl, 2010) and people with mobility issues are highly likely to have difficulties accessing public spaces and facilities, participating in community life, and carrying out daily activities (Altuğ Turan & Malkoç True, 2022). In order to count and consider them in designs, and create vibrant, walkable, and accessible communities for all, it is important to address the mobility condition of elderly individuals in urban open spaces design.

Designed environments in urban spaces can influence physical and mental situations in people with various conditions (Rad & Ngah, 2013). If elderlies and other people with mobility issues find themselves excluded physically from places they live and contribute, it is a problem that should be considered in many disciplines. In the architectural field, one of the problems that has attracted a lot of attention regarding design for everyone in urban open spaces is the problem of mobility. Many urban open elements in cities are designed for people with no serious physical conditions as we can see in our daily interaction with city spaces (Grotz & Fo, 2015).

In this project, we will explore problematic areas and blind spots present in urban open spaces. We will define various dimensions of these spaces for elderly individuals with mobility issues and discuss diverse strategies. By proposing applications and guidelines for designers, we aim to enhance the quality of their outdoor experiences, making them feel more comfortable and easily accessible.

To achieve this, we have divided our thesis into three main sections. The first section will provide the background and context of urban open spaces, including a brief history of works related to this topic and an overview of how cities should be fair and usable in terms of their public spaces. I will conduct a comprehensive literature review on the subject and frame our research questions accordingly. In the following section, I will outline our proposed methodology for the research which will be divided into different actions and parts. The third section will define the results and the outcome would be the suggestions for operating a system that can facilitate the experience in urban areas for those facing mobility limitations.

Need for Study

"There are always more customers on the ground floor of department stores than on other floors." Jan Gehl, life between buildings, 2011

My mother has had arthritis for many years and we have to deal with her limitation in mobility. Arthritis is a more prevalent condition than many realize, impacting millions of individuals

worldwide. In the United States alone, approximately one out of every five adults has received a diagnosis of arthritis from a medical professional. This condition often results in significant joint pain, which can restrict individuals from engaging in their usual daily activities. (Elizabeth A. Fallon, Michael A. Boring, Anika L. Foster, Ellen W. Stowe, Tyler D. Lites, Erica L. Odom, n.d.) She was advised to refrain from using stairs, even just one step (OrthoInfo, n.d.). Throughout the many years that I cared for her, not only was she instructed to avoid stairs, but it also caused her considerable pain to take them, whether ascending or descending. That was one of the first reasons made me to start this research project.

For the elderly, various factors such as arthritis or other conditions can weaken their bodies, rendering them unable to use the built environment effectively. As designers, it's crucial to recognize aging as a significant consideration in how our users interact with urban designs.

Figure 1.Mother of the author taking stairs (Resource: Author's photos)

In the book "Life Between Buildings," Jan Gehl highlights the significance of ground floors in attracting customers, emphasizing their accessibility advantage over other levels due to the absence or limited presence of stairs. Gehl illustrates how stairs are not typically people's preferred choice for daily activities, as demonstrated in images from his book. These visuals underscore the inherent preference for ground-level spaces, where ease of access encourages higher foot traffic and

engagement. This implies that stairs aren't just problematic for elderly individuals with mobility issues; they're also a significant concern for otherwise healthy individuals.

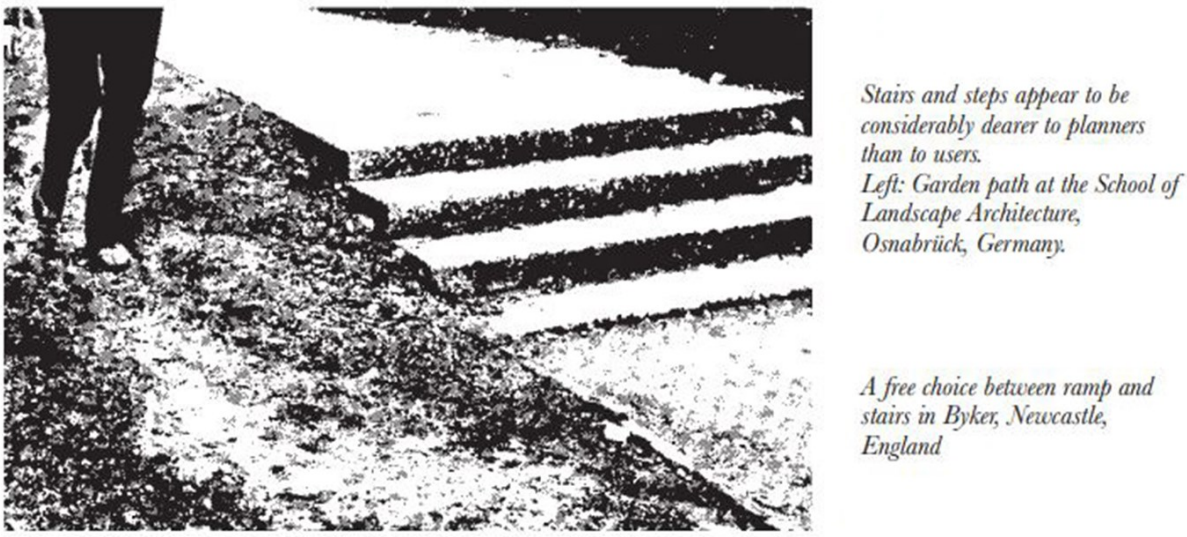

Figure 2. A free choice between ramp and stairs (Resource: Life between buildings, Jan Gehl, 2011)

The challenges faced in navigating multistory city centers and shopping malls underscore pedestrians' preference for simple horizontal movement, often opting for escalators if available. Even then, escalator use can be hard and not mostly available (Gehl, 2011).

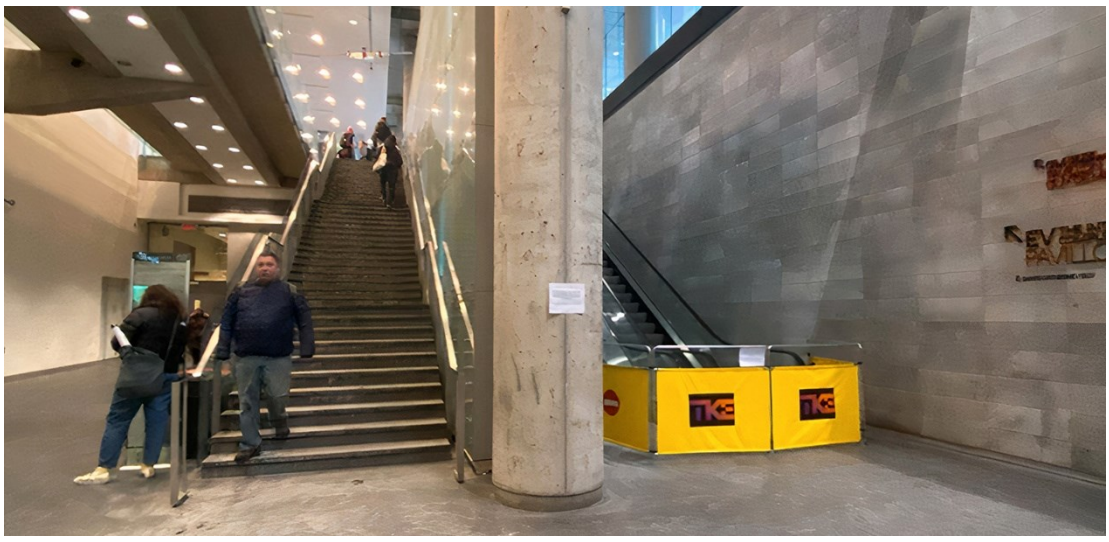

Figure 3. The escalator is out of service (Resource: Author's photos)

Sometimes, individuals may encounter mobility challenges in urban settings due to elevation changes, regardless of age. This scenario could arise for anyone, such as when shopping with a stroller or taking a baby outdoors. In such situations, you may find yourself needing to carry items or maneuver a stroller. When faced with stairs along your route, how would you navigate them?

Figure 4. Carrying a baby carriage by more than one person on stairs (Resource: Life between buildings, Jan Gehl,2011)

For all pedestrians, with different abilities and ages, differences in level of heights represent a crucial problem. All huge movements going up or down need more effort, extra muscular activity, and an interruption in the rhythm of walking (Gehl, 2011). In situations where pedestrians need to be directed up or down, flat ramps are generally preferred over stairs. Ramps also make it easier for people to navigate with baby carriages and wheelchairs. The main guideline for managing pedestrian traffic and differences in elevation is to avoid such changes whenever possible. If it's necessary to guide pedestrians up or down, ramps should be used instead of stairs (Gehl, 2011).

The project will take place in Montreal, this city is famous for its twisty outdoor staircases. Staircases in Montreal's plexes originated during the mid-19th century when British and Scottish immigrants introduced the concept of stacked residential units with separate access from the streets. As the city's population surged in the early 20th century due to European and rural

Quebecer migrants, multiplexes became popular. To comply with regulations restricting building width and requiring green outdoor spaces in front of buildings, builders placed staircases outside, maximizing interior space and saving landlords money on heating. And now there are many neighborhoods, just beyond Montreal's downtown core, such as Le Plateau, Rosemont-La Petite-Patrie, Mile End, and Villeray that have these types of buildings (*The Twisty History of Montreal's Outdoor Staircases*, 2022).

So, what is our responsibility when designing height changes in urban areas? As designers, architects, and urban planners, who is our audience when it comes to public spaces? Are ramps the best alternatives for stairs according to Gehl's explanation? How can we improve the quality of people's experiences in cities like Montreal where staircases are iconic?

Purpose

The study aims to observe elderly individuals and others with mobility challenges and understand their unique needs. I aim to effect on Improving the experience for people with mobility issues in urban open spaces in Montréal to increase inclusivity in this city as a case study.

The research seeks to inform the design and planning of urban open spaces in Montréal to ensure they are accessible, welcoming, and accommodating for all residents and visitors, regardless of mobility limitations. We aim to positively impact the daily experiences of our targeted people in cities like Montreal. To achieve this goal, our proposal entails integrating a new feature into the widely utilized application, Google Maps. This involves introducing a distinct user category: individuals facing mobility challenges.

Scope and Objective

"In situations in which pedestrian traffic must be led up or down, relatively flat ramps are generally preferred to stairs." Jan Gehl, life between buildings, 2011

In this project, we will explore problematic areas and blind spots in urban open spaces and define different dimensions and aspects of these spaces that pose challenges for people with mobility issues. We will identify various dimensions and elements of a city based on previous projects that affect people's movement. Subsequently, we will categorize significant elements into a specialized

architectural programming system, which will be analyzed through architectural lenses. Diagrams will illustrate potential solutions or mitigation strategies for these challenges. The findings of this study will serve as foundational data for the development of a technological accessory aimed at minimizing the impact of problematic spaces for individuals encountering them, thus creating a more comfortable experience in urban areas.

The main objective of my research is to be able to develop methodologies that listen to the voices and experiences of elders and other people with mobility issues.

Figure 5. The possibility of entering the building by stairs and ramp (Resource: Author's photos, 2022)

Figure 6. The close-up of the footprint on the ramp and stairs and understanding of people's preferences (Resource: Author's photos, 2022)

This example illustrated in figures 5 and 6 serves to validate and emphasize Jan Gehl's assertion at the beginning that we should closely pay attention to people's voices, regardless of whether they have mobility issues. The photos demonstrate that individuals typically prefer using ramps over stairs.

Research Questions

Urban environments often have obstacles and blind spots that can hinder the experiences of individuals, impacting their ability to fully engage in outdoor activities and navigate their surroundings with ease. Understanding the properties and characteristics of urban spaces that pose difficulties for people with mobility issues is essential for identifying solutions and enhancing accessibility. Therefore, the following questions will explore the various aspects of urban design and their impact on the experiences of elderly individuals and others with mobility issues, with a focus on promoting inclusivity and accessibility in outdoor environments.

The research aims to explore the following questions:

1. What are the properties of an urban space that we can identify as problematic for people with mobility issues?
2. What are the potential blind spots in urban open spaces that may hinder the experiences of elderly individuals and others with mobility issues in cities?
3. How can individuals with mobility challenges participate in outdoor activities and access urban spaces in a manner that aligns with their counterparts?
4. What are the roles of design elements in urban spaces that can promote the experience of the elderly and others with mobility issues in terms of accessibility?

These inquiries provide a comprehensive framework for understanding and addressing the challenges faced by diverse populations in navigating and enjoying urban environments.

Chapter 2: Literature Review

Inclusivity and Accessibility

Inclusive design is a design approach that aims to create environments that consider all people in the design process, regardless of their age, ability, or any conditions, in other words, it is designed with people (Holmes & Maeda, 2018). Some principles are proposed for inclusive design such as fair use, flexibility of use, simplicity, and intuitiveness (De Oliveira Cunha et al., 2012)(Zhang et al., 2022).

Inclusive design in city spaces refers to the approach of designing urban environments, including buildings, public spaces, and transportation systems, that are accessible and usable by people of all ages, abilities, genders, and mobility statuses. This involves considering the needs of all people, and designing spaces that are easy to navigate, and usable by all (Coleman et al., 2007).

Graham Pullin in the book “Design meets disability” critiques existing terminology and advocates for more inclusive approaches to design. He discusses the concept of designing for individuals with disabilities, highlighting various terms and their limitations in capturing the essence of this field. He wants to emphasize the complex interaction between a person's bodily impairments and the environment they live in, as recognized by the World Health Organization. The author expresses dissatisfaction with terms like "design for special needs," "assistive technology," "medical engineering," and "design for people with disabilities," pointing out their limitations or potential implications. Instead, they advocate for terms like "mainstream design," which typically caters to nondisabled individuals, and terms like "inclusive design" or "universal design," which aim to make mainstream design accessible to everyone, regardless of disabilities (Graham Pullin, 2009).

Aging and People with Mobility Problems

The book, inclusive design by Coleman talks about how attitudes towards age and disability are changing. Instead of seeing them as separate from society, people now recognize that everyone will experience them at some point in their lives. Both disabled and older people want to be independent and active participants in society. People now realize that disability isn't just about a

person's abilities; it's also about how things are made and how they're used. By designing things with everyone in mind, we can make sure everyone is included and able to participate (Clarkson, 1994).

Aging is a process that we all go through and as we get older, we will go through all the barriers that come with it. As people age, they might feel left out of society because many spaces aren't designed with their needs in mind. They can't use these places as easily as someone who doesn't have limitations, which makes them feel excluded and undervalued. Health issues increase with age, with arthritis being one of the most prevalent. Arthritis leads to joint swelling, pain, and limited movement, particularly affecting arm and hand strength and dexterity (Clarkson, 1994).

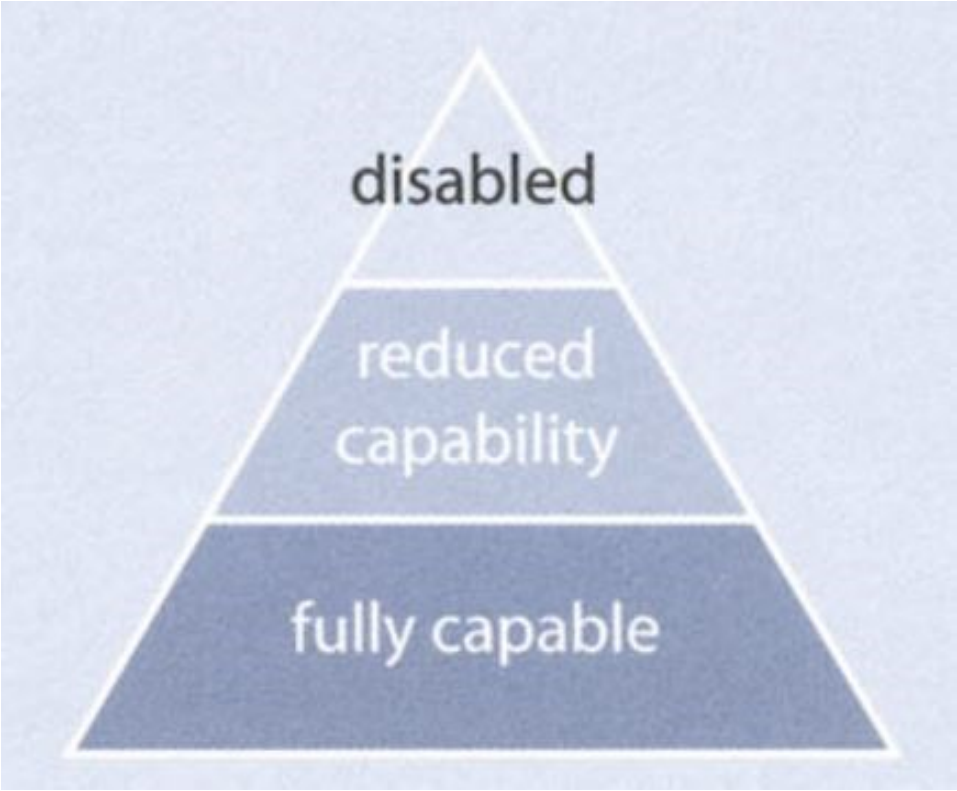

Figure 7. The pyramid of needs: Maria Benkzton and Sven Erich Juhlins, Ergonomi Design Gruppen, Sweden. (Resource: Clarkson, 1994)

As mentioned in the previous chapter, aging and the barriers that come with it, such as arthritis, can restrict individuals from engaging in their usual daily activities. (Elizabeth A. Fallon, Michael

A. Boring, Anika L. Foster,Ellen W. Stowe, Tyler D. Lites, Erica L. Odom, n.d.) and it is advised to refrain from using stairs, even just one step (OrthoInfo, n.d.). The pyramid of needs framework in Figure 7 emphasizes the spectrum of user capabilities—from fully capable individuals to those with reduced capacity and disabilities—underscoring the importance of designing products and environments that are accessible and enjoyable for all, regardless of age or physical ability.

"And for many groups in society stairs are a direct barrier." Jan Gehl, Cities for people, 2011

Finding staircases difficult to use is not just for elderly individuals with mobility issues but also most people. Stairs and steps require extra effort and can deter people from using them, especially in multistory buildings. Staircases often see less usage compared to ground floors, indicating their physical and psychological obstacles. Strategies such as angling staircases to create shorter segments and incorporating visual interest aim to encourage their use. However, ramps and elevators are preferred options, particularly for those with mobility limitations (Gehl, 2010).

Figure 8. Stairs as a physical and psychological barrier. (Resource: Cities for People, Jan Gehl, 2011)

When pedestrians have the option to choose between ramps and stairs, they tend to prefer ramps. Ramps allow for a more consistent walking rhythm and accommodate children, individuals with

disabilities, and rolling pedestrian traffic without interruptions. While ramps may not always have the same character as stairs, they are generally favored due to their practicality and accessibility (Gehl, 2010).

Figure 9. If we have a choice between a ramp and stairs, we almost always choose the ramp. Marathon preparation in Venice means ramps instead of stairs. (Resource: Cities for People, Jan Gehl, 2011)

Figure 10. Shoppers have a choice of ramps, stairs, and escalators at this shopping center in Beijing, China. (Resource: Cities for People, Jan Gehl, 2011)

Outdoor Activities

Based on Jan Gehl's categorization of activities in public spaces, places should be a context for different types of activities and it is important because some activities are necessary, and the great majority of those are related to walking. Because they are influenced by physical framework.

It is important to know how the quality of outdoor spaces affects human activities. When outdoor areas are not well-maintained or are of poor quality, people tend to only engage in necessary activities and quickly move on. However, when the outdoor areas are of high quality, not only do necessary activities take place, but people also tend to engage in more optional activities as the pleasant environment encourages them to relax, socialize, and enjoy their time (Gehl, 2011). The urban built environment, particularly the pedestrian infrastructure we design, often fails to adequately address the needs of elderly and disabled individuals (Hanson, 2004).

So, as a designer, we should know who else might have a problem with staircases when it comes to accessibility in urban open spaces and what properties should a place have to be inclusive for all people with different ages and abilities.

Montreal

"Outside staircases everywhere. Winding ones, wooden ones, rusty and risky ones." Mordechai Richler, from "The Apprenticeship of Duddy Kravitz" (1959)

Montreal is the second most populous city in Canada, the tenth most populous city in North America, and the most populous city in the province of Quebec (Wikipedia, n.d.-a). Among Montreal's numerous features, few are as unique or as memorable as its famous (or infamous) outdoor staircases. We can find these striking staircases scattered throughout Montreal, including in the neighborhoods of Le Plateau, Mile End, St. Henri, Rosemont, Hochelaga, Griffintown, and many more. (LRDG Campus, 2021).

Montreal's outdoor staircases are both captivating and challenging. Each staircase is distinct and tourists often admire these architectural icons, while locals may find them hard because they had to carry up groceries one too many times during the winter (LRDG Campus, 2021).

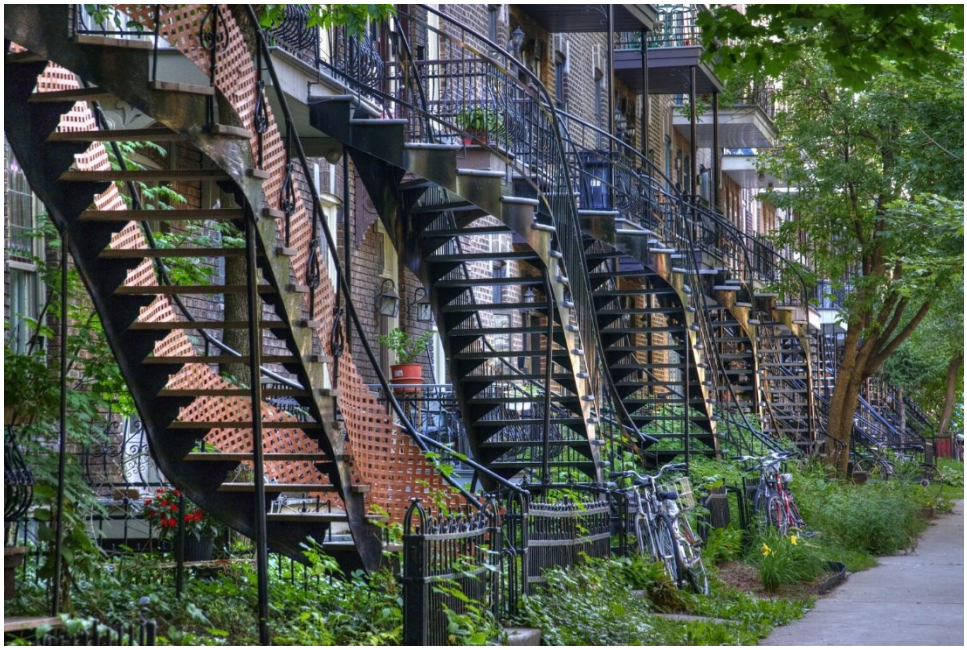

Figure 11. Iconic staircases in Montreal (Resource: LRDG Campus webpage, 2021)

These staircases were built because as the city's population rapidly increased during the late 19th and early 20th centuries, there was a pressing need for housing. Additionally, outdoor staircases saved landlords on heating costs and provided a safer escape route in case of fire. Thus, the outdoor staircases in Montreal emerged as a pragmatic solution to urban expansion and architectural constraints, reflecting the city's unique blend of necessity and innovation(Treehugger, 2018). Considering that outdoor staircases are not only found in houses but also in various urban locations such as most Metro stations, it's crucial to acknowledge that stairs remain problematic and non-inclusive elements of design, particularly for individuals with mobility issues. And as a designer, we should think about other alternatives that are possible for height changes.

In a city like Montreal, in the public areas, while it's feasible to follow Jan Gehl's suggestion and incorporate ramps instead of stairs, replacing the vast number of existing staircases entirely is not realistic. Therefore, the focus should be on how to enhance people's experiences in urban areas through feasible interventions.

Donna P. Duerk's Programming System

Donna P. Duerk is recognized for her significant contributions to the field of design, particularly in the realm of programming and problem-solving within the design process. Her approach emphasizes the importance of identifying needs and bridging the gap between existing conditions and desired outcomes. "Architectural programming" is a process of gathering and managing information that is provided to the designer, who then uses that information to make the most appropriate decisions regarding design.

Key features of Duerk's programming system include:

- Problem Definition: Programming serves as the initial phase of the design process, focusing on defining problems and planning solutions comprehensively.
- Solution Articulation: This entails describing the ideal solution through words and diagrams, aligning with mission statements, goals, performance requirements, and concepts.

- Prioritization and Trade-offs: Goals are broken down into manageable units of analysis, enabling effective navigation of conflicts and prioritization of design elements.
- Integration of Analysis, Synthesis, and Evaluation: Throughout the programming process, these elements are integral, ensuring a comprehensive understanding and approach to problem-solving.
- Role in Design Process: Programming plays a significant role in feasibility studies, needs assessments, master planning, and building prototype designs, serving as a preliminary design service.

I will use Duerk's system for this design research for comprehensive problem-solving, which means it offers a structured approach to identifying and addressing design problems comprehensively which is a guideline for designers and architects when they want to design a walkable public space. Moreover, effective communication by using words and diagrams, facilitates clear communication of design solutions and priorities. Also, conflict resolution by breaking down goals and facilitating trade-offs, enables designers like me to navigate conflicts effectively and make informed decisions.

Conclusion

In this chapter, we delved into the interconnected themes of inclusivity, accessibility, aging, and urban design, exploring the multifaceted challenges and opportunities they present for creating inclusive urban spaces. By examining the principles of inclusive design and the evolving discourse surrounding disability, age, and mobility, we gained insights into the importance of considering diverse needs and perspectives in the design process.

From the critique of existing terminology by Graham Pullin to the recognition of aging as a universal experience by Coleman, we witnessed a paradigm shift towards more inclusive and holistic approaches to design. Through the lens of Jan Gehl's observations on urban spaces and human activities, we understood the profound impact of the built environment on people's behaviors and experiences.

The case of Montreal's iconic outdoor staircases served as a poignant example of the intersection between historical context, architectural innovation, and contemporary accessibility concerns. While these staircases reflect the city's rich heritage, they also highlight the pressing need for design interventions that accommodate diverse abilities and promote inclusivity in public places.

Drawing on Donna P. Duerk's programming system, we identified a framework for comprehensive problem-solving and effective design decision-making. By prioritizing problem definition, solution articulation, and integration of analysis, synthesis, and evaluation, Duerk's approach offers a roadmap for navigating the complex challenges of urban design in a systematic and inclusive manner.

The subsequent chapters will primarily focus on the methodology, which predominantly involves observational studies conducted at different sites. The results obtained from these observations will be structured and analyzed using Donna Duerk's programming system to present a comprehensive outcome that aligns with the principles of inclusive design and addresses the challenges identified in this literature review.

Chapter 3: Methodology

Introduction

The methodology chapter of this research serves as a crucial component in understanding the approach undertaken to investigate the research questions and achieve the objectives of this study. In this chapter, the chosen research design, data collection methods, sampling techniques, and data analysis procedures will be elucidated in detail. Additionally, the rationale behind the selection of each methodological component will be expounded upon, elucidating the alignment between the research objectives and the chosen methodologies.

The methodology will employ a structured approach to comprehensively address the barriers encountered by individuals with mobility difficulties in urban open spaces. This will involve:

- Observation at four distinct sites across Montreal: Namur metro station, the landscape surrounding the Olympic stadium, a building in Old Port, and the 'Ring' landscape.
- Utilizing a combination of tracking, counting, mapping, photography, and video recording to capture the intricate nuances of human behavior, spatial dynamics, and accessibility barriers present at each site.
- Employing self-ethnography to deepen understanding and empathy towards individuals with mobility limitations, fostering a more nuanced perspective on their experiences.

Observing the challenges faced by elderly individuals with mobility difficulties is one way of gathering information about their experiences in outdoor spaces such as parks. And basically, everything in this project was formed from observing my mother's behavior in the problems she faced in the city. My mother had knee arthritis for more than 12 years and I struggled with her problems and lived with them. I realized many challenges my mother was dealing with in public spaces. My experience with her was more than observational.

Moreover, more case studies needed to be observed. For this point, some problematic places had been selected to follow people’s behavior in the context of urban open spaces. Based on some small projects of observing around Montreal and asking professors and other citizens here about vertical movement in public spaces that they know is designed problematic, we came up with some

locations. These places should have some properties to be considered good examples for observation for the project. Some of these properties are written below.

- More visitors and users, means these places should be important places that attract a more diverse group of people (elderly, disabled, etc.)

- Multifunctional buildings around the site, having this option helps the project to have people at different times of the day

Residing in Montreal provides convenient access to various locations and resources, facilitating the identification of less inclusive spaces within the city for observation. This city like other cities has many blind spots and problematic locations for mobility issues (Grotz & Fo, 2015).

	LOCATION	ESTABLISH YEAR
1	Olympic Stadium Landscape	1976
2	Namur Metro Station	1984
3	Old Port Montreal	2021

Table 1. Important locations in Montreal as alternatives for doing the observations

The First Alternative, the Namur Metro Station

Namur station is a Montreal Metro station in the borough of Côte-des-Neiges–Notre-Dame-de-Grâce in Montreal, Quebec, Canada(Wikipedia, n.d.-b). This station is one of the most crowded stations of this city because of its important location and accessibility to vital places.

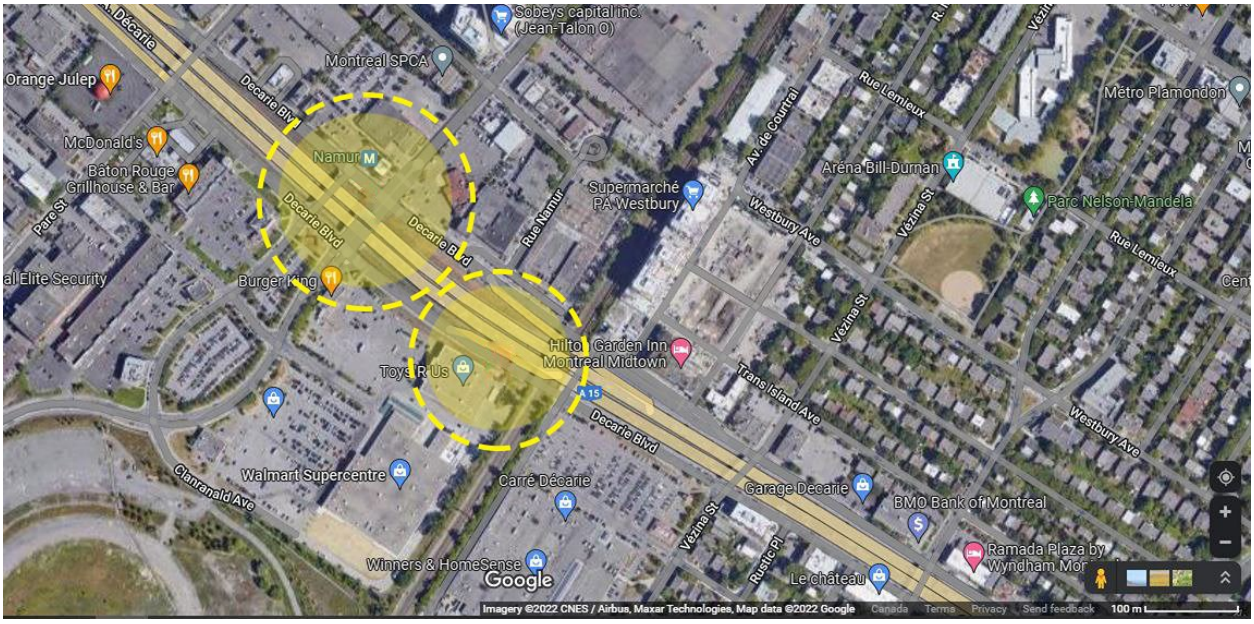

Figure 12. Namur metro station. (Resource GoogleMaps.com, 2024)

The Namur station is a side platform station with an entrance at the north end. It was planned in such a way as to allow an additional entrance to be built on the other side of the Décarie Autoroute, but this has not yet happened(Wikipedia, n.d.-b). The most important buildings are located on the east side of the highway. And because of the long-distance ways between places in this area, this alternative was not walkable enough. it is important to know that a well-functioning pedestrian system is to have the shortest distance(Gehl, 2010). Furthermore, the lengthy pathways in this area are empty of attention to detail and human perspective. As depicted in the left side of Figure 12, the wall beneath the bridge, through which pedestrians must pass, lacks any design elements and fails to attract pedestrians. This highlights how pedestrians are neglected in this urban area.

Figure 13. Namur metro station situation and distances. (Resource: Google Earth.com)

The Second Alternative, the Olympic Stadium Landscape

An international symbol of Montréal, the Olympic Stadium — and its Tower, the world's tallest inclined tower — was designed by French architect, Roger Taillibert, and built in the 1970s as the main venue for the 1976 Summer Olympics (Montréal, n.d.). The stadium currently serves as a multipurpose facility for special events, including concerts and trade shows (Montréal, n.d.). Despite these places were designed many years ago, this place remains a popular choice for events within the city. However, a pertinent question arises: does this location serve the needs of all individuals? Are those with mobility issues able to easily participate in the events hosted here?

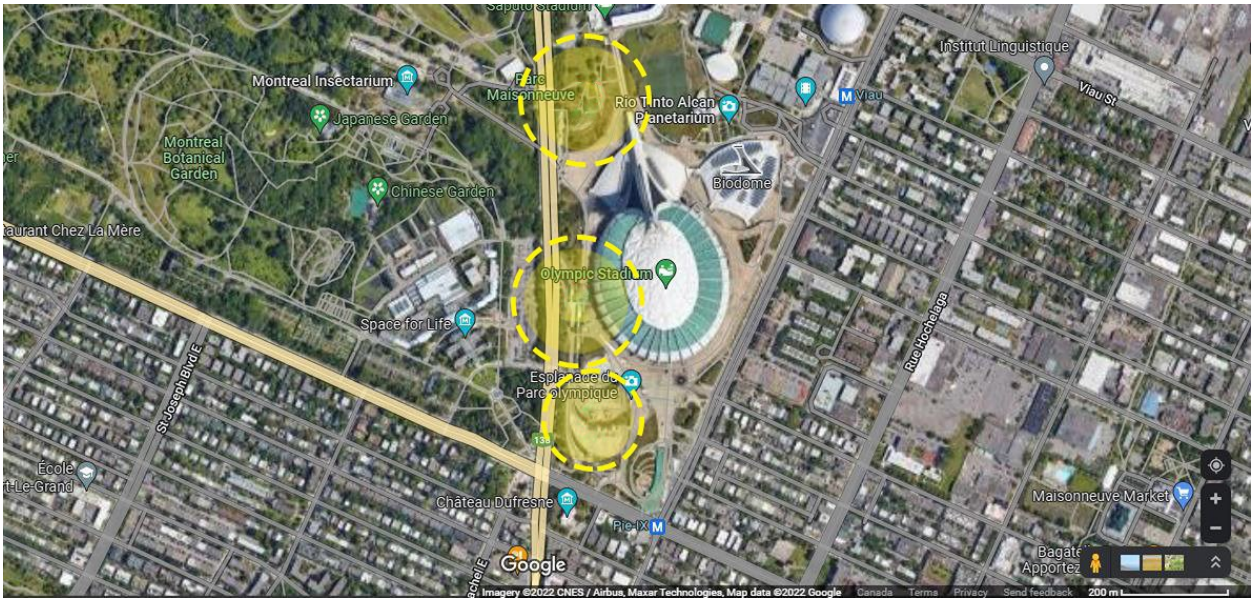

Figure 14. Olympic Stadium Landscape and Sherbrook St. (Resource: Google Maps)

To address these questions, it's crucial to assess the layout of the site. There's a considerable height contrast between Sherbrooke Street and the landscape of the Olympic Park. Moreover, considering the historical context from over 40 years ago, inclusivity and comprehensive design considerations for diverse populations weren't as prevalent and there was a limited emphasis on inclusivity. Consequently, the solution to mitigate the height differential between the street and the park's landscape primarily involved the use of stairs. Having stair access at all entrances inadvertently poses challenges for individuals with mobility limitations. And the challenge is that there are no or fewer available options for those people to enter the park.

Figure 15. Some of the staircases from Sherbrooke St (Resource: Author's photos, 2022)

Another reason that this place was problematic for those who walked, was that the materials were the same from the top view. The necessity of nosing edges was clear. Because the main purpose of stair nosing is to increase the safety of your stairs (Archea et al., 1979).

Figure 16. One material for the staircase in the site entrance (Resource: Google Maps, 2024)

The Third Alternative, a Newly Built Site in Old Port Montreal

The third option involves observing a location situated in Old Port Montreal. This building serves the city and is open to the public. It features exhibition spaces and a rooftop area, offering stunning views of the Saint Lawrence River and other spectacular scenery nearby such as Habitat 67.

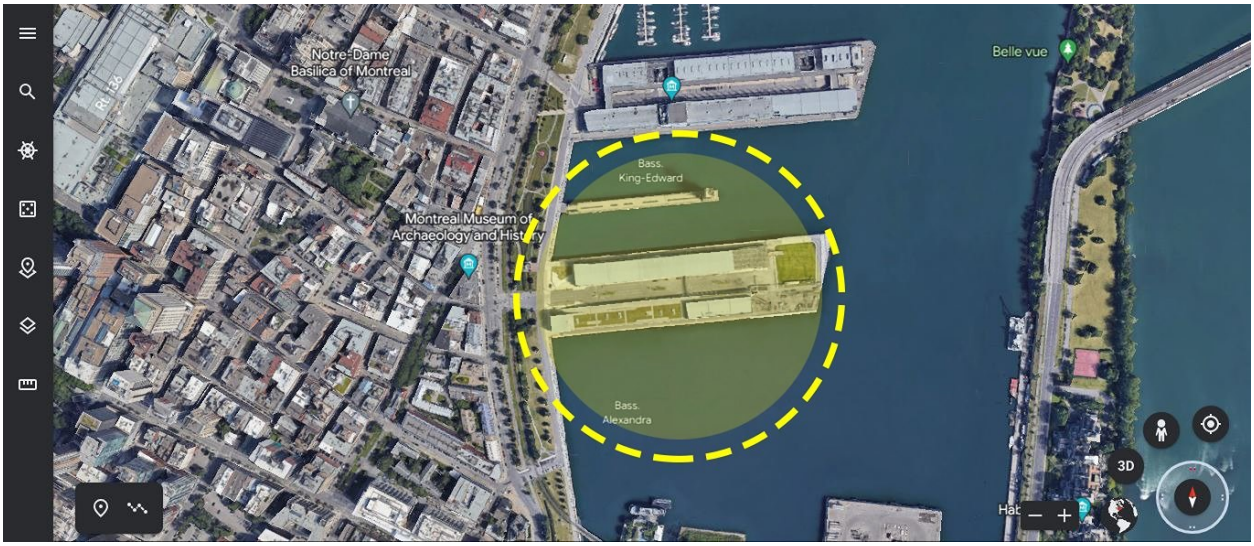

Figure 17. Port of Montreal Tower (Resource: Google Earth, 2024)

In this newly built building, there are stairs leading up to the rooftop for those who want to enjoy the view, and stairs leading down to the picturesque landscape alongside the Saint Lawrence River.

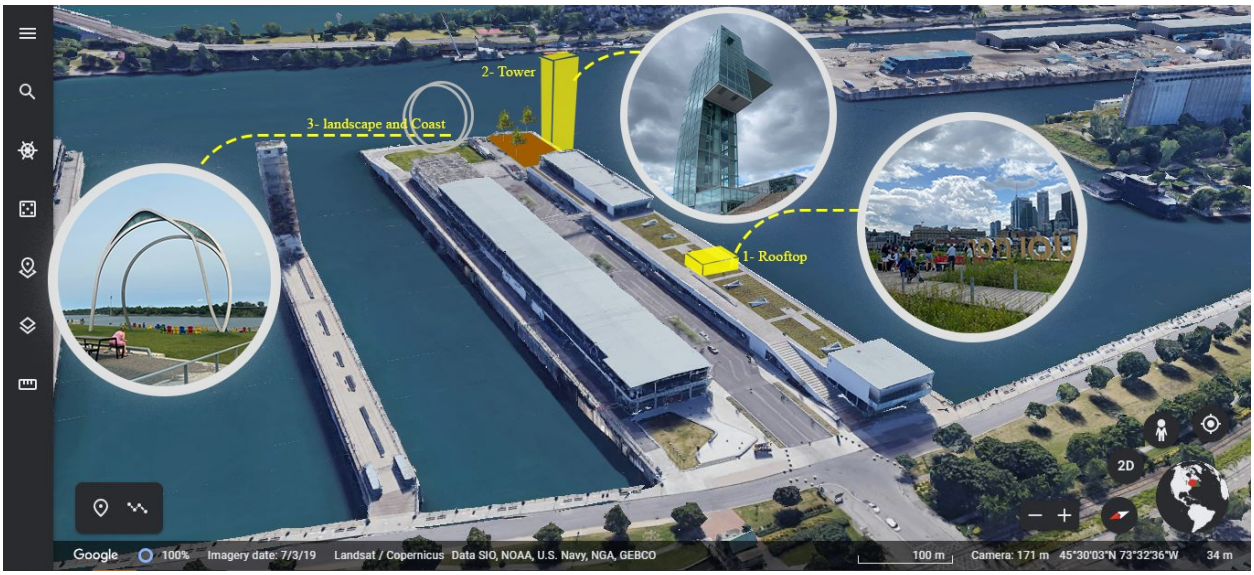

Figure 18. Different places in Old Port Montreal (Resource: Google Earth, 2024)

Tracking, Mapping, Photography, and Video Recording

People's movement, place's accessibility, usability, and challenges for walkability should be considered. In general, it is really important to observe and perceive people's behaviors in confronting the obstacles in urban areas (Gehl & Svarre, 2013). Based on the ways that are suggested in the book How to Study Public Life by Jan Gehl and Birgitte Svarre we have some methods to do the observation more properly.

The first method is counting. Counting is a commonly utilized method in public life studies. Essentially, it enables the quantification of various aspects, facilitating comparisons before and after events, between different regions, or across different periods(Gehl & Svarre, 2013).

The second method is mapping. In public life studies, various elements such as activities, people, and locations for walking can be represented on a map by using symbols to denote their quantity. This behavioral mapping, allows us to visually depict the distribution and characteristics of activities and challenges within a given area(Gehl & Svarre, 2013).

Another method in my observation is, tracking or this is also called shadowing. To observe people's movements across an area or for a longer time, we discreetly follow people without their knowing it (Gehl & Svarre, 2013).

The last method that I used in this observation was photography and filming. Photography plays a vital role in public life studies, capturing moments where people behave in a designed environment and study area(Gehl & Svarre, 2013). Whenever I encountered individuals struggling with the designed elements in the city, I instinctively began video recording to capture their experiences and observe how they navigated through the obstacles. Tracking their movements allowed me to understand not only how they approached specific challenges but also how they interacted with other barriers within the environment. These recordings, supplemented by photographs that do not reveal faces or identifiable features, taken during my observations, provided valuable insights into the real-world experiences of individuals with mobility issues in urban settings.

These methods help extract information related to people's experiences and their difficulties in open spaces, recording how they behave in outdoor environments. It should be done at different times during the day, on different days of the week such as weekends to be more diverse in data. However, this method has its limitations and should be combined with other forms of information collection, such as literature review, to provide a more comprehensive understanding of the issues faced by the elderly in these public spaces (Müller, 2021).

Observation has to feed different aspects of the project.

- To define and discover targeted people, and who face greater difficulties.
- To discover how they adapt or refuse to use the entire system.
- To simulate their situations and limitations to help others understand the challenges faced by people with mobility issues.

Observation Part 1

"... Please look closely at real cities. While you are looking, you might as well also listen, linger, and think about what you see" Jane Jacobs, The Death and Life of Great American Cities, 1961

Among the three options considered for observation, besides factors such as visitor traffic, pedestrian activity, and the presence of multipurpose buildings in the vicinity, we deemed the construction date to be significant. This factor, along with others, provided a good reason for

conducting research at a specific location. Hence, we chose to observe a newly constructed building in Old Port Montreal. This decision was influenced by the timing of its completion, as it is a new structure not yet featured on platforms like Google Maps or Google Earth, while Inclusive design and universal design- creating environments that are accessible, accommodating, and welcoming to individuals with varying levels of mobility and physical capabilities- have been integrated into the fields of design, urban planning, and architecture for many years.

Therefore, this project was particularly disappointing because the designer neglected a crucial aspect of design: inclusive design.

The building itself consists of various sections and levels: the entrance features both a ramp and six stairs leading to the building entrance level and also stairs to the rooftop.

Figure 19. Two possibilities and options for going up to the next level in this building (Resource: Author's photos, 2024)

Figure 20. Two options for going up by stairs or elevator (Resource: Author's photos, 2024)

Once on the rooftop, you can savor the expansive view ahead. If you choose to descend, there's a path to obtain tickets for the tower, where you can observe the entire Old Port area. Alternatively, you can remain on the coast and appreciate the scenic vista of the Saint Lawrence River.

One of the famous example of a public rooftop space is the High Line in New York City. While not on a one-story building, it is an elevated park built on a former railroad track. This is one of the most comparable examples to the site we are about to observe.

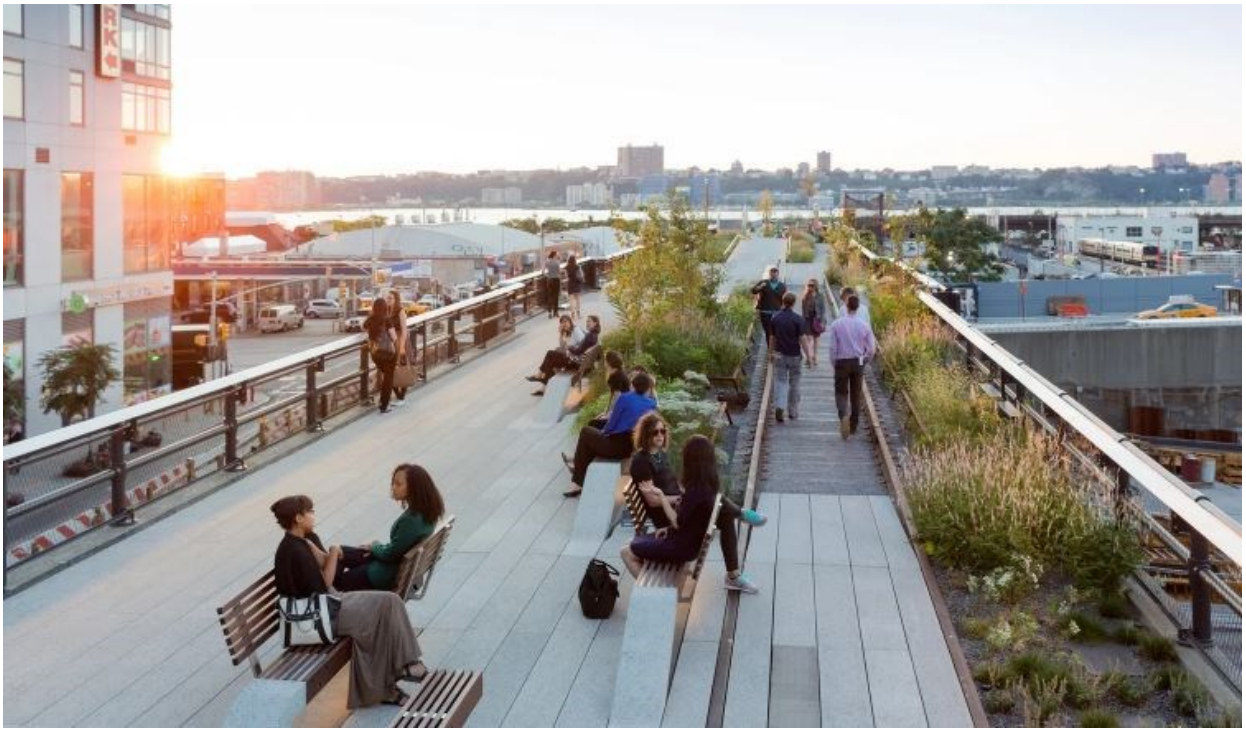

Figure 21. The High Line in New York, an accessible rooftop (Resource: https://www.thehighline.org/visit/)

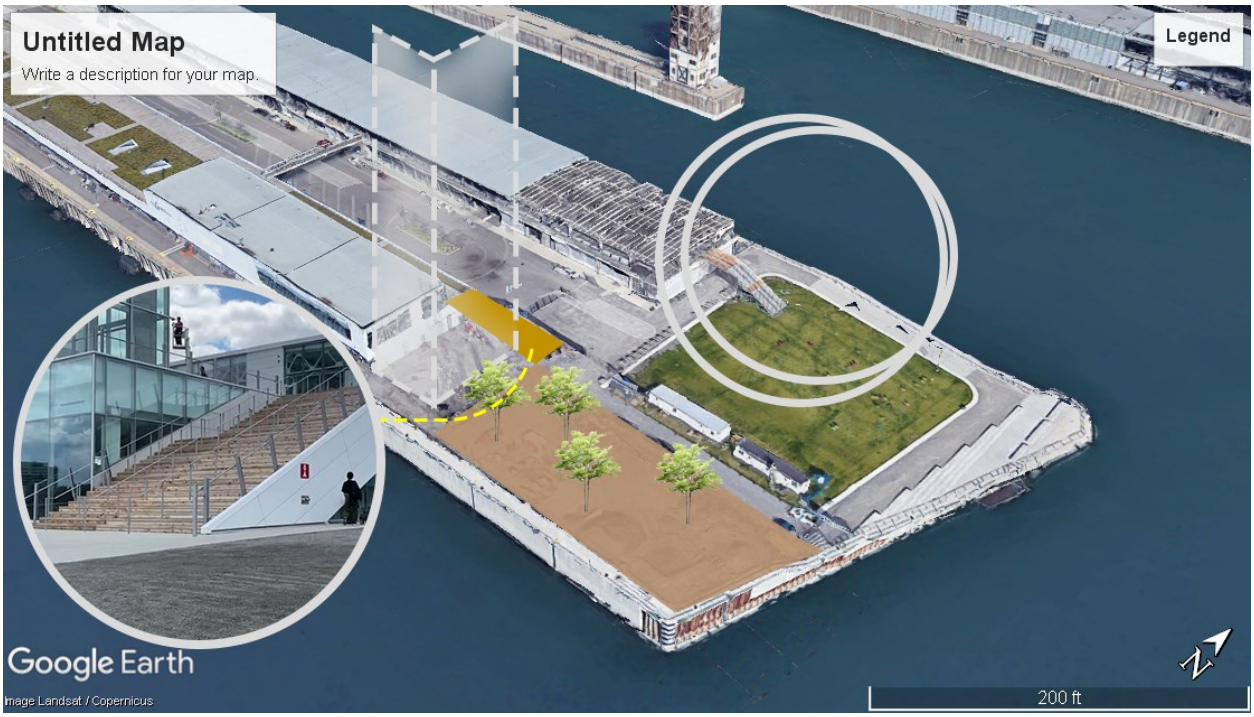

Figure 22. Where staircase is located on the back side of the selected site (Resource: Author's photos, 2024)

Once the observation started, on July 17th it depicted that not only elderlies have problems with both staircases on both sides of the site, but also many other visitors cannot adapt themselves and use them.

Figure 23. The back side of the selected site and its view (Resource: Author's photos, 2024)

As previously mentioned, this location has both indoor spaces, such as exhibition areas, and outdoor spaces, including rooftop areas and the scenic coastal landscape. We made an effort to schedule our observations during suitable weather conditions to attract a wider and more diverse range of visitors. As a result, approximately 98% of our visitors tend to use outdoor places. Furthermore, this contributed to the fact that people tend to avoid entering the building, except when they specifically decide to visit the tower. By refraining from entering the building, many of our visitors missed the opportunity to discover that there was an elevator inside, as there were no signs indicating its presence.

Consequently, individuals, including those with mobility limitations, attempted to go up the stairs at the entrance, pushing themselves to reach the enjoyable rooftop area even if it proved challenging or painful.

The first observation prompted us to categorize individuals facing challenges in navigating the stairs and the entire site. This table aims to identify the targeted demographic, including the elderly and wheelchair users, whom we identified as our primary focus for this project.

For each of them, some documents can clarify and prove the existence of problems. Here are pictures according to the table

	TARGET GROUP WITH ACCESS PROBLEM	PERCENTAGE
1	Elderly individuals	10
2	Parents with baby carriages or strollers	35
3	Wheelchair users and individuals with disabilities	05
4	People carrying items such as carry-ons or strollers	05
5	Cyclists or individuals with wheeled objects	35
6	Overweight individuals	10

Table 2. Targeted individuals extracted from the initial observation

Figure 24. An elderly individual, leaning on her cane for support, slowly ascended the stairs at the entrance (Resource: Author's photos, 2024)

Figure 25. Parents with their babies and baby carriages (Resource: Author's photos, 2024)

Figure 26. The only elderly individual in a wheelchair who chose to take the second set of stairs due to assistance from children helping her descend (Resource: Author's photos, 2024)

Figure 27. Carry-on luggage (Resource: Author's photos, 2024)

Figure 28. Two cyclists lifted their bicycles and ascended the stairs to reach the top (Resource: Author's photos, 2024)

The Conclusion of the First Observation

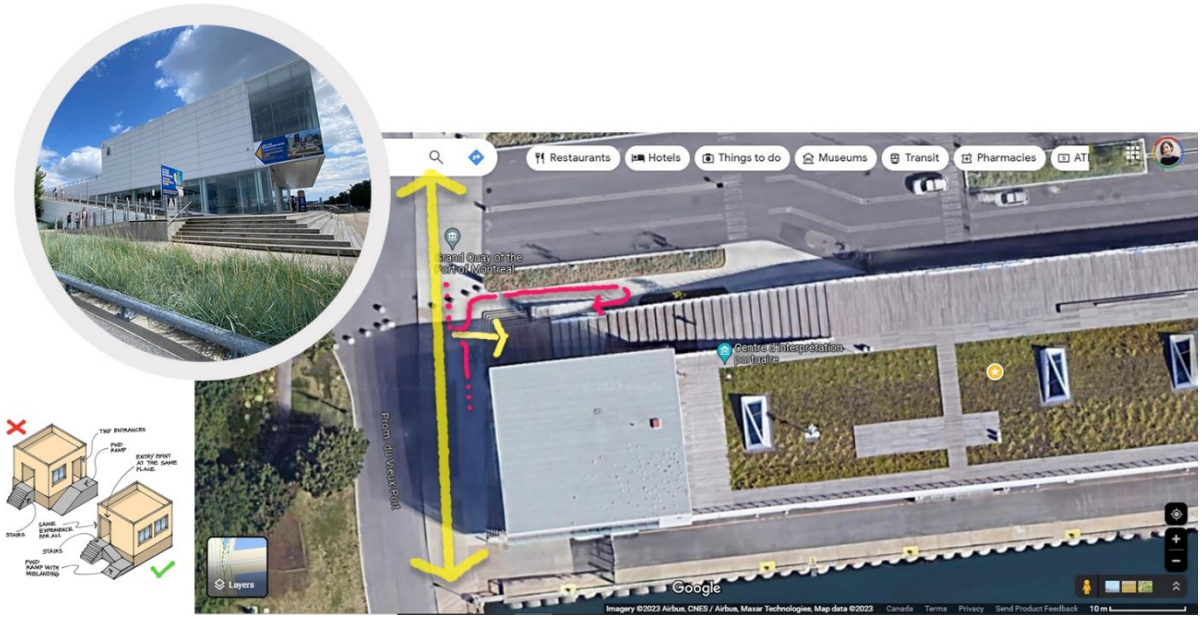

Figure 29. Putting people with mobility issues as second users (Resource: Author's photos)

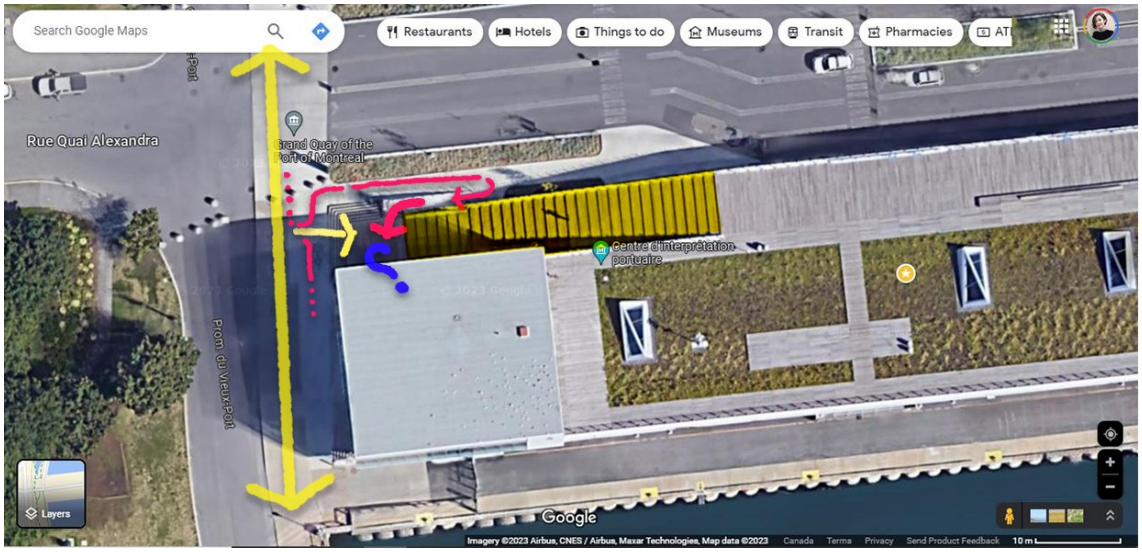

Figure 30. Lack of ramp and signage on the entrance (Resource: Author's photos)

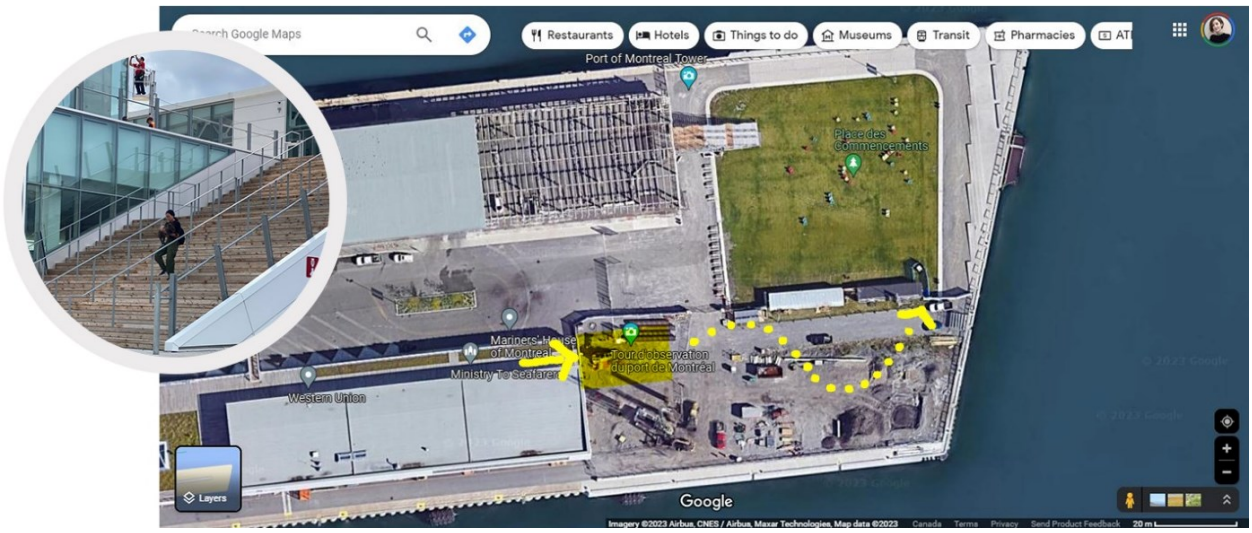

Figure 31. Lack of ramp and having only one option which is stairs for all people as the only access point for going down (Resource: Author's photos)

Observation Part 2

After the first observation, it became clear that providing an alternative to stairs is crucial, particularly for individuals encountering mobility challenges. That is why a relevant suggestion for enhancing the old port landscape is the installation of ramps or elevators on both sides. Ramps are favored universally, catering to individuals with varying mobility conditions (Gehl, 2010). Moreover, the lack of signage compounded the issue, making it challenging for those with mobility impairments to navigate the path. Consequently, several solutions were proposed to address this predicament, including diagrams illustrating additional alternatives in figure 32. When considering the optimal solution between ramps and stairs, it becomes essential to assess the ideal combination thereof.

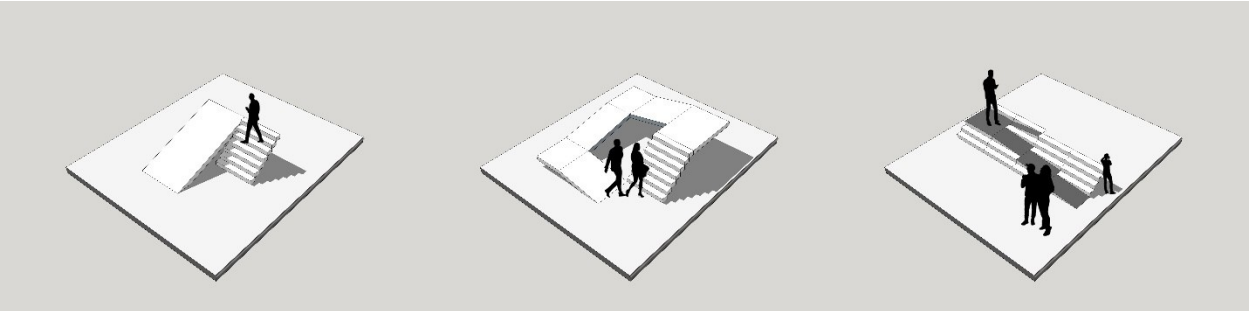

Figure 32. Different alternatives for ramps and stairs (Resource: Author's diagram, 2024)

As depicted in Figure 32, the alternative on the right stands out as particularly design-oriented, exciting, and artistic in terms of addressing the issue identified during the initial observation.

A good example of an architect successfully integrating both stairs and ramps is found in Montreal, at the location where the massive Ring hangs in Place Ville Marie. Here, to address the height changes between Cathcart Street and Rene-Levesque Blvd. W, a combination of ramps and stairs such as the design depicted in Figure 33 was chosen for construction.

The Ring, an art installation designed by the internationally renowned Quebec creator Claude Cormier and his landscape architecture and urban design firm CCxA, serves as a powerful symbol of unity and cultural vibrancy in downtown Montreal. The objective of the project is to highlight the dynamism of the city center (PVM, 2023).

Figure 33. Site of the Ring in Montreal (Lam, 2022)

This reason persuaded us to visit the site and ensure that this combination could serve all individuals, embodying an inclusive design. So, we started the second phase of our observation at this location, employing the same methodology as the initial phase: tracking, counting, mapping,

and photography. This approach allowed us to observe and document people's behaviors effectively.

The first outcome worth mentioning is that the focus group during the initial observation aligns with the individuals observed here at the Ring. The majority of them encounter no issues navigating upwards due to the presence of the ramp. Below are some photographs of the focus group.

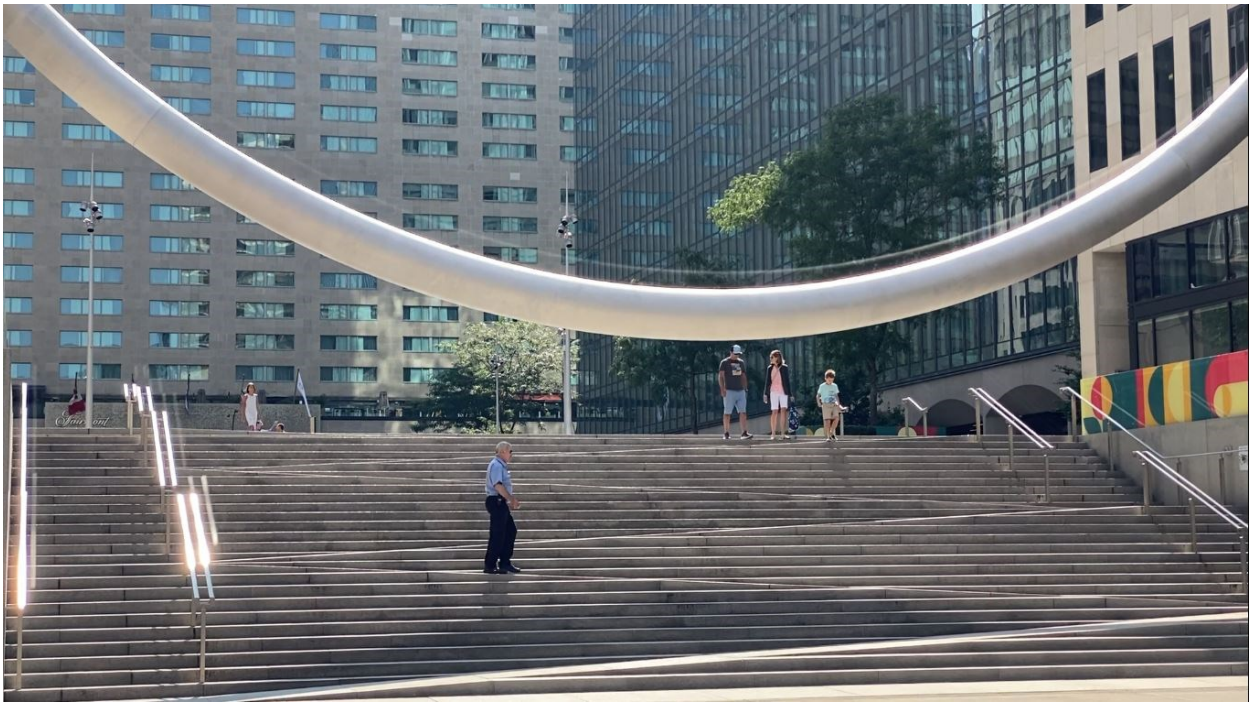

Figure 34. An elderly individual using the ramp to go down (Resource: Author's photos, 2024)

Figure 35. Parent and baby carriages (Resource: Author's photos, 2024)

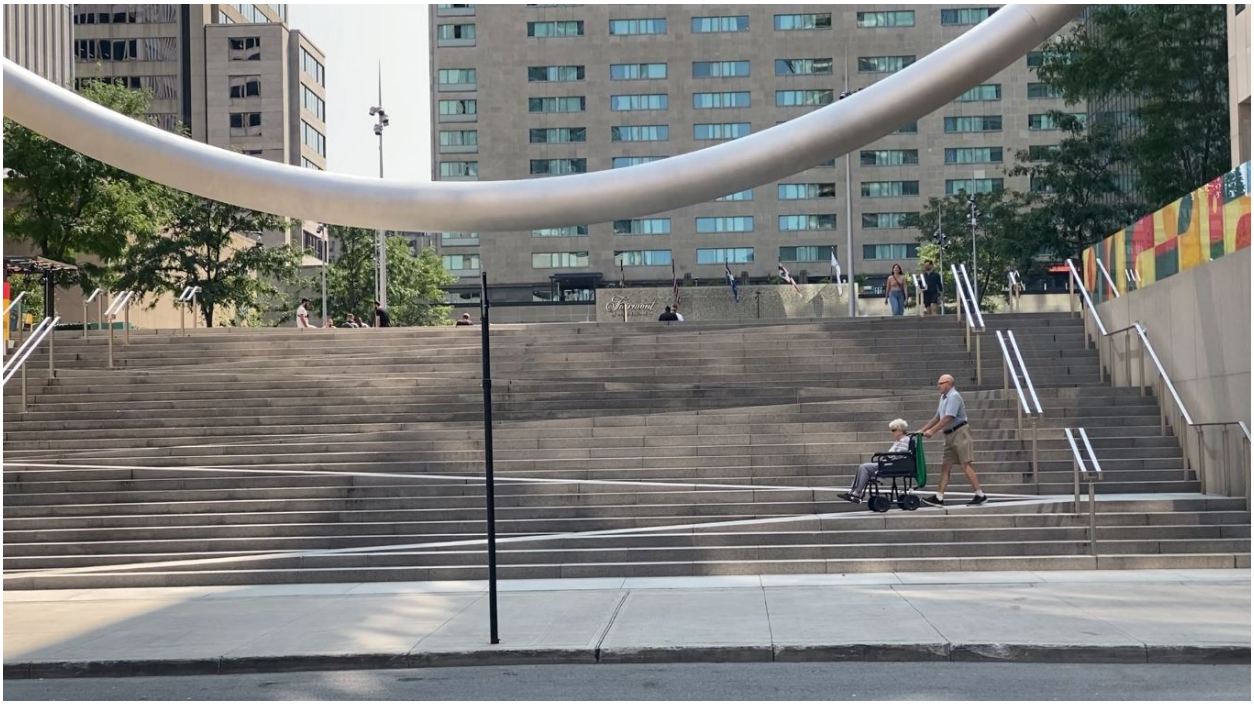

Figure 36. People on wheelchairs (Resource: Author's photos, 2024)

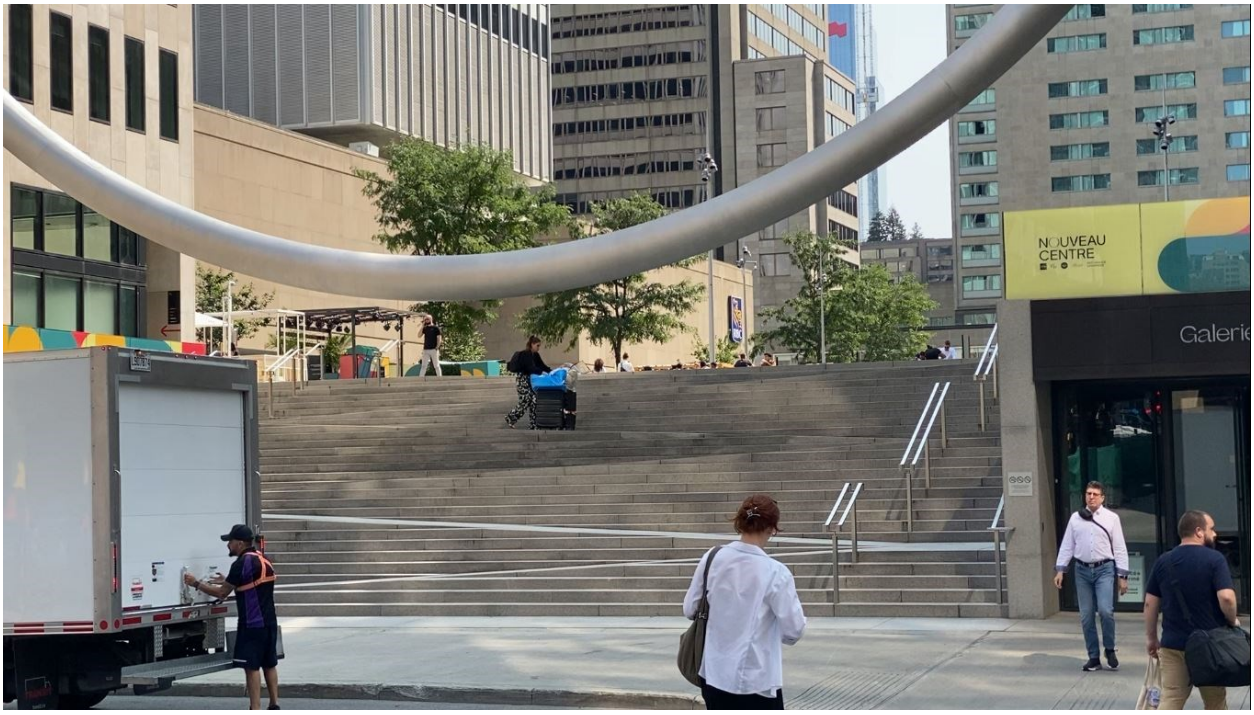

Figure 37. A person who carries heavy luggage (Resource: Author's photos, 2024)

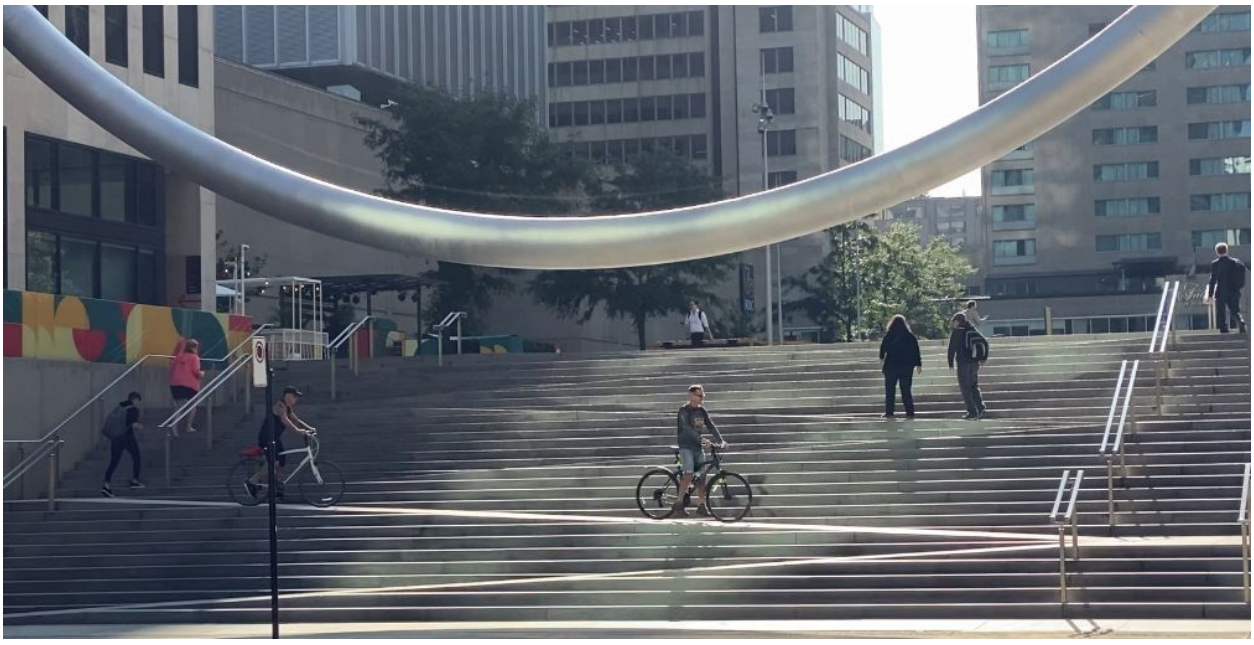

Figure 38. Cyclists found it easy to go up or down (Resource: Author's photos, 2024)

The outcome was somewhat surprising, as the Ring landscape appeared to embody the ideal design for incorporating both options. While many individuals with mobility issues acknowledged the

accessibility features designed for them, there were instances where others failed to notice or discover the ramp at all.

Figure 39. These sequence photos show the moment when the person failed to notice the ramp (Resource: Author's photos, 2024)

For example in Figure 38, the cyclist initially failed to notice the ramp concealed within the stairs, leading her to lock her bicycle in front of the stairs due to the belief that she couldn't lift her bike to the top. Upon her return, as she descended the stairs, she suddenly became aware of the ramp's existence. Subsequently, she began taking photographs from various perspectives to capture the presence of the ramp.

Figure 40. They are pointing to the ramp after descending the stairs, as they did not notice it initially upon their first glance (Resource: Author's photos, 2024)

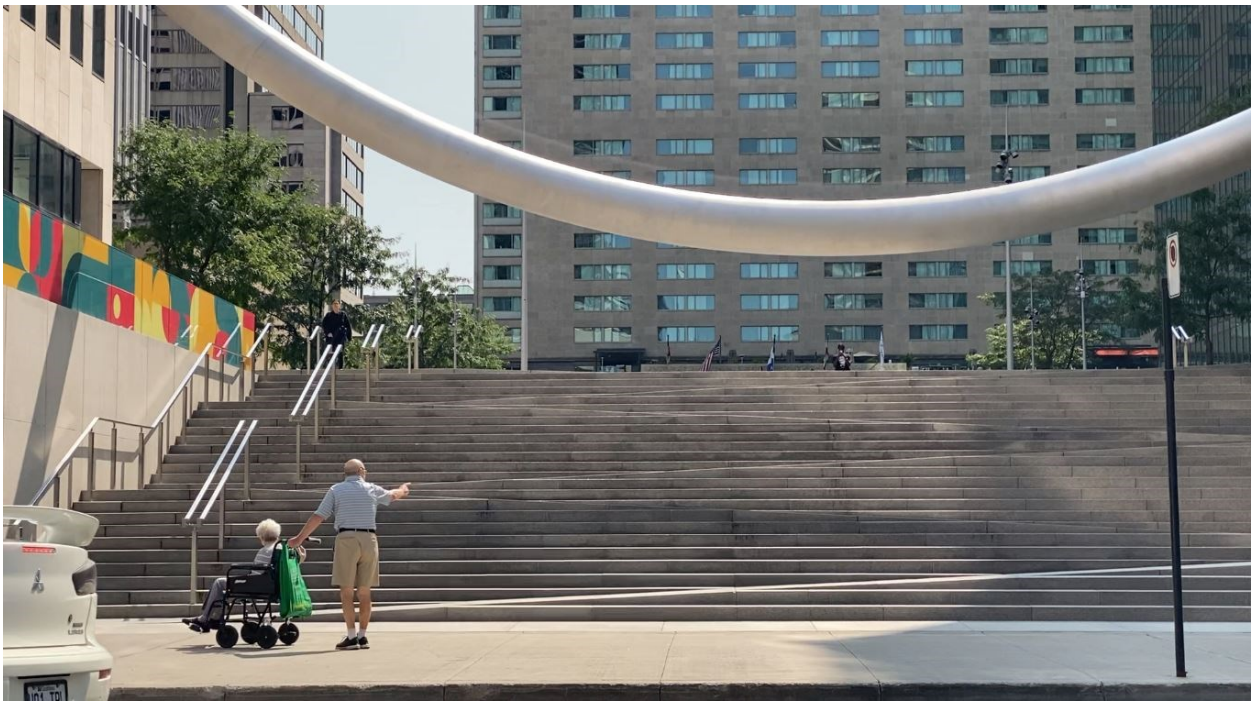

Figure 41. He is tracing the ramp with his finger to confirm whether it leads to the end of the stairs or not, as he intends to take the wheelchair to the top level (Resource: Author's photos, 2024)

Figure 42. They are pointing to the ramp to locate its presence throughout the entire staircase. They noticed the ramp after observing a man and his heavy container ascending it (Resource: Author's photos, 2024)

Here is the link to the observation films on my YouTube channel:

https://youtu.be/-NGqwaiwFEg?si=j6x3duW1dDBhM092

https://youtu.be/T8eqDJipsxg?si=Aph3ePdosH5geHlU

https://youtu.be/bE9oxZaTQ6o?si=gEY30O1axvPfEnAT

Result and Conclusion

After this phase of observation, we recognized that although this location was designed to accommodate a variety of people, there are still aspects that require improvement to enhance readability and usability. In many instances, we observed, that individuals were unable to recognize the ramp, or they were uncertain if it extended to the end of the stairs.

To address these issues, first, we propose changing the material when the function changes. Utilizing at least two different materials would enhance visibility and aid in distinguishing the ramp more effectively.

Figure 43. multiple functions should have visual differentiations (Resource: Author's photos)

Besides the material changes, as a solution, nosing edges could be considered. The design currently employs one material for all surfaces, which was noted as one of the problems in the Olympic stadium landscape. Introducing other materials or nosing edges along the edges would enhance safety and improve visual readability for pedestrians.

Secondly, based on what Jan Gehl brings up about walk psychology, it is talking about the "tiring length perspective" which refers to situations where pedestrians can see the entire route before starting. Contrarily, dividing routes into smaller segments can make journeys more engaging and manageable (Gehl, 2010). For example, in Figure 44, if the design were segmented and divided into distinct sections and levels in height, allowing pedestrians to see the end of each section (design in pedestrian eye domain), it would reduce confusion and provide assurance regarding the continuity of the ramp to the end.

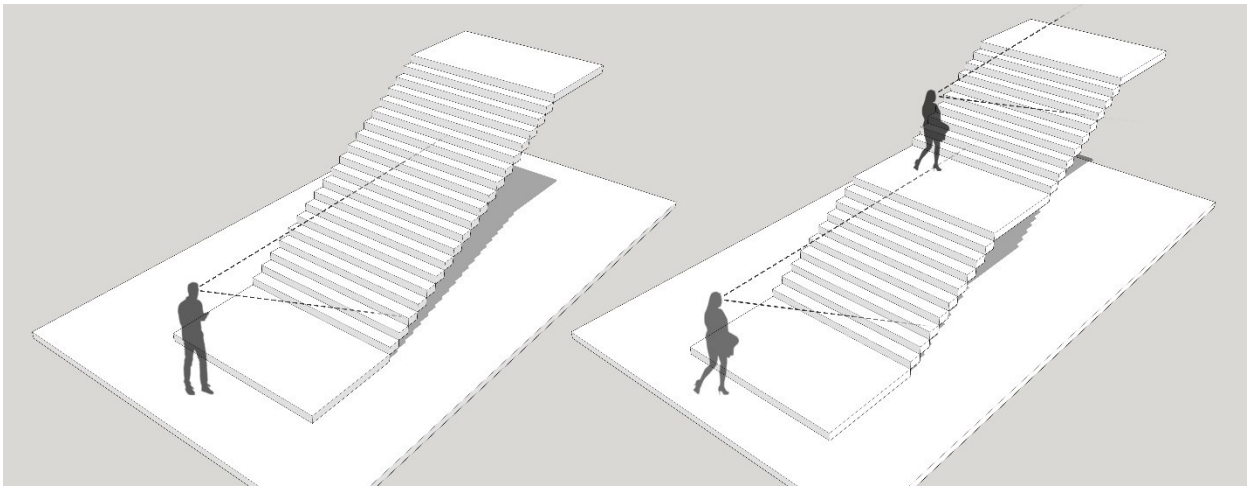

Figure 44. Breaking the design into multiple levels can reduce pedestrian confusion regarding the continuity of the ramp and the design (Resource: Author's diagram, 2024)

The other problem that this location faced was a lack of signage, similar to the issue observed at the Old Port site. No signage elements were emphasizing the existence of the ramp. This lack of signage meant that there were no visual indicators or signals directing pedestrians with mobility problems towards the ramp.

Here is the link to the cases that illustrate the problems:
https://youtu.be/Lnej0vmbhzs?si=eMnB9XAZCpSbxRJi

After discovering the problems and barriers in these locations, I feel that we cannot design for these people unless we know exactly how they feel and how they experience the places. for this reason, I came up with the idea of self-ethnography to deepen my understanding and empathy towards individuals with mobility limitations. Immersing oneself in the perspective of individuals confronting mobility challenges offers a profound insight into their daily hurdles and the profound influence of urban design on their lives. This drove my decision to develop a device that enables me to experience the world from their vantage point.

Chapter 4: Reflective Practice Approach: Development of a Knee-Blocking Prototype

Introduction

Enter the world of reflective practice, where traditional views of professional expertise get a makeover. Donald A. Schön's book, "The Reflective Practitioner: How Professionals Think in Action," serves as our guide through this transformative journey. Schön breaks through the barriers of traditional learning, highlighting the importance of intuitive knowledge—the stuff pros know but can't always explain. He shows us that real expertise comes from hands-on experience, not just textbooks (Schön, 1984).

He called this approach "reflection-in-action" which concerns self-ethnography. And Schön argues that this kind of self-reflection is a disciplined practice, not just wishful thinking. But reflective practice isn't a solo journey—it's influenced by the people and structures around us. Schön reminds us that navigating these dynamics is key to becoming better at what we do (Schön, 1984).

So, let's dive into the world of reflective practice, where self-awareness and self-ethnography lead to better professional decisions and a deeper understanding of our design.

Design Research for Knee Blocking Devices

After identifying issues at a problematic urban site and examining ideal solutions for addressing height changes, I decided to develop an object that simulates the barriers faced by people with mobility issues, allowing us to understand their experiences in urban areas better. To design this object effectively, I needed to understand the factors that contribute to mobility difficulties. Given that my main focus group was the elderly, I closely observed their experiences to inform my design process. As many elderly individuals, like my mother who suffers from arthritis and knee pain, struggle with mobility issues, I decided to create an object that could simulate their challenges.

I used an autoethnographic approach, which is a form of ethnographic research that connects personal experiences to wider cultural, political, and social meanings and understandings (Ellis, 2004). Autoethnography allows researchers to use their personal experiences to describe and critique cultural beliefs, practices, and experiences while acknowledging and valuing their

relationships with others. This approach involves deep and careful self-reflection to interrogate the intersections between self and society, the particular and the general, the personal and the political, and strives for social justice and to make life better (Adams et al., 2015).

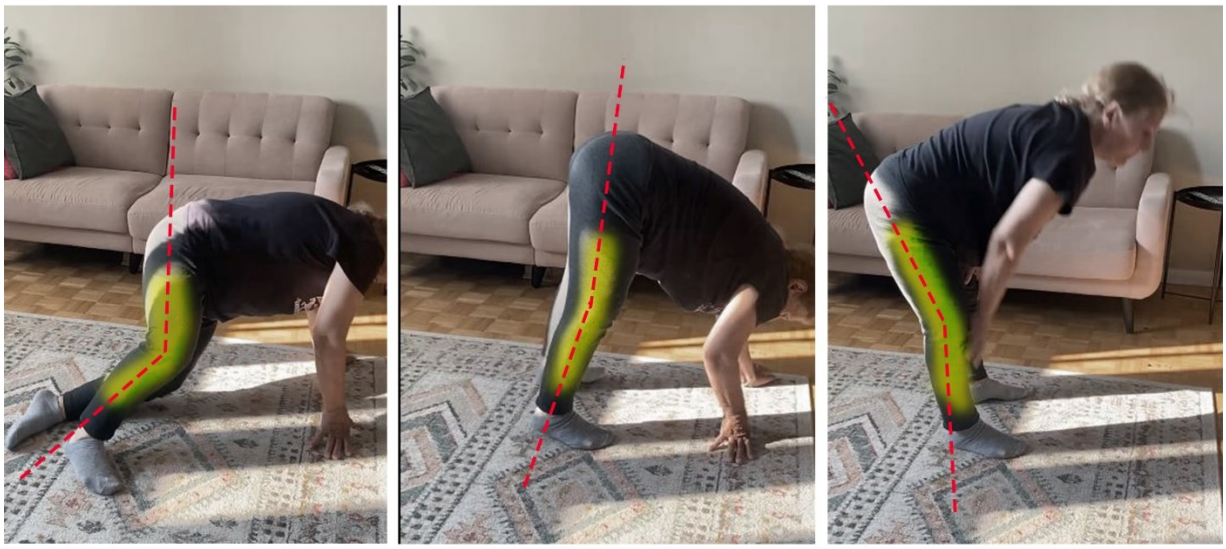

Figure 45. The angle of the mother's author when she wants to use her knee (Resource: Author's photos, 2023)

Her knee issues stemmed from limited flexibility, hindering her ability to bend them adequately when faced with elevation changes. This restriction may have various underlying causes, such as discomfort or degeneration of the knee's articular cartilage, leading to bone-on-bone contact. Regardless of the specific reason, elderly individuals grappling with knee function challenges typically experience reduced mobility, slower movement, and often require assistance, including the use of handrails, when navigating stairs.

Hence, the device we aim to design would essentially serve as a knee blocker, simulating the limitations experienced by individuals with mobility issues. Unlike conventional knee braces, which primarily support knee function, our device will restrict the movement of fully capable individuals, allowing us to immerse ourselves in their perspective. By adopting this empathetic approach as designers, we can gain a deeper understanding of the challenges faced by those with mobility issues.

Autoethnography, as employed in this design process, involves a reflexive study of a group or an individual's lived experiences and connecting those experiences to broader cultural, political, and

social concepts (Ellis, 2004). Historically, autoethnography was defined as "insider ethnography," referring to studies of a culture of a group of which the researcher is a member (Hayano, 1979). Autoethnography embraces and foregrounds the researcher's subjectivity, making their thoughts and emotions visible to the reader, and thus, it rejects the traditional empirical research methods' detachment (Witkin, 2022).

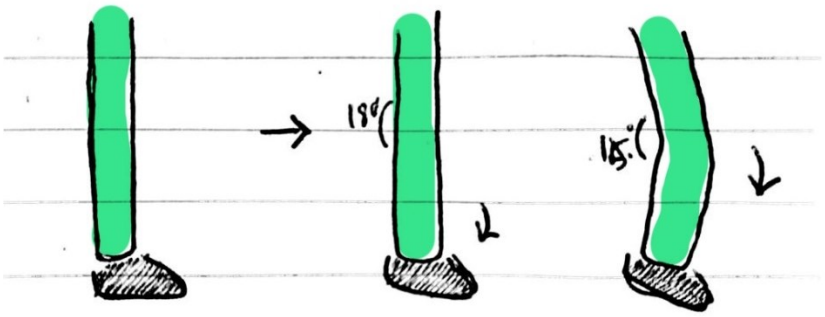

Figure 46. Bending the knee at different angles (Resource: Author's sketches, 2023)

The 3D modeling process has commenced, allowing me to simulate mobility limitations effectively. Using SketchUp software, I've crafted a detailed model that enables precise measurements of individual components based on my leg dimensions, incorporating both female and male dimensions to have the average size.

Figure 47. Measuring both female and male sizes of leg (Resource: Author's photos, 2023)

This capability facilitates the testing of various angles to restrict the flexibility of my knee. Moreover, the software empowers me to explore attachment methods for these devices on the body,

ensuring that individuals can walk while experiencing limited mobility. Ultimately, this process aims to design solutions that enable individuals to navigate stairs with greater difficulty, replicating the challenges faced by those with mobility issues. The goal of this autoethnographic design was to create an object that not only embodies the mobility challenges faced by the elderly but also facilitates a deeper, empathetic understanding for those who do not share these experiences.

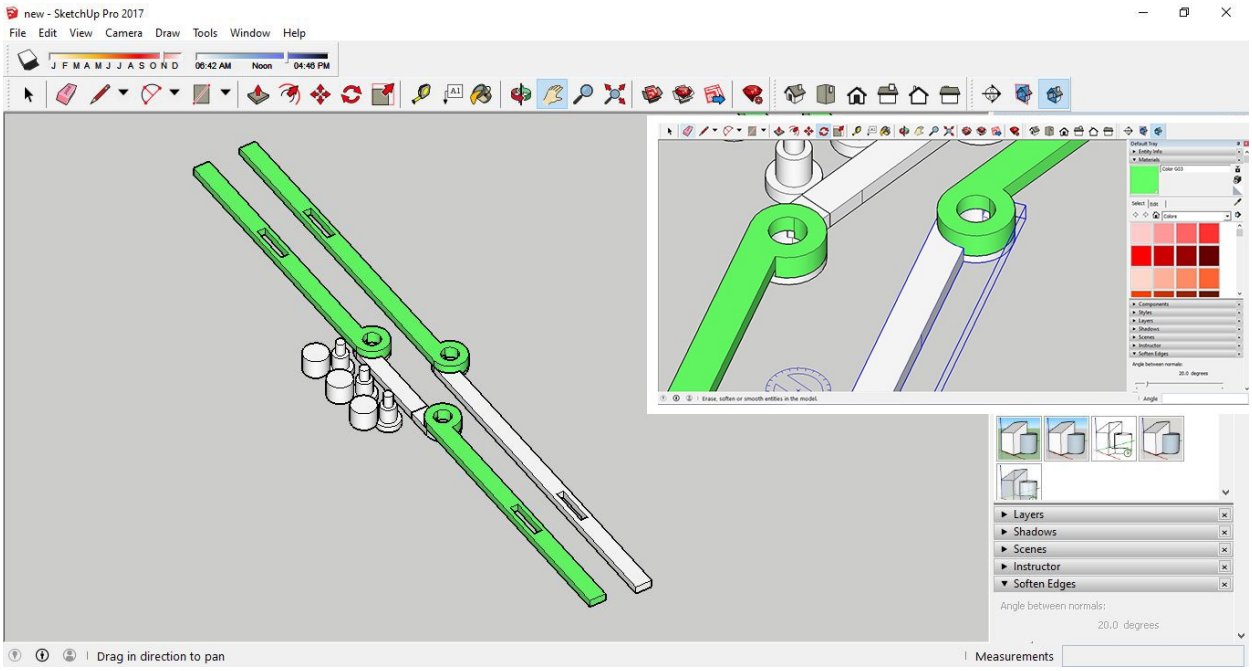

Figure 48. It is a screenshot of the SketchUp software where we simulate the knee-blocking device (Resource: Author's photos, 2023)

Several limitations were encountered during the 3D printing process:

- Constraints on the size of the pieces, with each component required to be less than 25 cm in dimension.
- Precision requirements for the pin, necessitate a snug fit into the corresponding hole with a tolerance of less than 1 mm.
- Time constraints imposed limitations on the editing process, demanding efficient use of available time for adjustments and modifications.

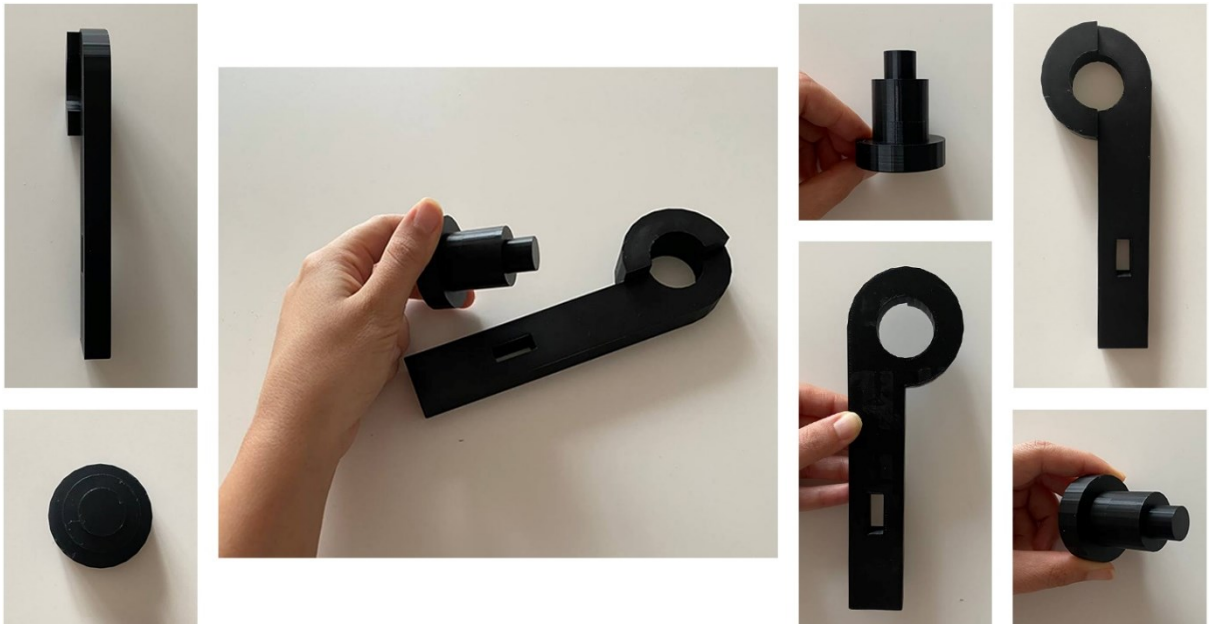

Figure 49. First pieces of the test (Resource: Author's photos, 2023)

Upon conducting the initial test, it became evident that the joints were slightly oversized, possibly attributed to disparities between the physical print and the virtual model. Additionally, it was noted that positioning the joint on the opposite side of the leg would ensure optimal attachment of the piece. Subsequently, adjustments were made to the 3D model file for the final round of 3D printing.

Figure 50. 3D print machine in Digi Fab at Concordia University, 2023

In order to fix the designed pieces to the human body and specifically to my leg, I required a suitable means of assembly such as a rope or tape. After some research to determine the appropriate size for the holes in the 3D pieces, I discovered that a belt provided the perfect fit.

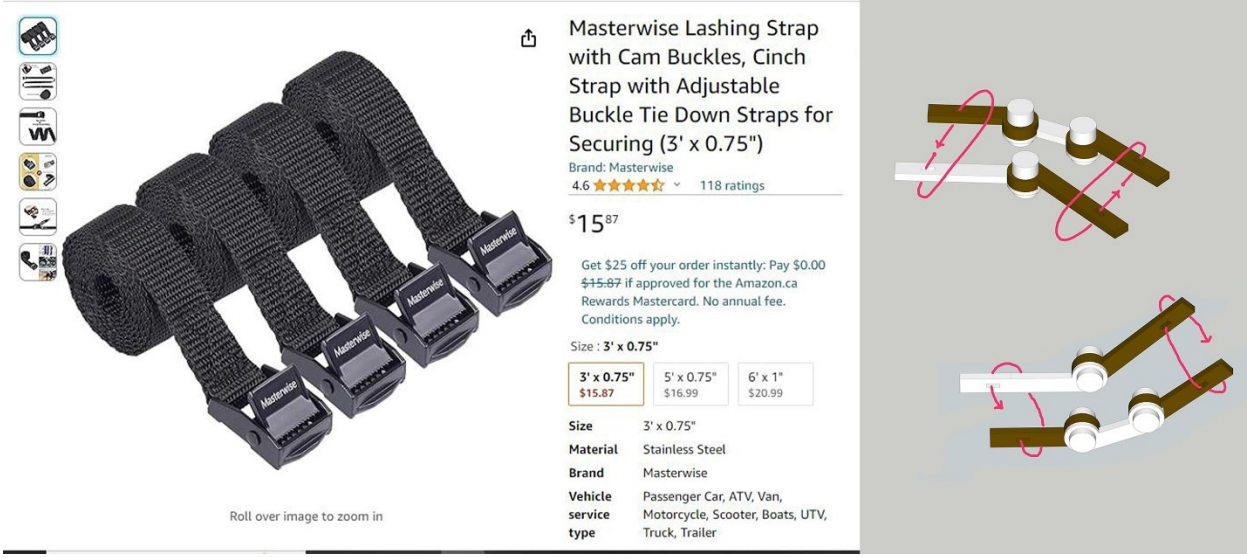

Figure 51. This is the diagram illustrating how the knee-blocking devices would be installed on the knee by using belts for simulation purposes (Resource: Author's photos and Amazon.com)

Conclusion

As we navigate the complexities of design research for knee-blocking devices, we are guided by the principles of reflective practice. Recognizing the limitations faced by individuals with mobility issues, particularly the elderly, we endeavor to simulate their challenges through innovative design solutions. By immersing ourselves in the perspective of those facing mobility challenges, we deepen our empathy and refine our design sensibilities. In embracing reflective practice, we forge a path towards more inclusive and empathetic design solutions, where the lived experiences of individuals with mobility issues inform every aspect of our creative process.

Here is the final setup with the knee blockers, illustrating how they can be equipped to better understand the limitations and challenges faced by individuals with mobility issues.

Figure 52. Final setup with the knee-blocking device (Resource: Author's photos)

Experiencing the city through the lens of someone with mobility issues many times, thanks to the knee blocker, opened my eyes to a myriad of challenges. Navigating stairs and various obstacles on urban open spaces and sidewalks made me acutely aware of how difficult it is for individuals with limited mobility to move around urban environments. This personal encounter underscored the significant role city infrastructure plays in either hindering or facilitating mobility. However, it also highlighted the equally crucial need for effective wayfinding and signage to assist those with mobility challenges. This firsthand experience was instrumental in testing and refining the new feature in Google Maps, ensuring it effectively addresses real-world mobility barriers. In Chapter 6, I will detail this feature, which aims to enhance accessibility and ease of navigation for all users. Additionally, in Chapter 5, I will utilize Duerck's design process to propose specific design elements and guidelines aimed at enhancing mobility and inclusivity for urban planners and designers.

Chapter 5: Programming for Inclusive Urban Design: Bridging Gaps

Donna P. Duerk's programming system

Donna P. Duerk's approach to programming in design involves identifying needs and bridging the gap between existing conditions and desired outcomes. Programming serves as the initial phase of the design process, focusing on defining problems and planning solutions. It's essential for programming to comprehensively uncover all significant aspects of the design problem and articulate the expected quality of the design solution (Donna P.Duerk, 1993).

Programming entails describing the ideal solution to the problem through words and diagrams, aligning with the mission statement, goals, performance requirements, and concepts. Prioritization and trade-offs are facilitated by breaking down goals into manageable units of analysis, enabling designers to navigate conflicts effectively (Donna P.Duerk, 1993).

Figure 53. Fundamental Framework for Programming (Donna P.Duerk, 1993)

Throughout the programming process, elements of analysis, synthesis, and evaluation are integral. As a preliminary design service, programming often plays a significant role in feasibility studies, needs assessments, master planning, and building prototype designs (Donna P.Duerk, 1993).

To ensure that designed environments like Old Port Montreal and The Ring landscape align with the mission of promoting accessibility and walkability for users, we'll reverse engineer the Donna P. Duerk graph.

The diagram below outlines a framework aimed at establishing an urban open space that prioritizes both walkability and accessibility for all users. This serves as a guideline for designers, urban planners, architects, and policymakers offering insight into the essential qualities required for inclusivity, particularly for individuals with mobility limitations.

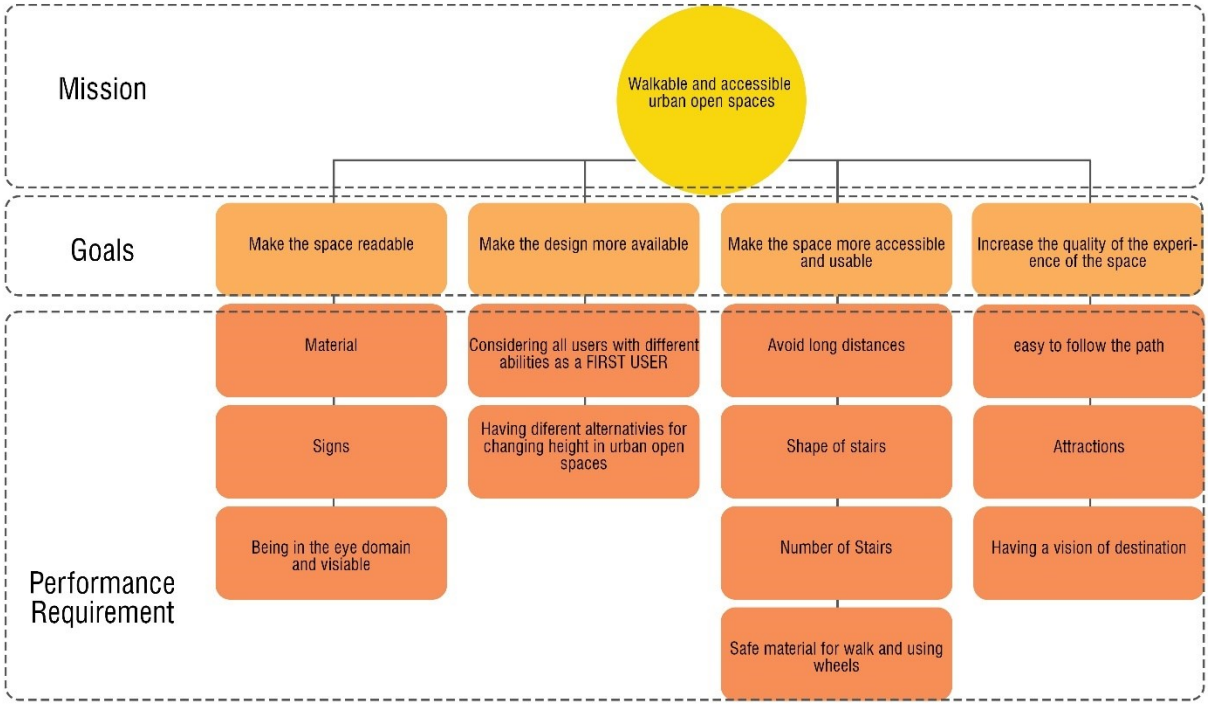

Figure 54. The Donna P. Duerk graph for walkable and accessible urban open spaces based on the observations on Old Port Montreal and The Ring landscape, 2024

Each of these PRs has some concepts that should be mentioned and they are sorted based on figure 53.

Concepts

The following concepts belong to PRs of “make the space readable” in our designs.
Concept 1-1: Material Selection for Enhanced Readability. Utilizing diverse materials can aid users in distinguishing between ramps and stairs more effectively. Viewing stairs from above

often obscures the edges of each step, making them difficult to discern. Therefore, adjusting the material on the edges can significantly improve readability without necessitating substantial alterations.

Figure 55. Concept 1-1: Material

Concept 1-2: Signage for Improved Readability. Employing varied materials in signage can serve as a visual cue for users, providing valuable information about different aspects of the design. This subtle adjustment enhances readability without requiring extensive modifications.

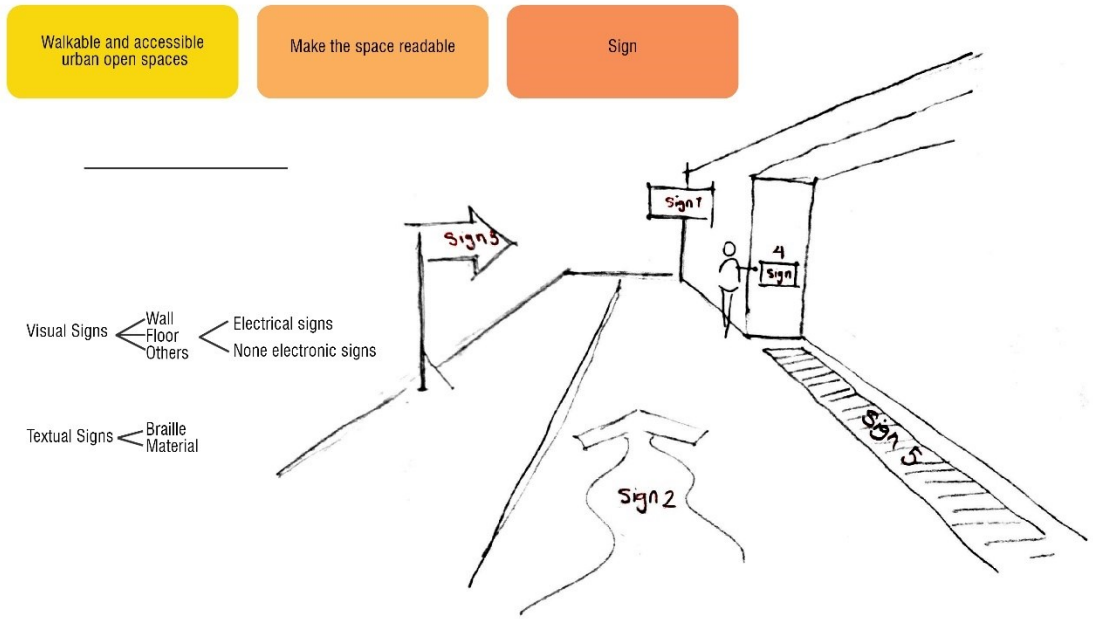

Figure 56. Concept 1-2: Signage

Concept 1-3: Design Visibility for Enhanced Readability. Ensuring that design elements fall within the line of sight and remain visible is crucial for making spaces more legible and predictable for individuals. By aligning pathways with users' visual field, they can easily perceive the intended route, fostering a sense of clarity and expectation. It's a fundamental truth that people inherently seek guidance and clarity regarding their surroundings.

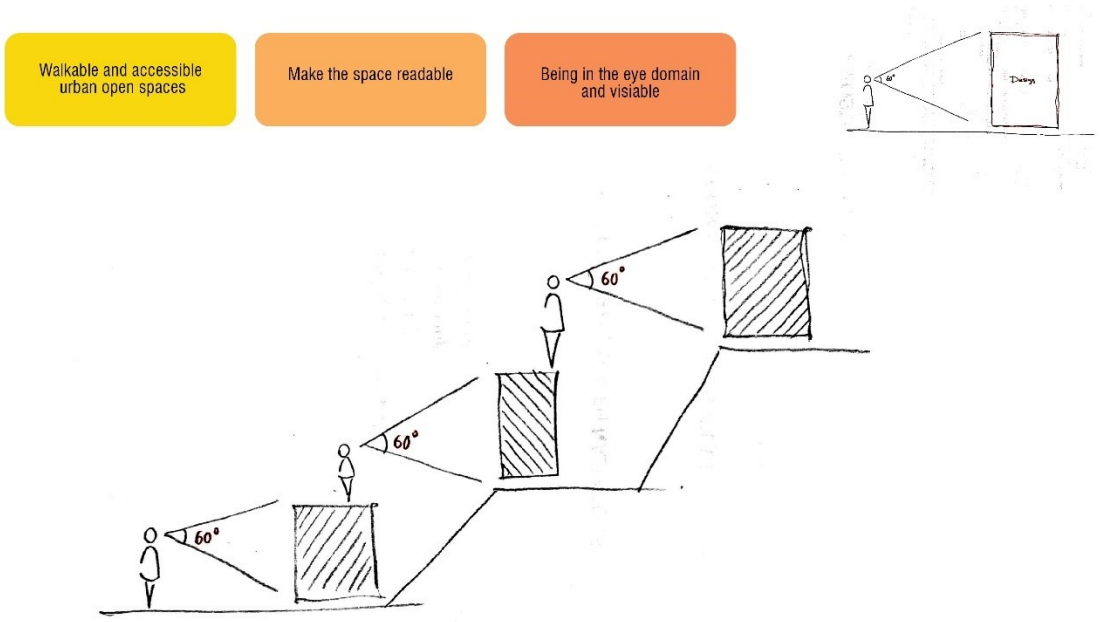

Figure 57. Concept 1-3: Visible Design

The following concepts are integral to the performance requirements (PRs) of "make the design more available" and should guide our approach to designing spaces for all individuals.

Concept 2-1: Prioritizing Individuals with Diverse Abilities as Primary Users. Incorporating the needs of individuals with various abilities as the foremost consideration in design.

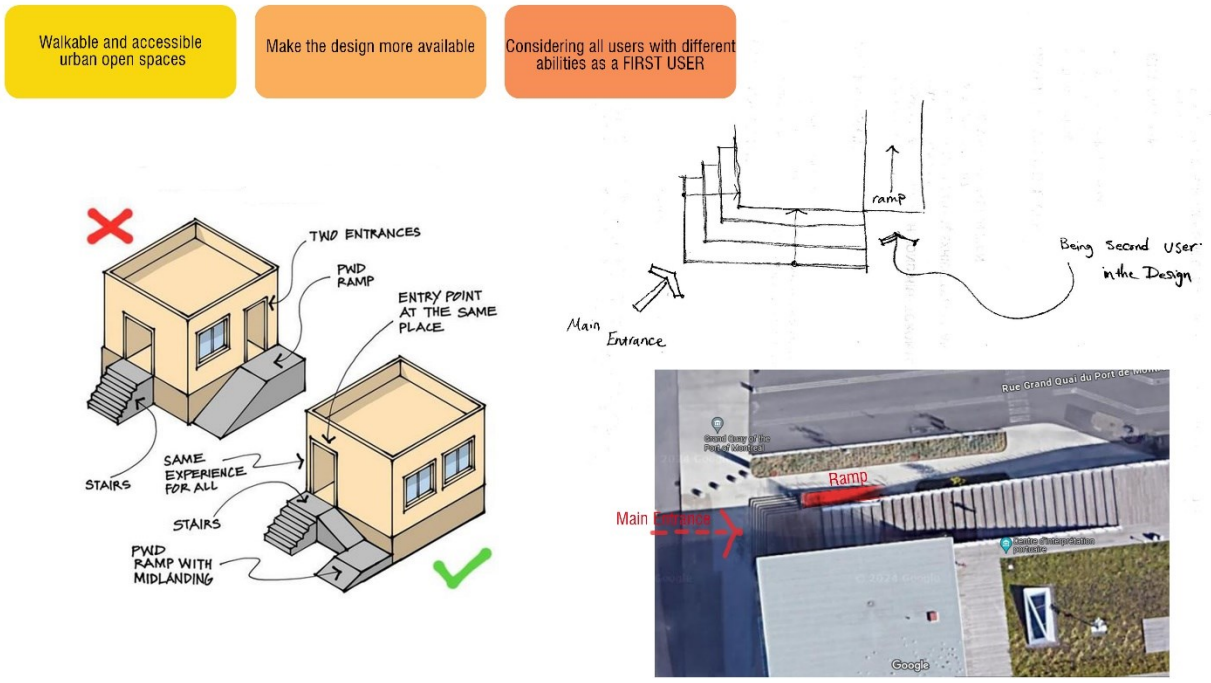

Figure 58. Concept 2-1: Prioritizing Individuals with Diverse Abilities as Primary Users

Concept 2-2: Providing Multiple Options for Vertical Mobility, Including Escalators, Elevators, Stairs, and Ramps, Enhances Accessibility in Urban Spaces.

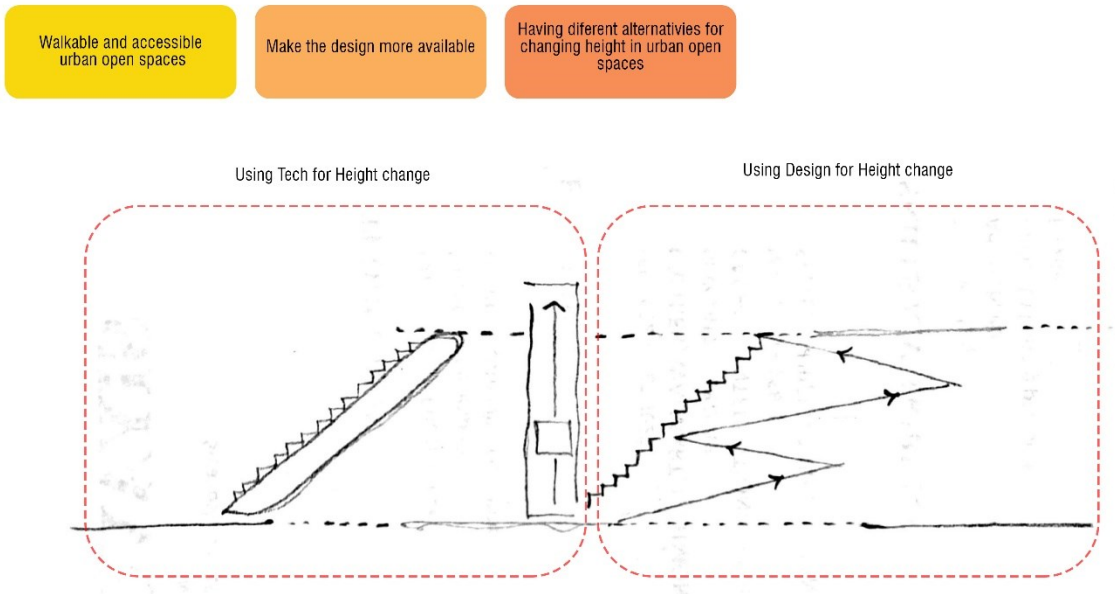

Figure 59. Concept 2-2: Multiple Vertical Options

The next concepts are fundamental to meeting the performance requirements (PRs) of "enhancing accessibility and usability" and should inform our design approach for creating spaces accessible to all individuals.

Concept 3-1: Shortening Distances to Enhance Accessibility in Urban Open Spaces. According to Jan Gehl, the optimal walking distance for individuals in their daily routines is approximately 400 to 500 meters (Gehl, 2011).

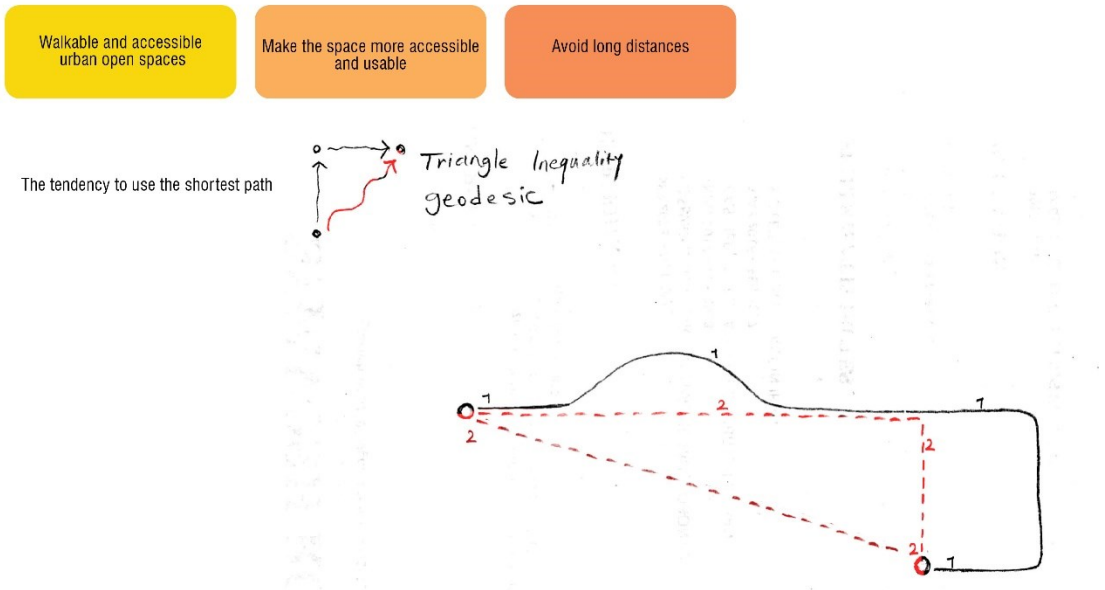

Figure 60. Concept 3-1: Shortening Distances

Concept 3-2: Altering the Design of Stairs to Improve Usability. The changes in the dimensions of the tread and riser

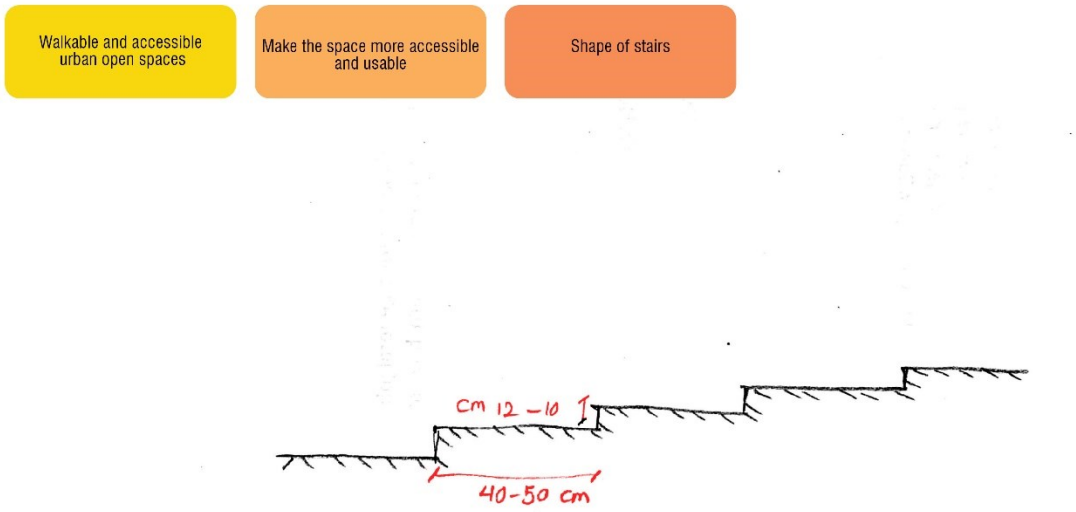

Figure 61. Concept 3-2: Changes in Design of Stairs

Concept 3-3: Interrupting the Path between Stairs by Introducing some Landings to Enhance Ease of Use (Gehl, 2011). Individuals, particularly those with mobility limitations, often benefit from taking intermittent breaks while walking to ensure smoother mobility and alleviate fatigue.

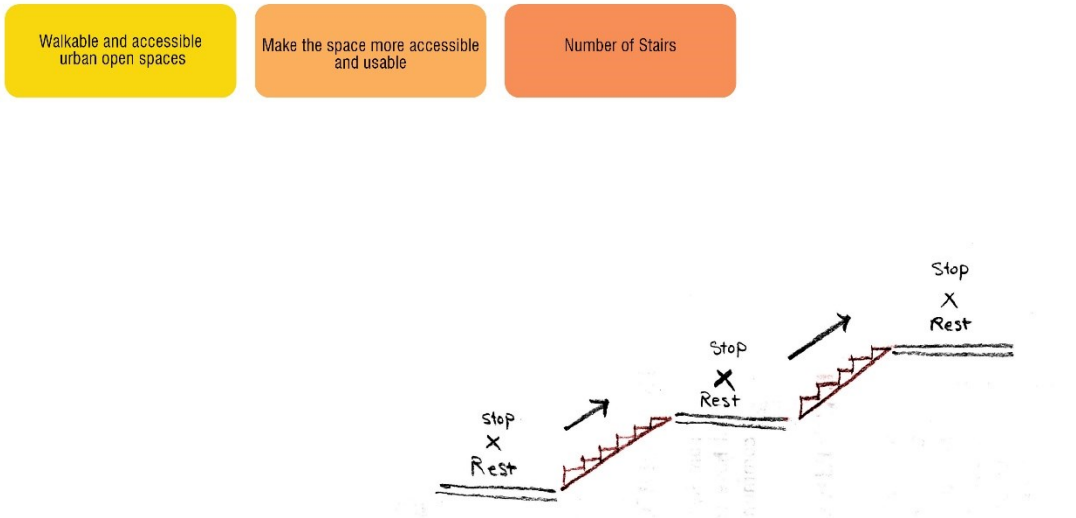

Figure 62 . Concept 3-3: Breaking the Path

Concept 3-4: Implementing Non-Slip Materials for Safety During Winter, as suggested by Jan Gehl.

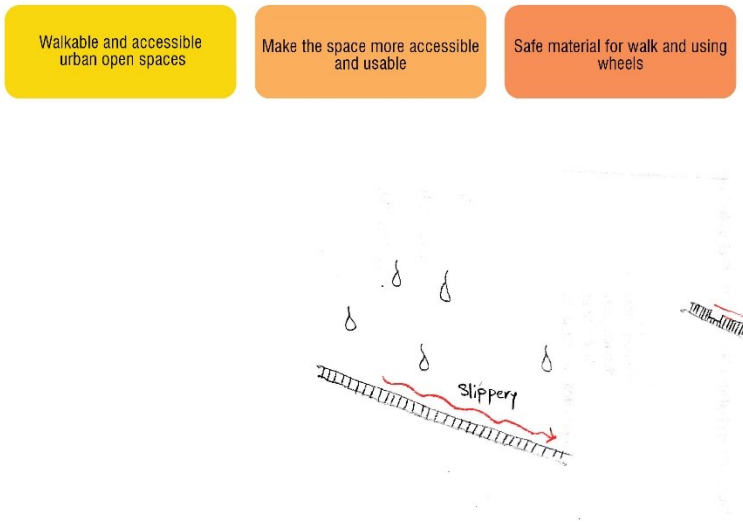

Figure 63. Concept 3-4: Non-Slip Materials

The last concepts are essential to fulfilling the PRs aimed at increasing the quality of the experience of the space.

Concept 4-1: Signs should be designed to be easily comprehensible, avoiding concealment, small sizes, or excessive complexity.

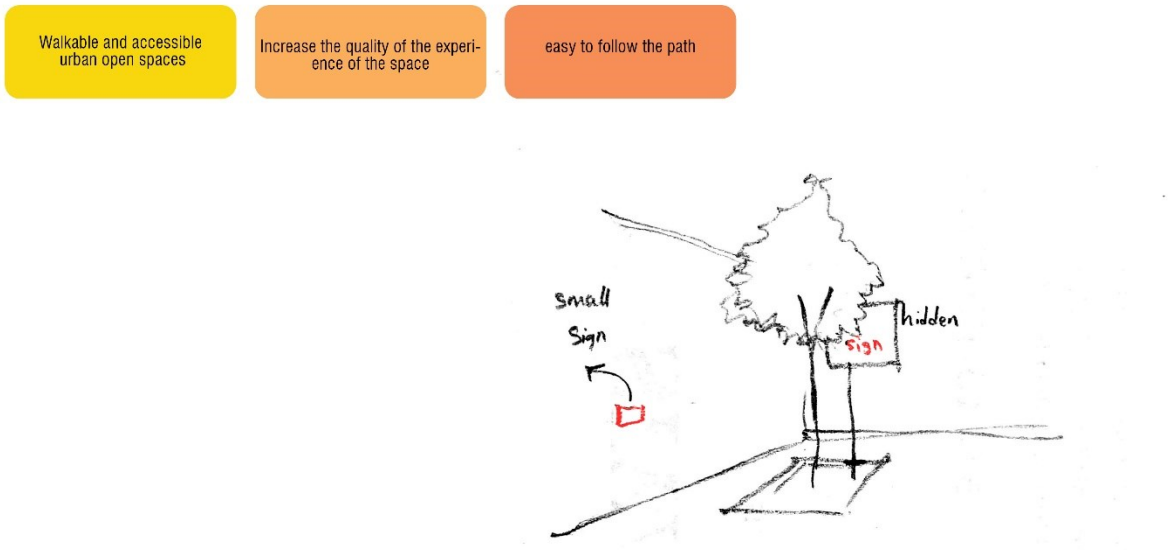

Figure 64. Concept 4-1: Visible signage

Concept 4-2: The pathways should be visually appealing to encourage usage. Occasionally, challenging yet engaging paths can still be navigated by individuals with mobility issues.

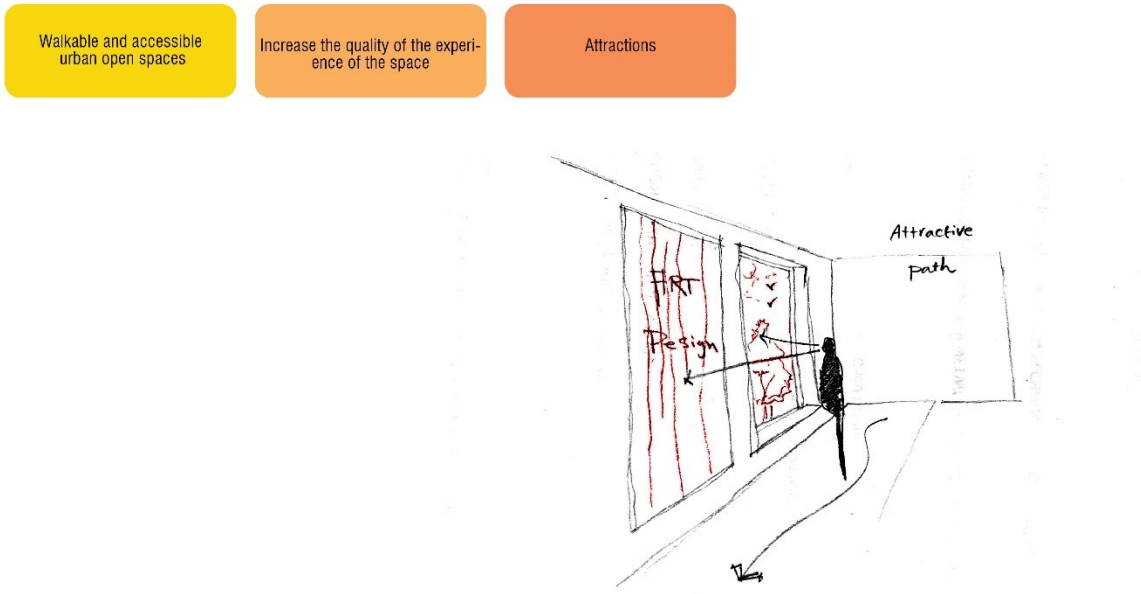

Figure 65. Concept 4-2: Appealing pathways

Concept 4-3: Individuals naturally anticipate what lies ahead. Providing clear visibility of the destination and the next level fosters a sense of orientation. Designing elements within the line of sight or breaking down the design into distinct levels enhances accessibility and comprehension.

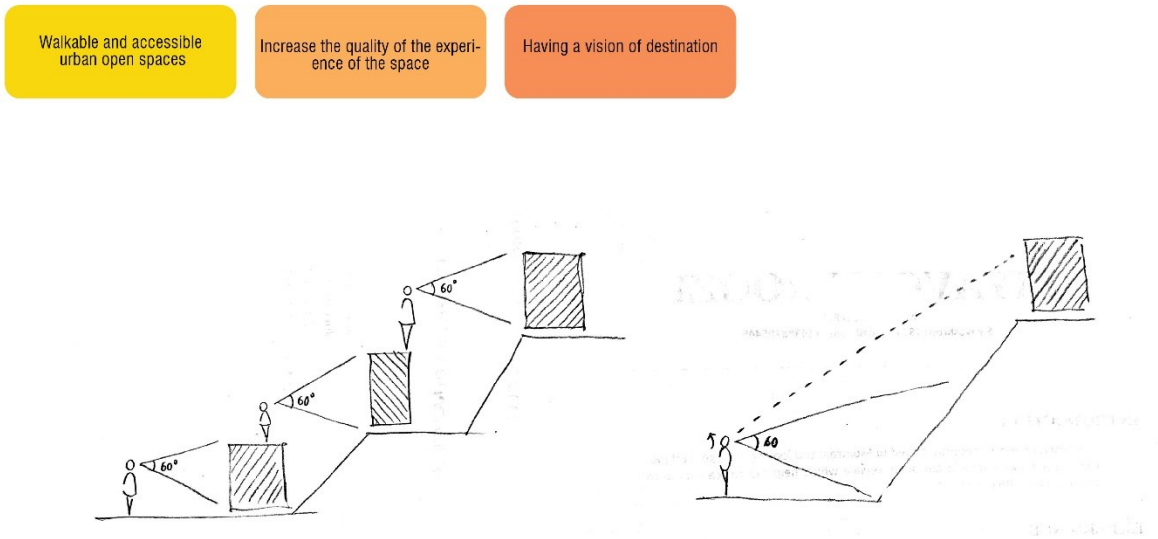

Figure 66. Concept 4-3: Clear visions of destination

Result

These insights and programming considerations can uncover various facets of this project, serving as a valuable tool to assist individuals with mobility challenges in navigating urban open spaces. By leveraging these aspects, individuals can find optimal pathways and avoid obstacles within city environments, enhancing their experience in public spaces.

Drawing from the outcomes and identified challenges faced by individuals with mobility limitations, several key points have emerged for refining the directions provided by Google Maps for users belonging to these specific categories.

Figure 67. The result shows what people with mobility problems need in urban spaces, author's diagram, 2024

Based on comprehensive observations and the Duna Duerk programming system, people with mobility issues have specific needs to ensure accessibility and ease of navigation. They require ramps instead of stairs, clear signage for easy navigation, and diverse materials to distinguish different functions and avoid confusion. Additionally, they need non-slip materials for safety and should be considered as the primary users in design. Including attractions along their paths can also make moving from one place to another less painful and more engaging.

Chapter 6: Research-Creation project: Development of a Google Map Feature for Users with Mobility Issues

Introduction

In an increasingly interconnected world, navigation and exploration are fundamental aspects of daily life. Google Maps stands as a tool, that empowers users to traverse unfamiliar terrain with ease.

Building upon the foundation of Google Maps, I propose the introduction of a novel inclusive navigation feature tailored specifically for individuals with limited mobility. Recognizing the diverse needs of users, including the elderly and those using wheelchairs, our objective is to enhance accessibility and inclusivity within the app. I aim to create a more user-friendly experience that caters to the unique requirements of individuals with mobility challenges.

Importantly, my goal is not to design an entirely new application but rather to accelerate the realization of inclusive navigation within the existing Google Maps platform.

Google Maps Feature

Google Maps is a comprehensive mapping service developed by Google, offering a wide range of features to help users navigate and explore the world around them (Google, n.d.). Here's a brief overview of what Google Maps can do:

Navigation and Directions: Google Maps provides detailed, turn-by-turn navigation instructions for various modes of transportation, including driving, walking, cycling, and public transit. It offers real-time traffic conditions to help you find the best route to your destination.

Exploration and Discovery: The service is a fantastic tool for exploring new places. You can find places of interest, read reviews, view photos, and even see the inside of some locations through Street View and Indoor Maps.

Location Sharing and Coordination: Google Maps allows you to share your location with friends and family, making it easier to meet up or keep track of each other during outings.

Real-Time Updates: For supported regions and services, you can get real-time updates on public transit, traffic conditions, and even the availability of parking spaces.

These are other features such as Offline Maps, Street View- panoramic views of streets around the world- and Business Information and Reviews that are not related to the project but are worth mentioning.

Based on the results from the previous section we propose the introduction of an inclusive navigation feature in Google Maps tailored specifically for individuals with limited mobility, including elderly users and those using wheelchairs. Recognizing that Google Maps already offers route planning for bicyclists and pedestrians, our objective is to enhance these capabilities with additional filters. This enhancement aims to create a more accessible and user-friendly experience, ensuring that all users can navigate the world around them with ease and confidence.

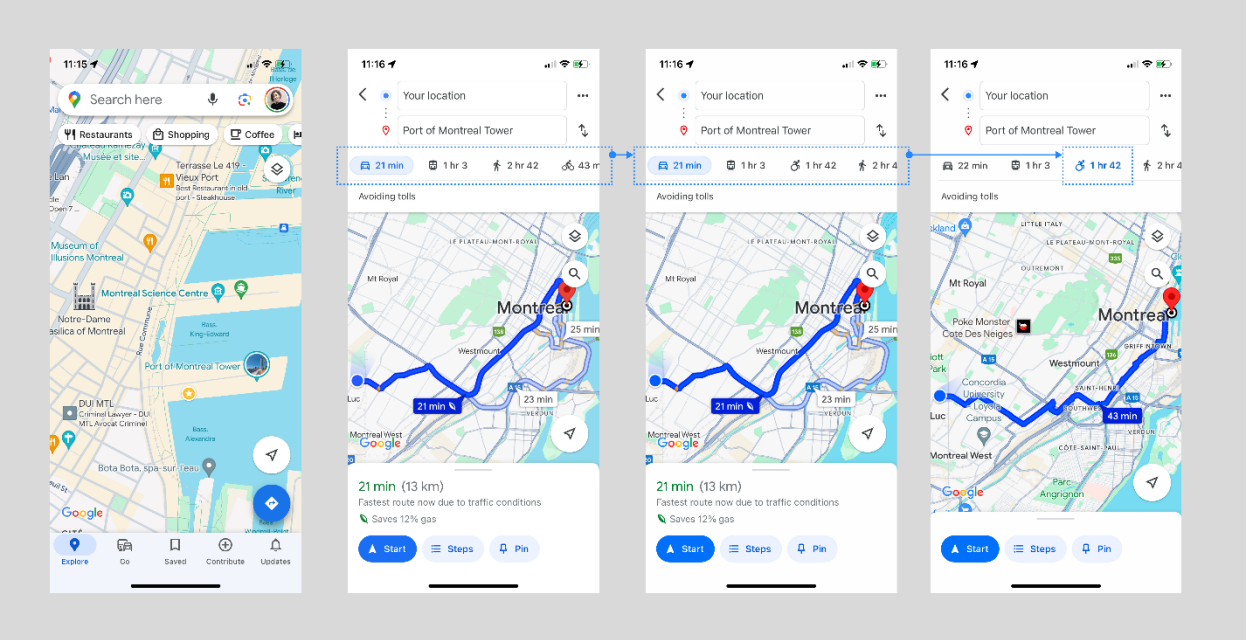

Figure 68. Adding a new feature to Google Maps with the icon of disability, author's diagram, 2024

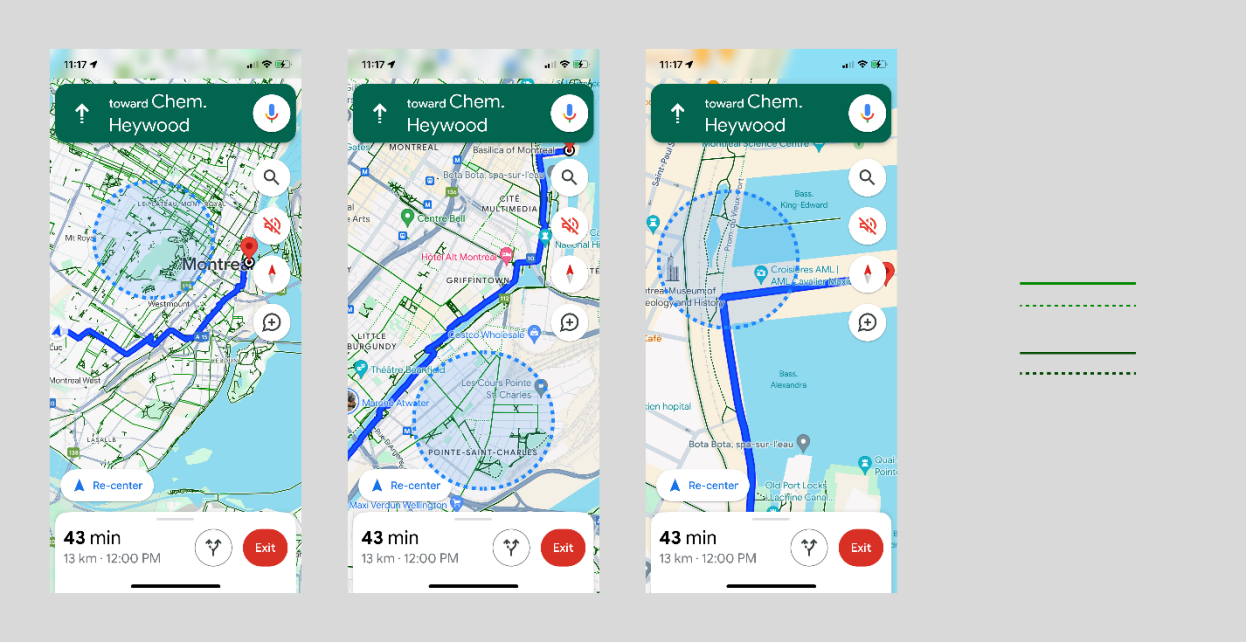

Figure 69. Identified path components in Google Maps for bicycles, author's diagram, 2024

In designing the icon for this feature, we consciously moved away from traditional symbols for individuals with disabilities, which often depict them in a passive manner. Our philosophy embraces the reality that people with mobility challenges, including the elderly and wheelchair users, are active and enjoy exploring their surroundings. Therefore, we crafted an icon that reflects autonomy and movement, portraying these users as they navigate the world independently (Hendren, 2016).

Figure 70. Icon for our targeted people, author's diagram, 2024

To enhance accessibility and inclusivity within the app, the following elements are critical for filtering and refining directions in the proposed mobility-friendly navigation feature, distinguishing it from standard walking or cycling options:

	Filter	Explanation
1	**Elevation Changes and Urban Solutions**	Actively identify and catalog all variations in elevation within urban landscapes, ensuring routes are optimized based on the presence of accessible solutions like ramps and slopes, rather than stairs.
2	**Preference for Bus Routes Over Metro**	Given the limited availability of elevators and escalators in many metro systems, directions should favor bus routes to ensure accessibility.
3	**Adaptations from Bicycle Algorithm**	Leverage similarities with the bicycle routing algorithm, adjusting for the unique needs of users with mobility challenges.
4	**Winter Conditions Consideration**	Specifically filter out routes that involve slippery materials during winter months, drawing on expert consultations and case studies, such as those conducted in Montreal.
5	**Prioritization of Shortest Routes**	Display the shortest possible routes as the primary option, addressing both the physical discomfort associated with longer distances and the universal preference for time efficiency.
6	**Interactive Feedback and Notes**	Introduce a feature allowing users to add notes or comments regarding real-time conditions, such as out-of-service elevators. If a location receives multiple comments flagging an issue, the app will reroute directions away from the problem area temporarily, soliciting user feedback to confirm when the issue has been resolved.
7	**Scenic and Attractive Routes**	When feasible, prioritize routes that offer a more enjoyable or scenic journey, highlighting paths through plazas, or along notable streets, enhancing the overall user experience.
8	**Customizable Breaks in Journey**	Enable users to specify desired break points along their route, accommodating the need for rest periods during their travel.

9	**Enhanced Visual Navigation through Camera Integration**	For users feeling disoriented or unsure of their surroundings, activating the camera feature can significantly aid navigation. Through the camera's lens, users will be presented with an overlay of their path, alongside directional cues and custom-designed signs tailored for easy following. This augmented reality experience transforms the physical environment into an interactive map, guiding users with clarity and confidence.

Table 3. Aspects that need to be considered in new features for people with mobility limitations, author, 2024

The provided image serves as an illustration of a live, augmented reality Google Maps view, demonstrating how this technology could be leveraged for the described purpose. With the integration of this feature, we can also address other important aspects. For instance, improving signage, which emerged as a significant issue at both observed locations, becomes feasible and straightforward.

Scenario

To validate our recommendations for Google Maps, we embarked on a brief expedition to identify the challenges firsthand and explore how Google Maps can enhance the urban navigation experience for individuals with mobility issues, using cities like Montreal as our case study.

For this experiment, we plan to go from point A to point B as shown in the diagram. Our goal is to illustrate the urban experience through the eyes of someone from our target group—individuals with limited mobility—highlighting how they navigate and interact with city spaces.

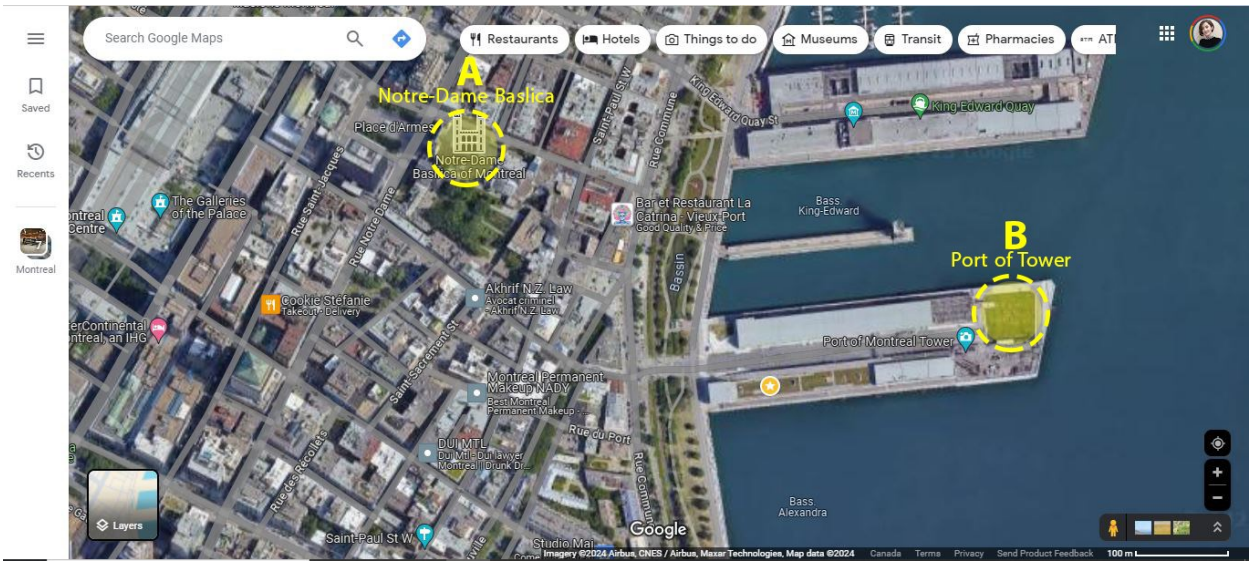

Figure 71. Two important locations in Montreal. A: Notre Dame Basilica Plaza to B: one of the coasts in Old Port

This demonstrates the standard and currently available options on Google Maps.

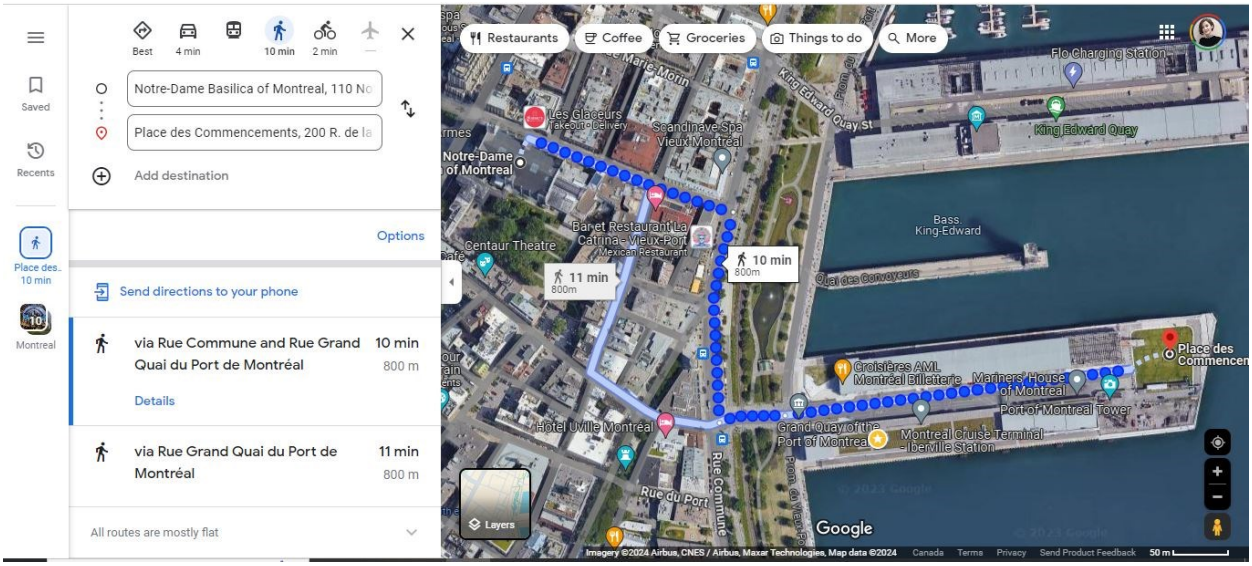

Figure 72. How Google Maps navigates through existing features.

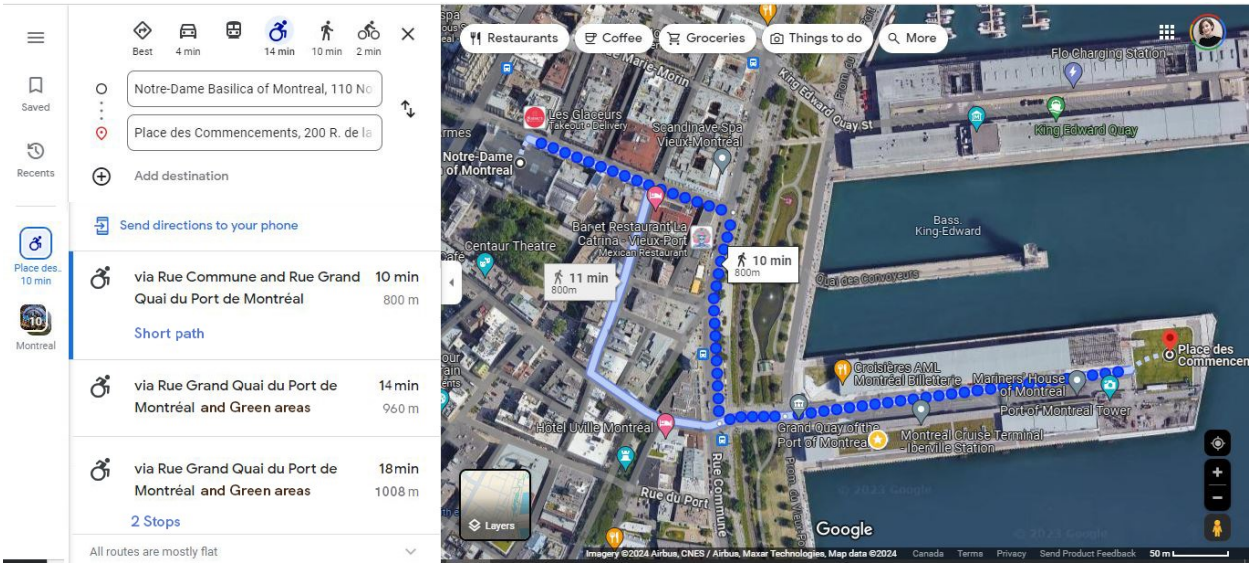

Figure 73 . How Google Maps navigates with the new feature on the shortest path section

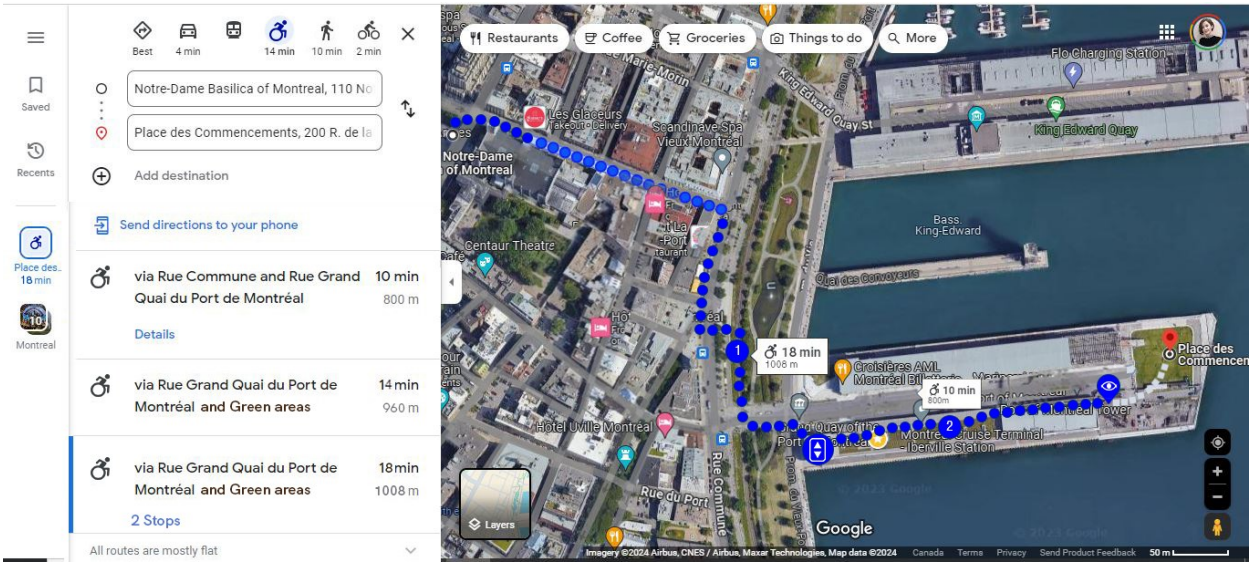

Figure 74. How Google Maps navigates with the new feature on the path with 2 stops and attractions

Based on our proposed enhancements to Google Maps for individuals with limited walking ability, for my prototype, I decided to wear the knee-blocking devices, I designed during the third part of our observation study. This was to better empathize with their experiences and more directly understand the challenges they face in navigating urban open spaces.

Figure 75. How I wore the knee-blocking devices. Location: Notre Dame Basilica Plaza

After equipping the knee-blocking devices, I recorded my experience navigating obstacles and challenges along the journey with the assistance of a companion. Attached to this research-creation is a video document of the prototype, and here are some screenshots from the prototype.

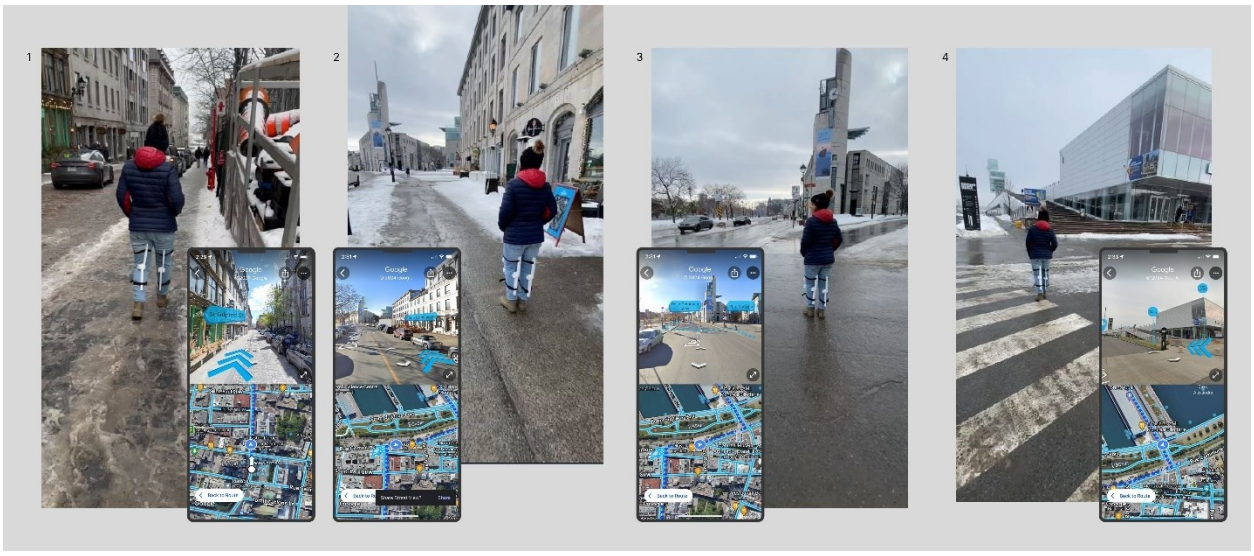

Figure 76. Screenshots of the Journey

Pictures 76-1, 76-2, and 76-3 depict the route leading up to the first stop, while picture 76-4 showcases the entrance of a public facility, that has attractive features, here I saw stairs and a ramp on the other side.

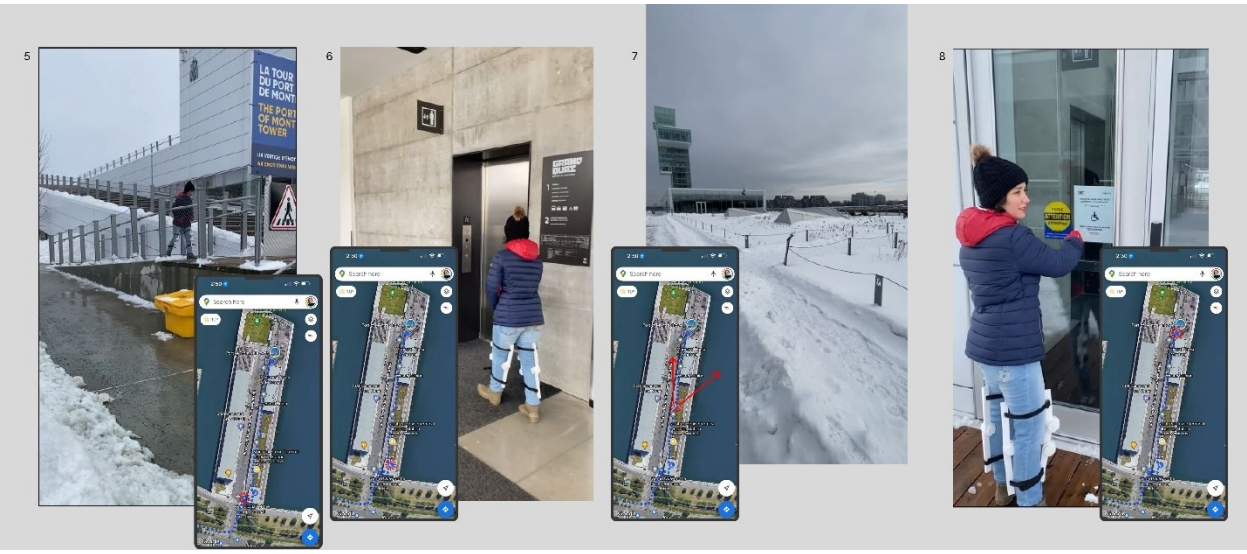

Figure 77. Screenshots of the Journey

Picture 77-5 a ramp facilitated access for the initial six stairs at the entrance. Followed by picture 77-6 an indoor elevator to bypass the remainder of the stairs. Picture 77-7 shows the rooftop, elevated spaces, scenic views of significant landmarks like Habitat 67, and the river awaited, complemented by amenities and benches for additional breaks. Picture 77-8 shows Hoping to reach the destination down by the river, I searched for an elevator. Unfortunately, there was no signage, and a paper notice on a door indicated no public access. Despite calling the specified number for assistance, no one arrived to open the door, leaving me uncertain about the existence of an elevator.

Figure 78. Screenshots of the Journey

Picture 78-9 depicts my trying to take the stairs but it was really painful so I skipped them and as a result, I found myself on the expansive balcony atop the stairs which is picture 78-10. However, an alternative route was available for individuals with mobility challenges seeking to reach the coast without navigating stairs and elevators. By bypassing the stairs and elevator altogether and taking the simple path next to the building-picture 78-11- from the outset, accessibility is ensured. The last picture is the final destination on the coast. Though this direction may lack extravagance, it is still nevertheless accessible.

Here is the link to the videos I created to test the application's feature:
https://youtu.be/CfAoVbgpaBE?si=zsvr6Cn8bm53jlaO

Workshop

To expand our understanding of problematic locations in Montreal, I organized a workshop at the 4th space in Concordia University during an expo for Dart 620. I reached out to various student communities, including ASCD (Access Centre for Students with Disabilities), dedicated to promoting equal access to education and fostering an inclusive campus community. Despite limited attendance, those present were engaged and enthusiastic about contributing to the project.

After providing a brief overview of the project's objectives, I invited participants to identify locations in Montreal that posed challenges similar to those observed during our previous case

studies. Drawing from their diverse experiences and perspectives, attendees shared valuable insights and suggestions, pinpointing areas where accessibility issues were prevalent.

Figure 79. The screenshot of the 4th Space Instagram's story about the Mobility Workshop which was a part of The Community Building Workshop located in at 4th Space, 4th space Instagram page, 2024

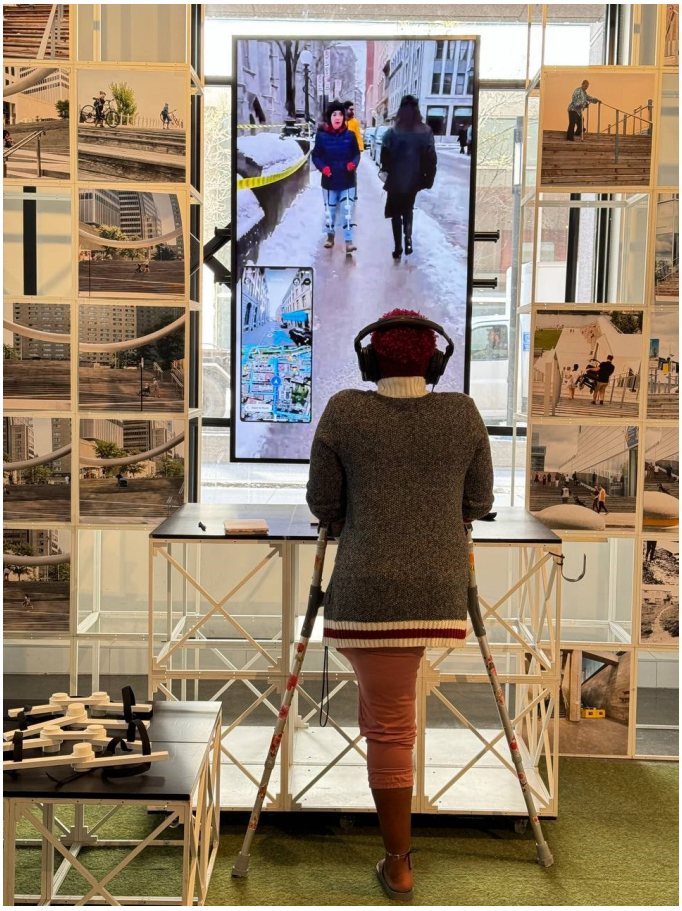

Figure 80. One of the participants of the workshop visiting the project's outcome, Author's photo, 2024

Their suggestions were recorded and plotted on a map of Montreal, creating a visual representation of the identified problematic locations. This collaborative approach not only expanded our pool of case studies but also fostered a sense of community engagement and ownership in the research process. By leveraging the collective knowledge and experiences of participants, we gained a more comprehensive understanding of the accessibility landscape in Montreal, laying the groundwork for future interventions and design solutions.

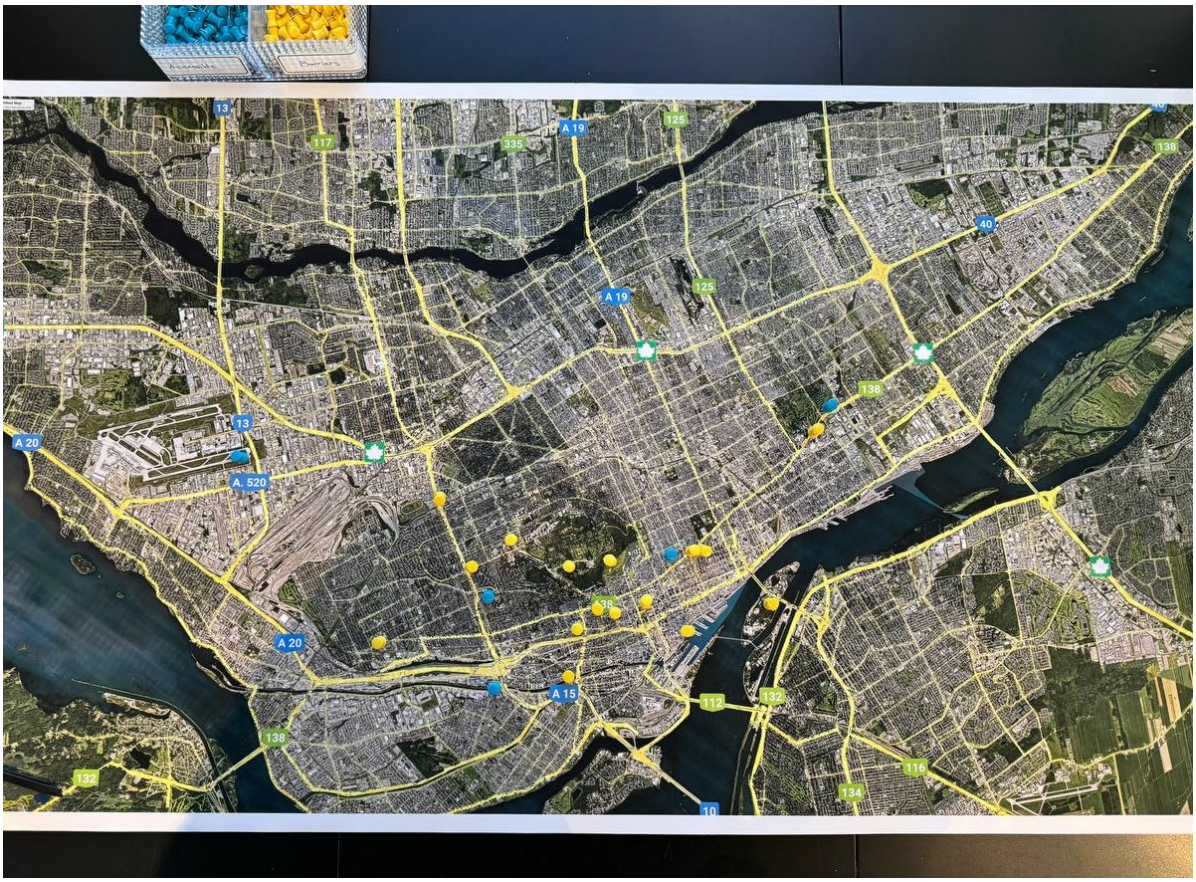

Figure 81. Final pins are the suggestions by participants of the workshop for problematic locations they know in terms of the mobility aspect

Conclusion

This project comprises an ethnographic study aimed at documenting the experiences of elderly individuals and those facing physical disabilities or mobility issues. Inclusive design is an essential approach for creating urban environments that accommodate the diverse needs of all individuals, regardless of age, ability, or mobility status. As discussed, the concept of inclusive design challenges traditional notions of disability and aging, advocating for a more accommodating approach to design.

Stairs represent one of the most challenging design elements for architects and designers when addressing vertical movements and elevational changes in urban environments and landscapes. However, these structures often lack inclusivity for individuals with mobility limitations.

The case of Montreal's iconic outdoor staircases serves as a consideration that shaped urban design. While these staircases are ingrained in the city's identity, they also highlight the challenges faced by individuals with mobility issues. That is why we conducted observations across various locations spanning from east to west. These sites, bustling with visitors and significant foot traffic, provided valuable insights into how people interact with and navigate through designed environments. Through tracking, counting, mapping, photographing, and recording behaviors, we captured the diverse range of obstacles and barriers encountered by individuals grappling with mobility challenges in Montreal's urban landscape.

These observations highlight key considerations regarding WHO faces difficulties with stairs and WHAT challenges need to be addressed by designers in future projects. Those affected include elderly individuals, parents with baby carriages or strollers, wheelchair users and individuals with disabilities, people carrying items like luggage or strollers, cyclists or those with wheeled objects, and overweight individuals.

The identified problems include a lack of ramps, insufficient signage directing to alternative options such as ramps and elevators, the use of a single material for multiple functions without adequate visual differentiation, challenges related to discomfort while walking, the importance of rest stops to recharge energy levels, and designing with the assumption that people with limitations

are secondary users. These insights are crucial for avoiding similar issues in future design initiatives.

After uncovering the challenges faced by individuals with mobility limitations in these locations, I realized the importance of understanding their experiences firsthand. To achieve this, I embarked on a journey of self-ethnography, immersing myself in their perspective to gain a deeper understanding of their daily struggles and the implications of urban design on their lives. As part of this effort, I decided to create a device that would allow me to step into their shoes. Drawing insights from observations of my mother in the third part of observations, who has battled arthritis for many years, I developed knee-blocking devices to specifically address challenges related to knee mobility. These knee-blocking devices function as a tool to simulate similar conditions for others.

The research journey has led to the development of two significant design solutions aimed at enhancing the urban navigation experience for individuals with mobility limitations. Leveraging Donna P. Duerk's programming system, we've outlined a comprehensive guideline for designers, architects, and policymakers to create more inclusive and accessible urban spaces. This framework addresses key aspects such as readability, usability, accessibility, and the prioritization of individuals with diverse abilities, laying the groundwork for future design initiatives.

Additionally, through the proposed feature for Google Maps, we seek to bridge the gap between existing conditions and desired outcomes, offering a novel solution tailored specifically for individuals with limited mobility. By enhancing accessibility and inclusivity within the app, we aim to empower users to navigate the world around them with ease and confidence, ensuring that urban spaces are accessible to all.

Together, these design solutions represent a significant step toward creating more inclusive and empathetic urban environments, where the diverse needs and perspectives of individuals with mobility limitations are prioritized and accommodated. Looking ahead, there remains much work to be done in the realm of inclusive design and accessibility. While our focus has been primarily on addressing the needs of individuals with mobility issues, we recognize that there are other marginalized groups whose voices must also be heard. In particular, individuals with vision

impairments face unique challenges in navigating urban spaces, and future studies must explore innovative solutions to address their needs.

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