

**DIRECTING VISUALLY IMPAIRED
PEOPLE IN A PERCEPTION WORLD**

**INCLUSIVE
MULTI-SENSORY
LANDSCAPE**

TIANQI CHEN



INCLUSIVE MULTI-SENSORY LANDSCAPE

Directing Visually Impaired People in a Perception World

Tianqi Chen

MLA Landscape Architecture, RISD

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By Tianqi Chen
05/28/2021

Approved by Masters Examination Committee:

Johanna Barthmaier-Payne, Department Head, Landscape Architecture

Nick De Pace, Primary Thesis Advisor

Robyn Reed, Thesis committee

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ABSTRACT

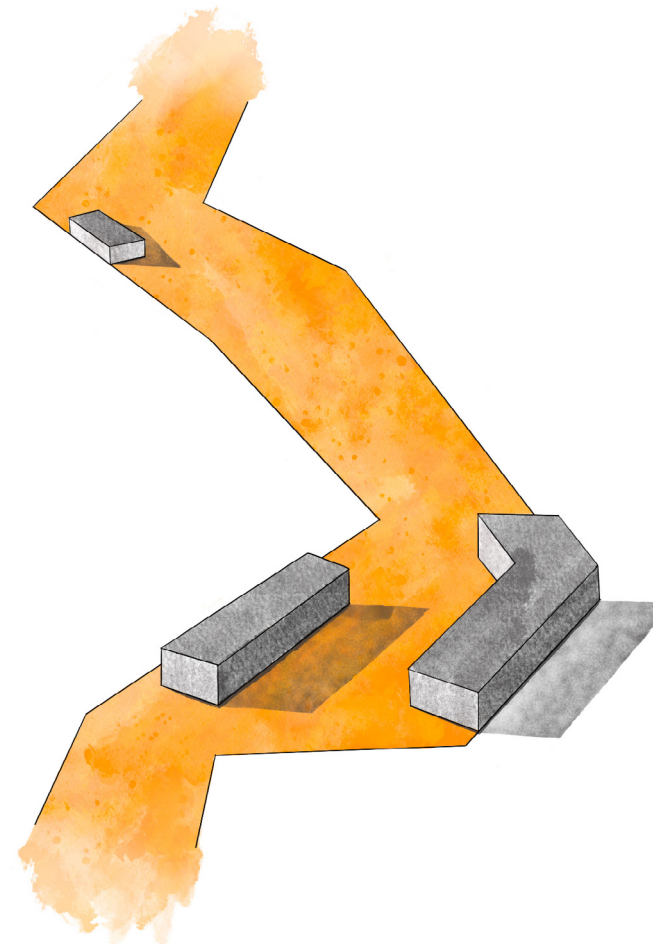
This thesis explored the use of inclusive landscape design to provide visually impaired people and normal people with enhanced multi-sensory experiences, and for recognizing space, navigating move through spaces. Inclusive design is human design, inviting people in and giving the communicative power to space through stimulating one's intuition and senses by repetition, sequencing, or patterning in design that signals time, space, and movement through the layouts of walking trajectories between important nodes or places of refuge. Through the visually impaired issue studies, solutions, and methods exploration, I developed principles as a solver, applied them on one site to transform space for testing my theory. This theory aimed to enhance public awareness of visually impaired people, pay attention to their outdoor experiences and provide everyone enhanced space experiences and motivate multisensory to emphasize the critical nodes, connect the fragmented spaces, direct people walking through intersections safely, and indicatively.

INTRODUCTION

As the most common way for us to appreciate the landscape is through our eyes, most of the environment design emphasizes the visual impact. However, does design respect the individual differences in beauty appreciation and environment experiences? With the increasing number of visually damaged people around the world, the issue of how to provide the same rich experiences for special needs people should be addressed.

The city is full of hidden dangers for people to move through: the conflict between vehicles and pedestrians, the transit points and boundaries everywhere... People, especially the visually impaired people are facing all sorts of challenges moving through the city and getting hints from the environment for them to recognize and navigate.

The city should not be a programmed machine but a living system to communicate with people, encourage participation and mutual interaction. A friendly public space can activate the connection between fragmented spaces, enhance spatial experiences. This thesis is exploring how to offer friendly and inclusive cityscapes to navigate visually impaired people, as well as normal people moving through spaces, earning enhanced spatial experiences, and highlighting the space boundaries and transitions.



1

**WHAT DOES
LANDSCAPE
MEAN TO YOU ?**



THE ISSUE

Have you ever noticed how you use and appreciate the environment when you walk inside the city? The city and landscape are both designed for walking and seeing. What if someone is a bit different from normal people? How do they use and participate in outdoor activities? As a designer, we have the responsibility to make the design becomes friendly to everyone. This chapter explores the idea of making design to be inclusive and thinks highly of providing equal outdoor participation for everyone.

Landscape design often displays as visual art, employing colors, patterns, shapes to divide and form spaces, encouraging activities that happen inside.



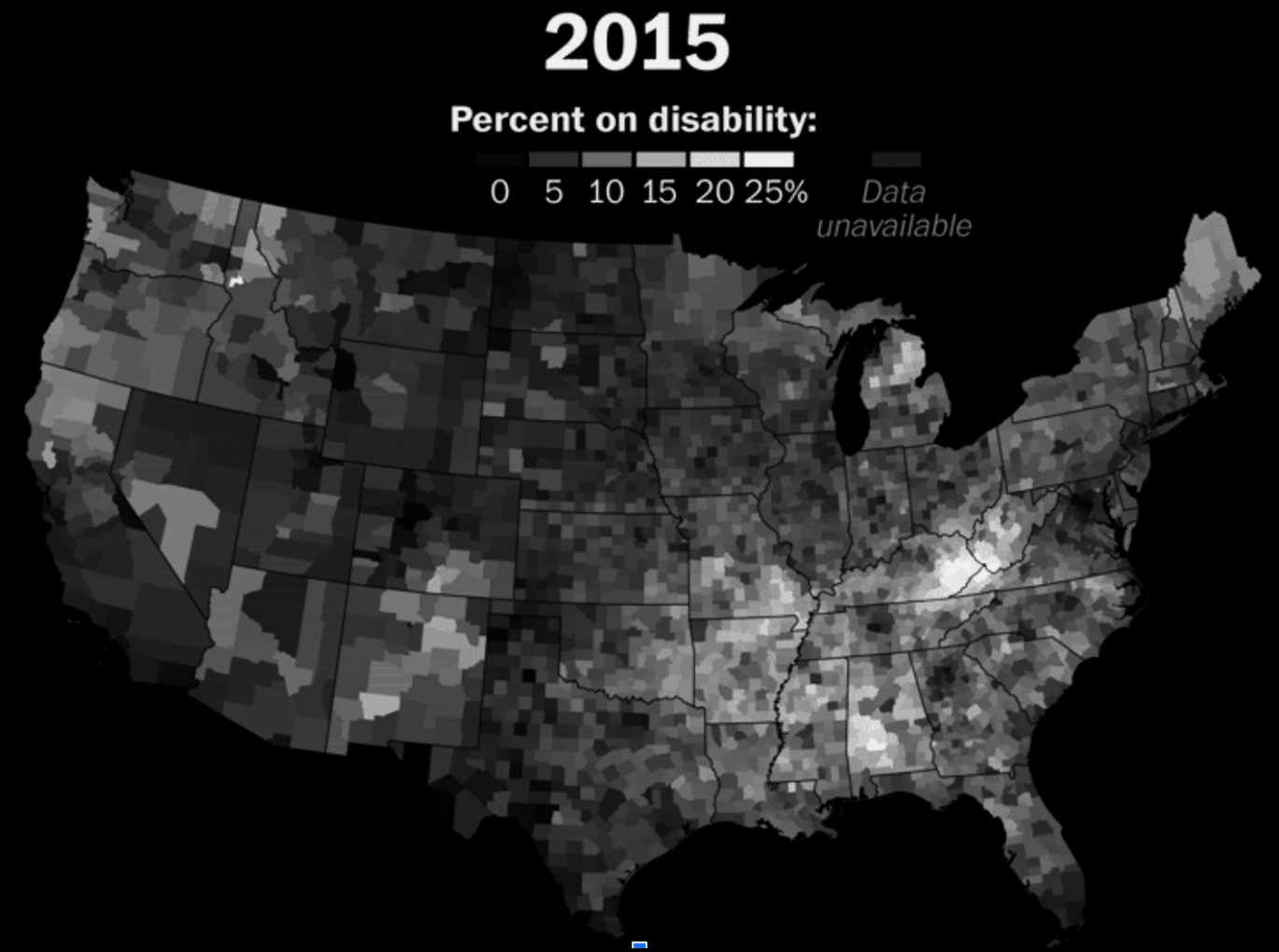
COMMON LANGUAGE EQUAL OPPORTUNITY

How to make the design becomes a common language for all of us?

How can design as a common language to bring the same experiences both on public surround and nature for the neglected people.

INCREASING DISABILITY

The number of disabled people is increasing in recent years. As part of our society, disabled people have the same rights as normal people. However, disabled people have always been neglected and kept out of outdoor involvement. The need of bringing disabled people back to social life and receiving equal content of information is a calling.



The ramp satisfies ADA regulation but is not well-considered for wheelchair users.



The ramp satisfies ADA regulation but is not well-considered for wheelchair users. Tortuous long route makes it difficult for disabled people to move.

CURRENT ADA DESIGN

Many designers approach ADA regulations as a hassle and constraint rather than an opportunity to create engaging, inclusive spaces. The ADA facilities are often not friendly to disabled people to use. Sometimes, those facilities even become a useless “decoration”. Successful design projects should be able to overcome these unfortunate pitfalls by creating inclusive practices that aim to create spaces suited for all users.

DIFFERENCES MAY BE HARMONIZED BY ACTIVE DISCUSSION

WHAT WE CAN DO

Differences may be harmonized by active discussion. A new design language should be considered for both abled people and disabled people to communicate with each other also with the environment and design itself. As designers, we have the responsibility to stand on disabled people's side and make decisions. How to make disabled people be accepted by the environment instead of isolated, and how to enhance disabled people's spatial experiences and provide them the equal chance for appreciating the landscape, are questions for both designers and the society.



INCLUSIVE DESIGN IS HUMAN DESIGN

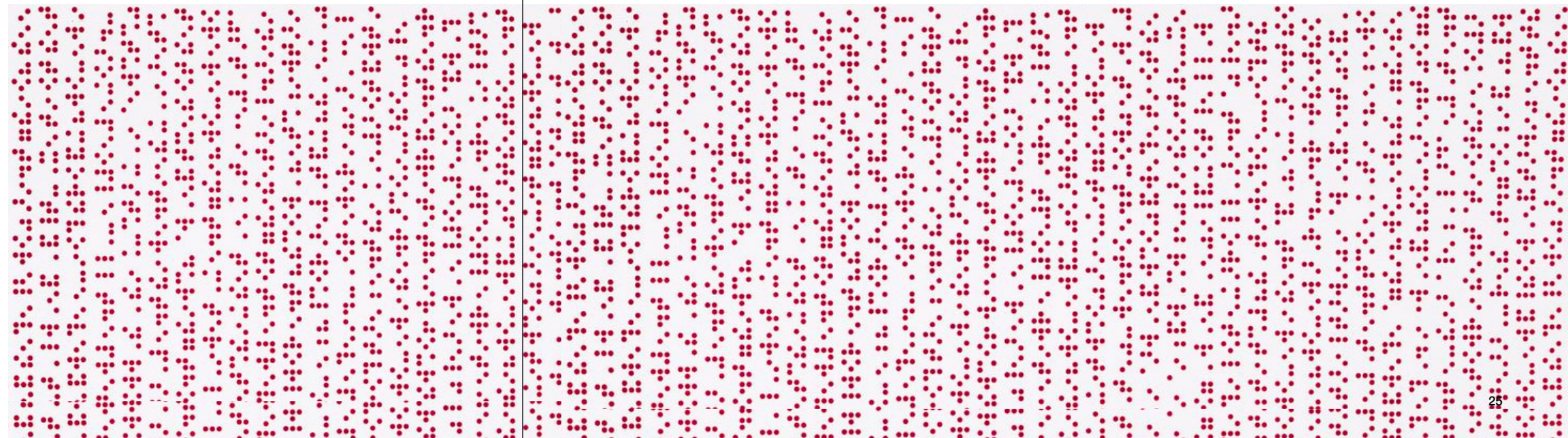
To enhance the ability and chance of communicating by employing the power of design as a means to magnify disabled people's existing sensory, and compensate for their lost sensitivity, and shift their understanding of human-environment dichotomies. Also, design can equally help people make visible the interrelatedness of materials, processes, actions, and their impacts. Inclusive design as a human design invites people in and provides equal opportunity for appreciating and enjoying the landscape.

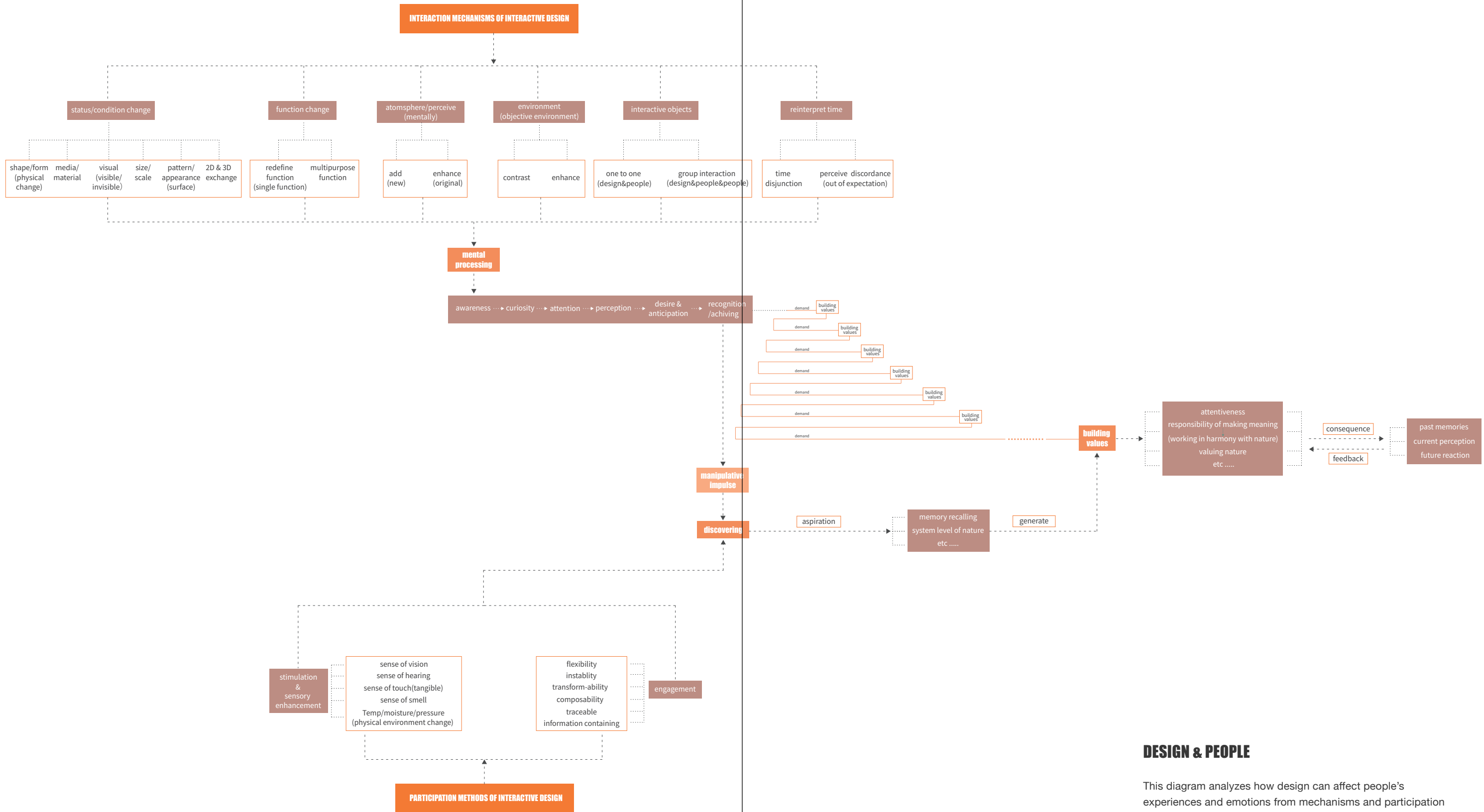
How can Landscape Design to be Inclusive ?

WE-DESIGNERS

The designers as abled people have the unconscious tendency to employ full senses to be aware of the surroundings. The disabled people lost part of sensory with other sensory be magnified as compensation.

Thinking and experiencing as disabled people, experiencing the world through their way can be a way to have the understanding and also as a start point to explore a new language.

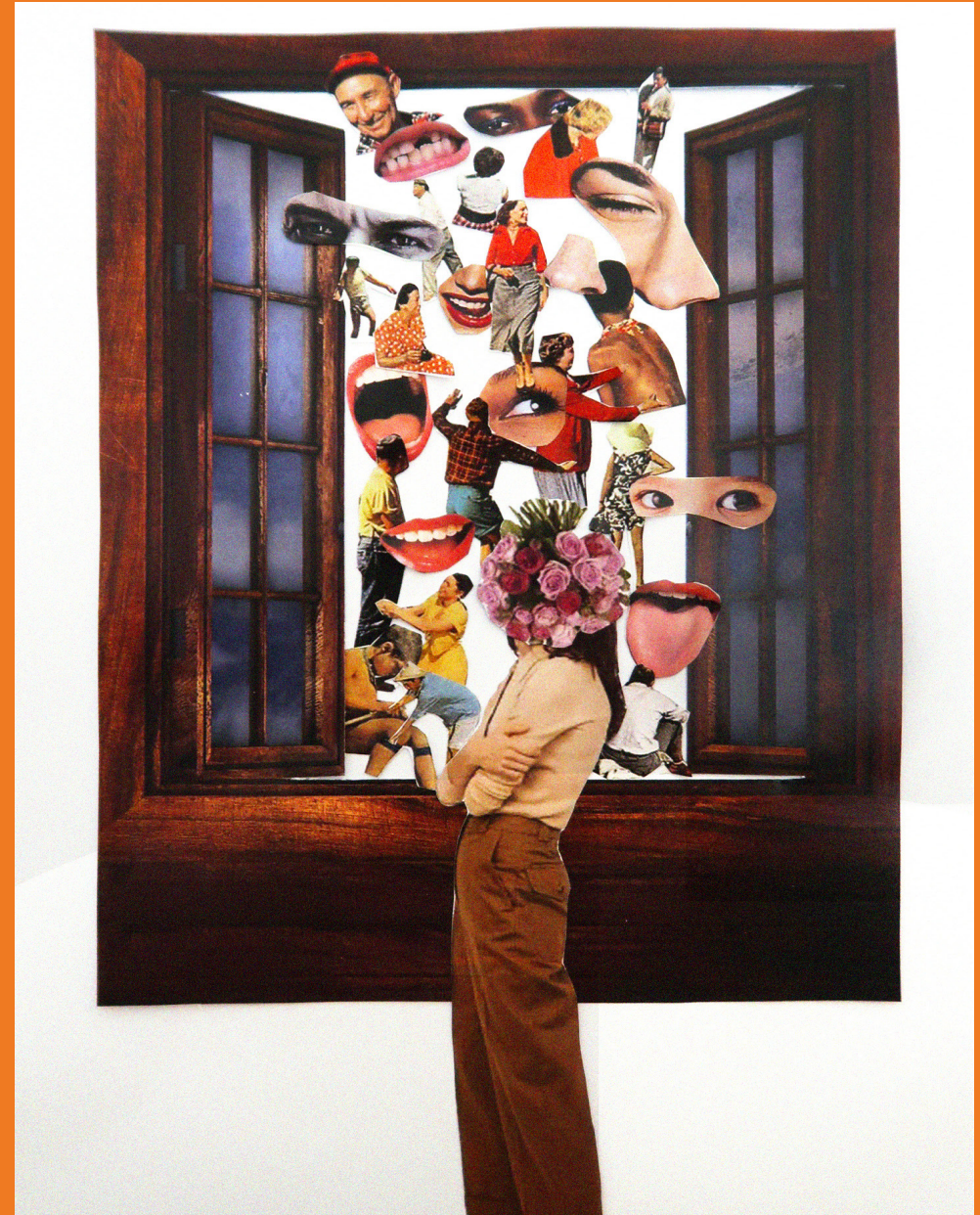




DESIGN & PEOPLE

This diagram analyzes how design can affect people's experiences and emotions from mechanisms and participation methods, and how people react to design. The relationship between design and people is mutually influencing.

**WHAT CAN YOU
“SEE” WHEN
COVER YOUR EYES ?**





METHODOLOGY

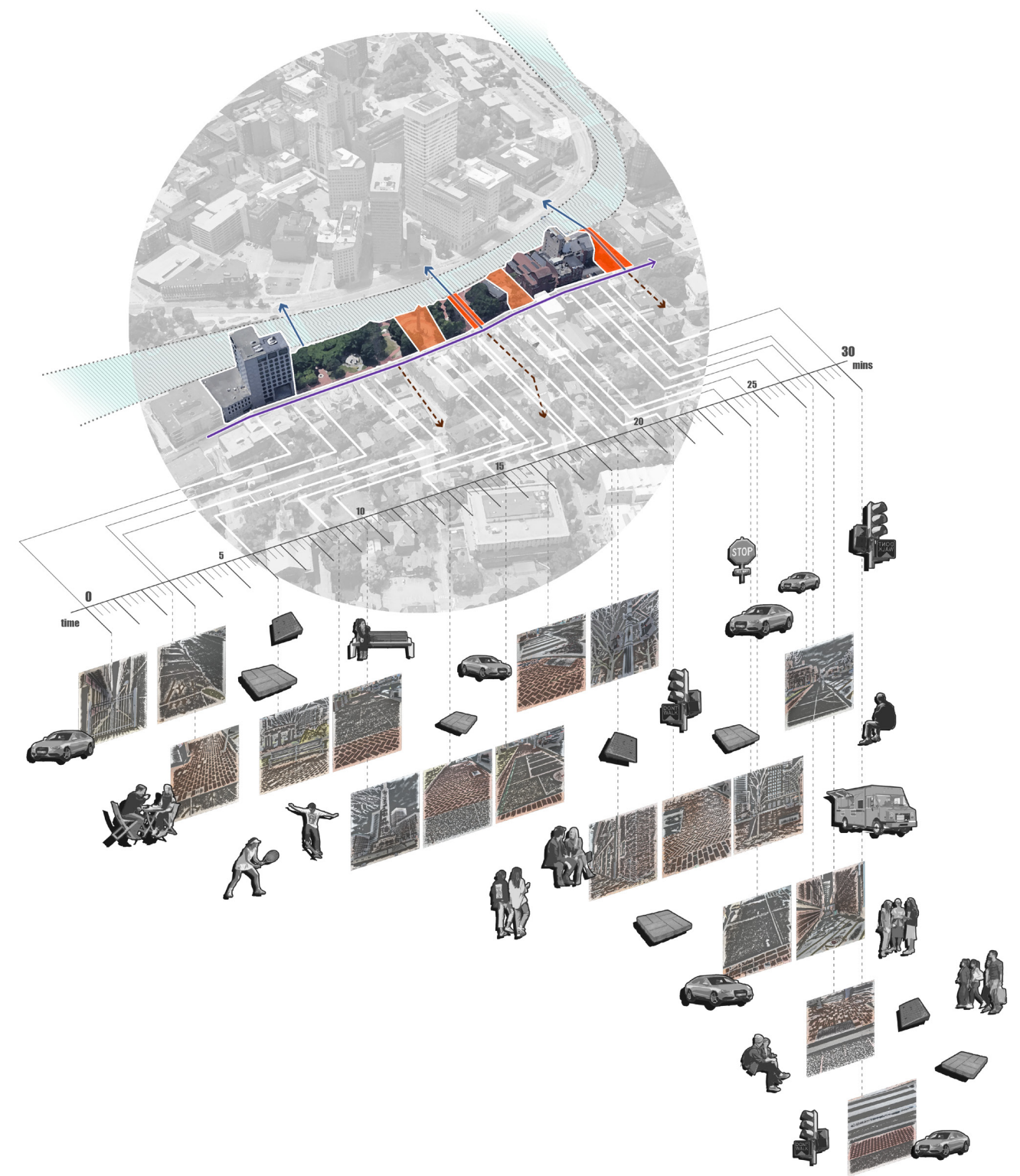
I walked through one of my most familiar ways in Providence and tried to close my eyes, pretend to be a blind person walking through, and feel the surroundings by employing other senses. By going back for the second time on the same road immediately, I recorded some of the significant signals when I couldn't use my eyes but other senses.

I tried to divide my senses separately to feel the surroundings and record what they can detect when only employing one sense. The first three maps have recorded the senses of touch, smell, and acoustics. The fourth one has recorded the instinct and visual reaction to the surroundings. The instinct implies the coordinated works of senses which can not be functioning as well as single sense working; while some visual impairment people still keep some of the visual ability, this means the detection of conspicuous color, objects, or other visual signals. The highlight parts are the perceiving areas with the marks of what kind of external stimuli. The curves show the range and intensity a single sensor can detect.



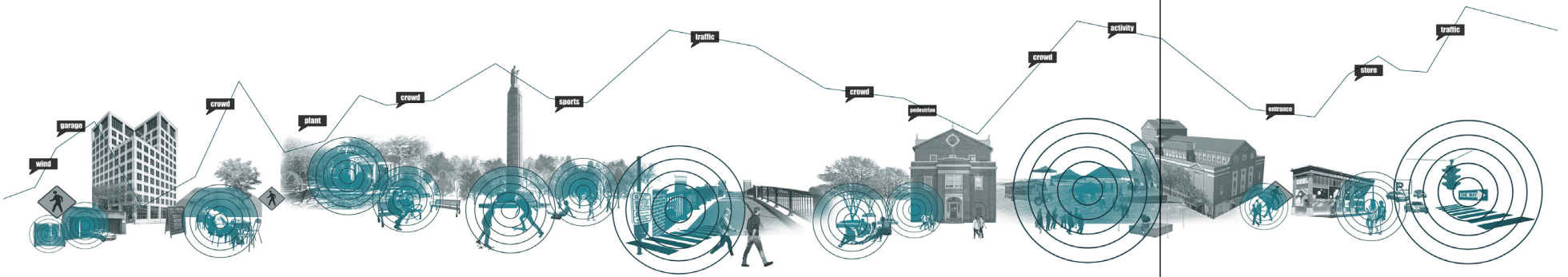
WALKING AS BLIND

In this phase, I narrowed my research down to blind people. Landscape as visual art is hard to appreciate by people who lost sight. To compensate for their lost sight, blind people will employ other sensors to perceive the world and receive information, which creates a different world from abled people's. To better understand how their sensory input helps them "see" the surrounding world, I covered my eyes and picked one route for testing. I recorded the specific moments when the surrounding environment stimulation became strong, and the factors that caused such stimulus.

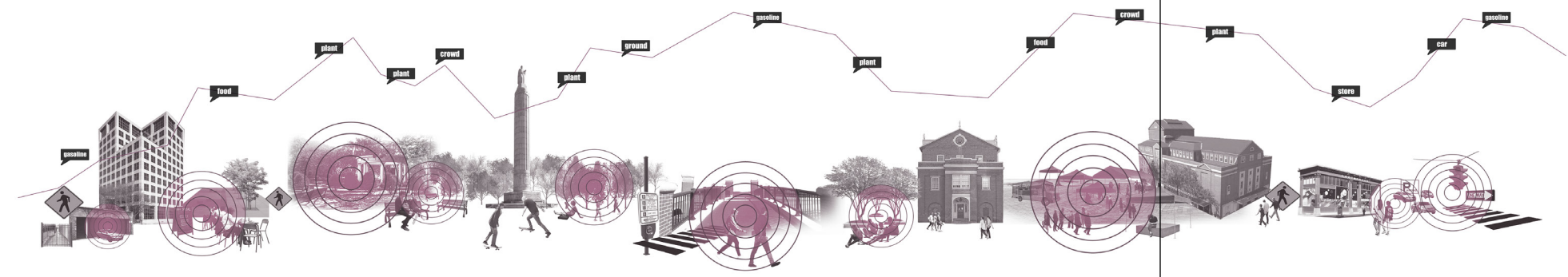




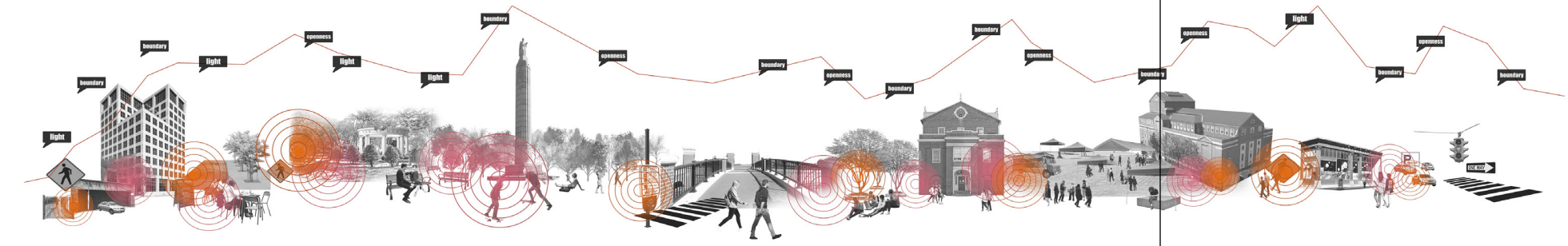
TOUCH



ACUSTIC



SMELL



INSTINCT & VISUAL

SENSORY EXPERIENCES

Without eyes, we often “ignore” some obstacles and block certain signals when we stay or walk through space. The world will be different as we cover our eyes and employ other sensors to perceive the environment. We can feel a different range of environments by using a single sensor to capture information. Touch, acoustic, smell, visual, taste will get different signals and play an important role in “seeing” and navigating.

For a better understanding of how their senses help them “see” the surrounding world, I covered my eyes and picked one route for testing. I recorded the specific moments when the environment stimulation became strong.

As I pretended to blind people walking on the road, I tried to isolate my existing sensory to detecting the surrounding environment. From acoustic, smell, touch and visual (some people still keep the ability of sight), I mapped four new environment perceiving maps based on the single work of each sensory. Each of them can detect different ranges of the environment and capture different signals from the surroundings. Based on my own on-site experience, I had a preliminary awareness of how sensory works help us perceive the environment.

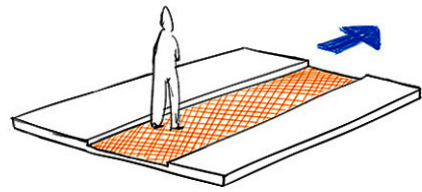


COMPENSATION SENSORY

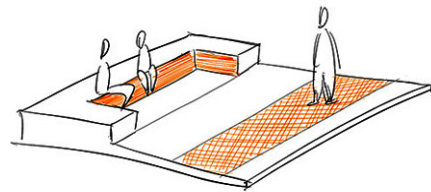
To help blind people perceive the world and receive information, they use other sensors to capture certain information. Each sensor will capture unique information and be triggered by different signals. I analyzed my experiences as a blind person and researched their sensors' working mechanisms. The compensation drawing is mapped based on the on-site experiences conducted previously. The size of the circles indicates the degree of information received, and the degree of a certain sensor being relied on. The icons show what kind of certain information can be detected, implying the potential design strategy entry points. The strategies can be employed based on their sensory experiences.

HOW DO YOU WALK THROUGH SPACE AS BLIND ?

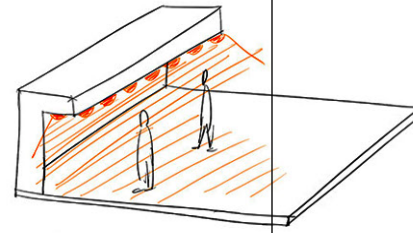




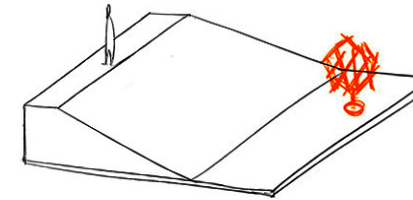
PAVING



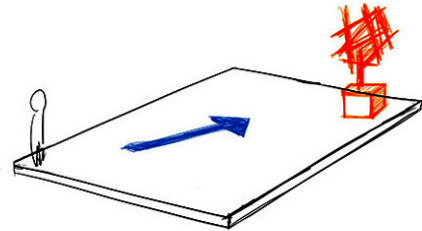
SIDED SEATING



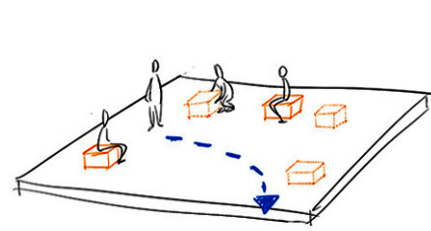
ARCHITECTURE LIGHT



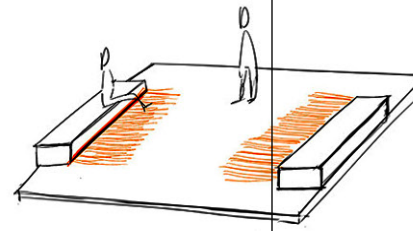
ELEVATED VANTAGE



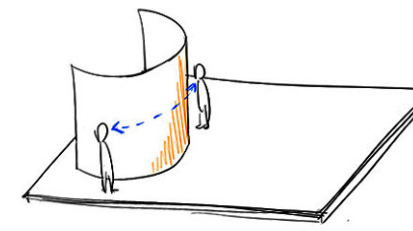
LANDMARKS



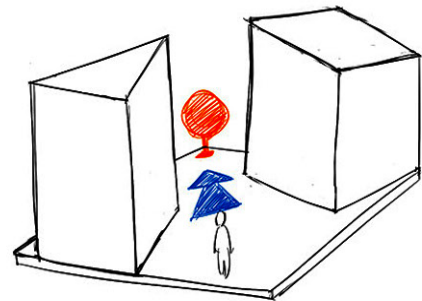
FLEXIBLE SPACE



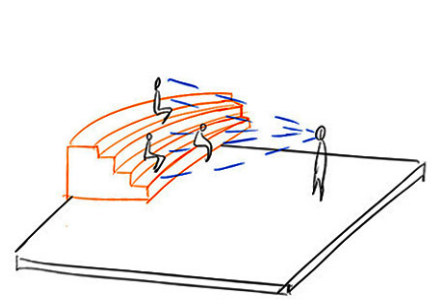
INDIRECT LIGHT



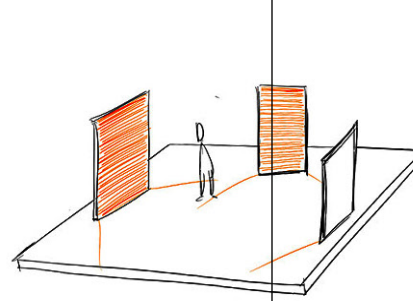
CURVED SURFACE



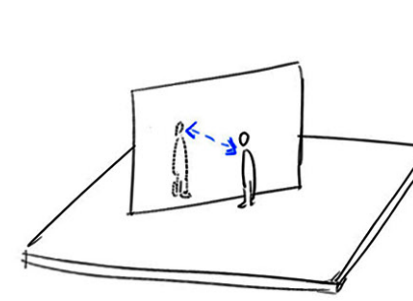
VIEW CORRIDOR



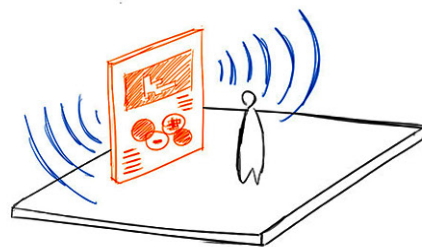
AMPHITHEATER



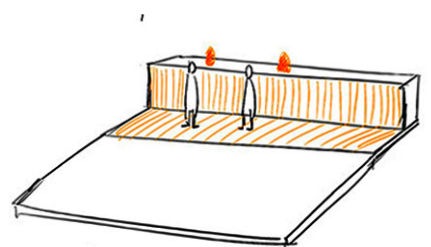
REFLECTED LIGHT



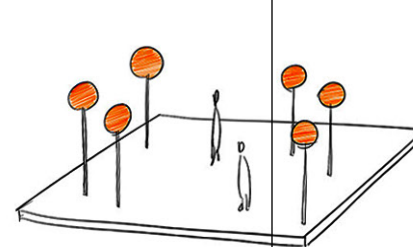
TRANSPARENT SURFACE



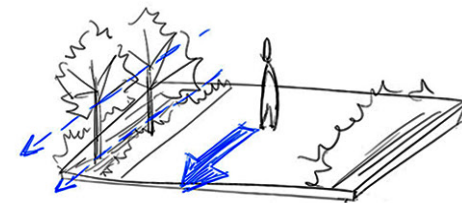
GRAPHICS



PEDESTAL SURFACE



DIRECT LIGHT



CLEAR SIGHT ZONE

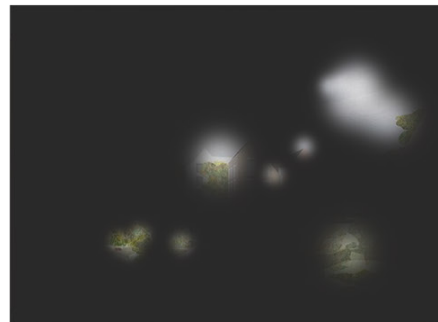
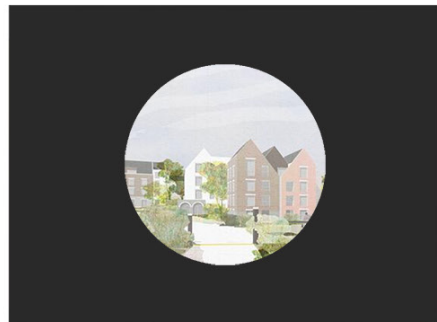
SOLUTIONS FOR BLIND PEOPLE

Walking through Providence, I take a look at how the current city design navigates people and how to deal with the special needs people. I recorded the findings during my city journey and classified them. From my recording and analysis, I made a solutions diagram. The solutions diagram is developed based on my observations and summary, what kind of methods we can employ to convey information and navigate people though space. I think the following methods can be used to navigate people, especially special people to navigate and recognize the environment.

FULL VISION



VISION IMPAIRED



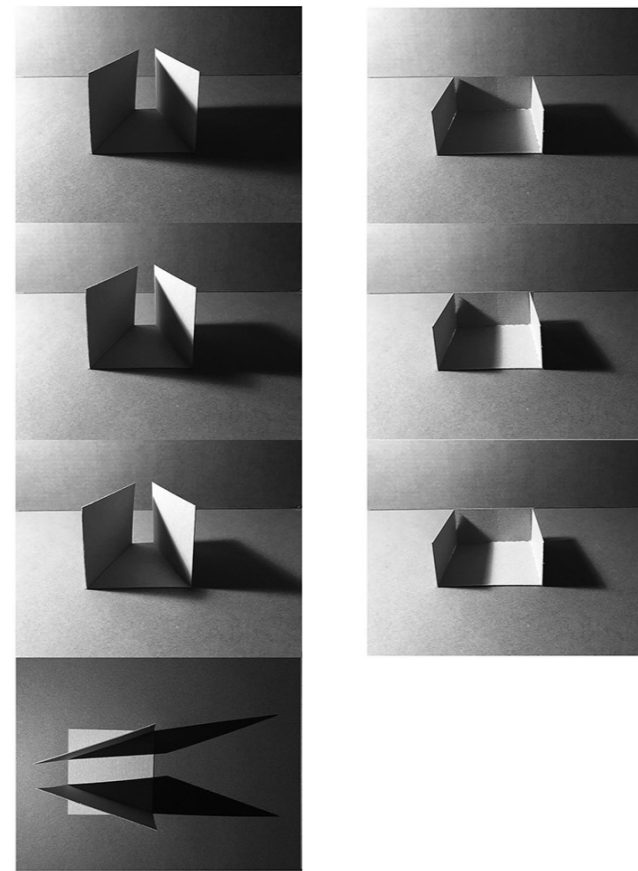
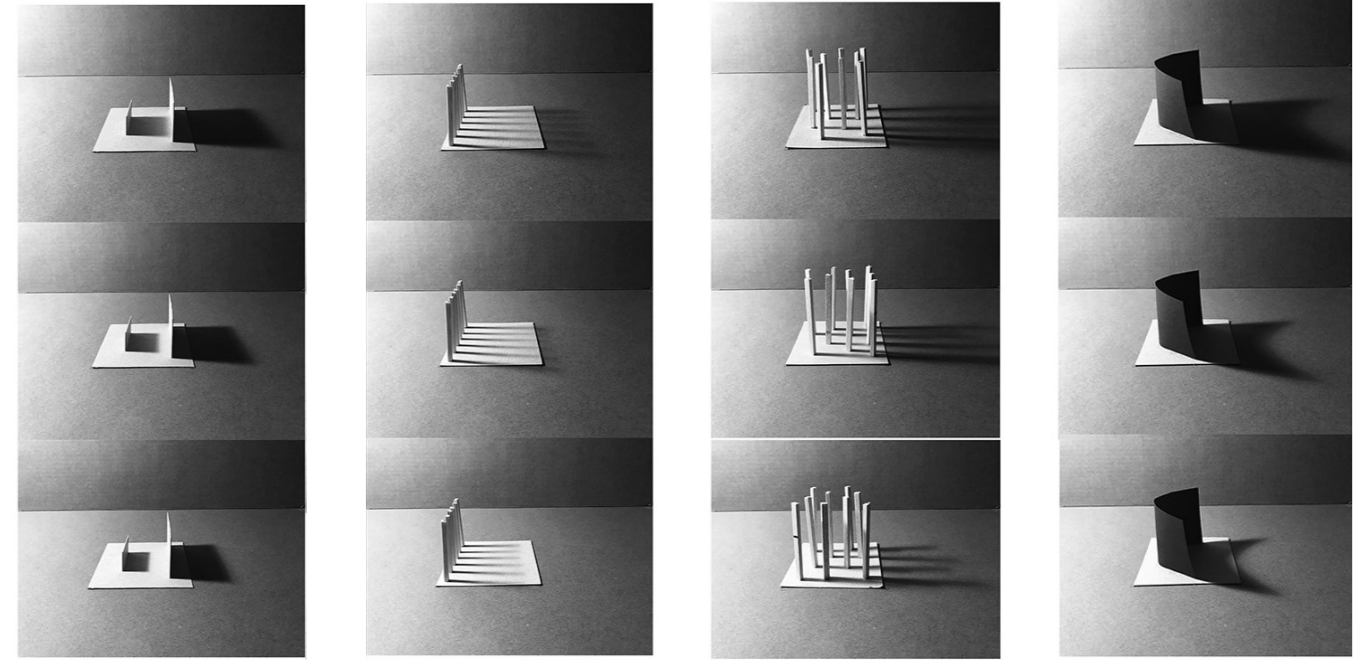
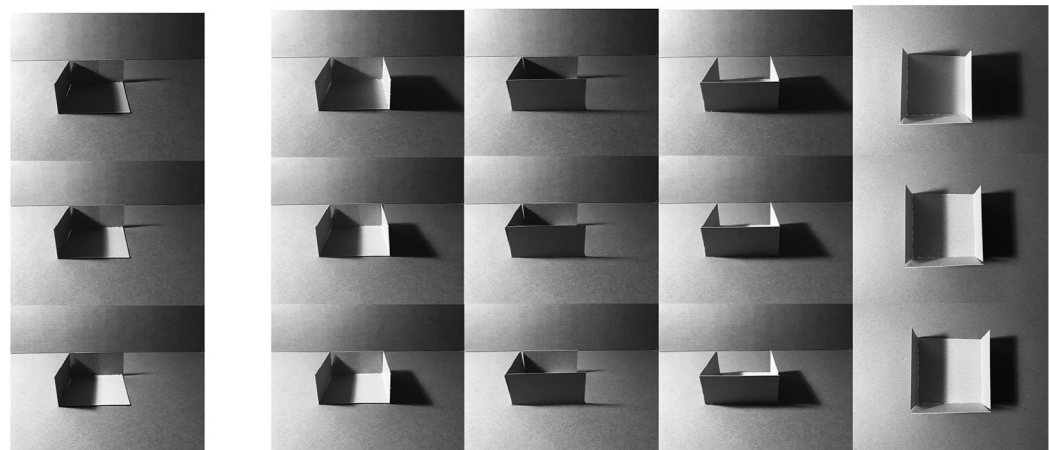
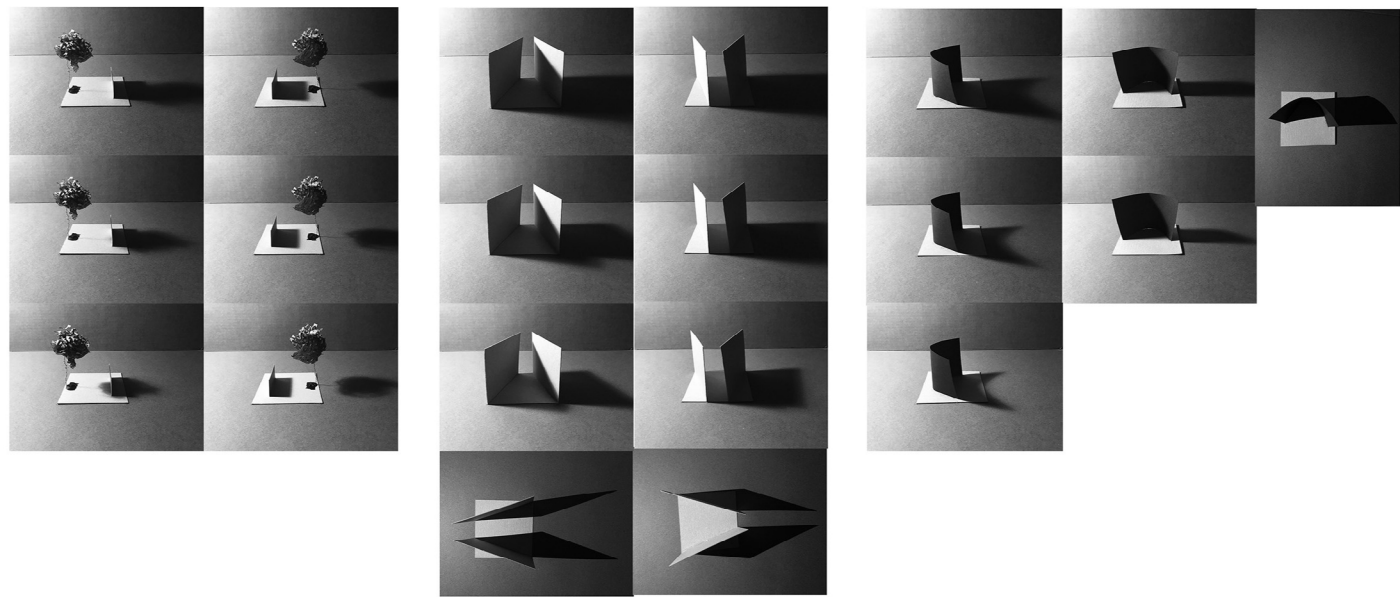
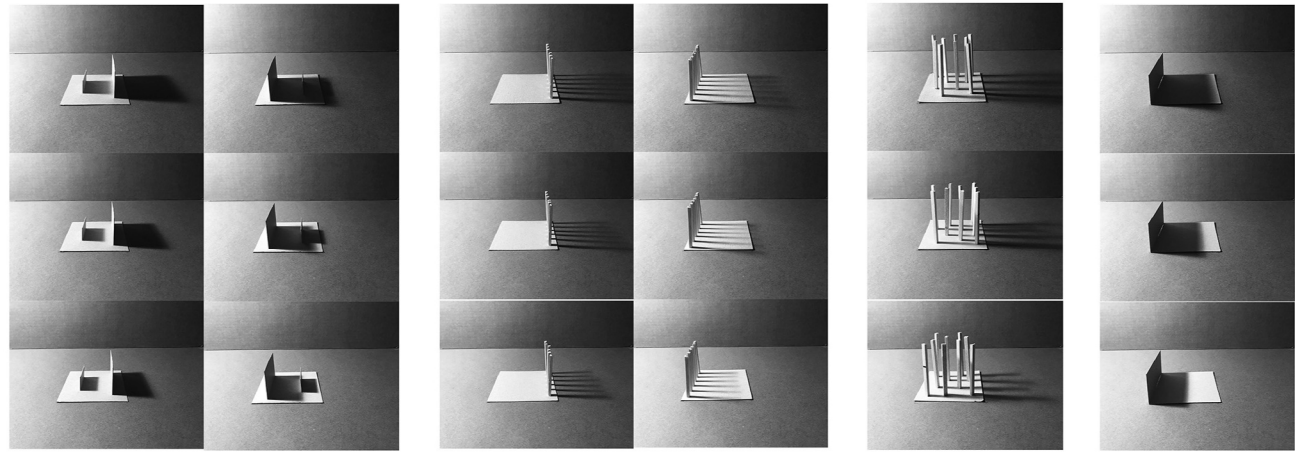
BLIND



DESIGN FOR VISION IMPAIRED PEOPLE

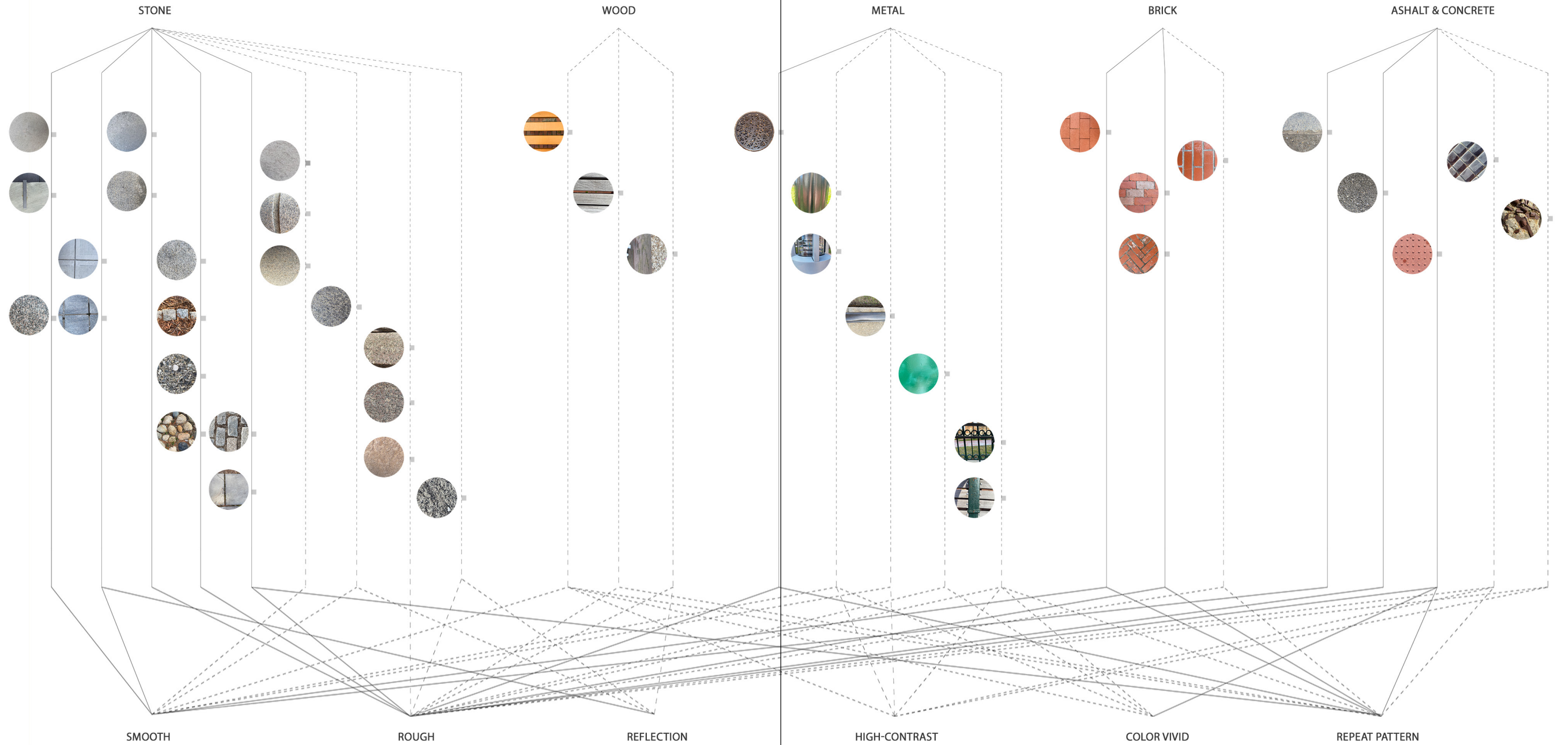
Blind people can be divided into full-blind and visually impaired. From my solution diagram, I found some exciting points. For both serving visually impaired people and normal people, I kept narrowing down my study of people who still keep partial abilities of vision, finding ways of enhancing the environment experiences and accentuating the critical nodes.

For the people who still keep the ability of sight but not fully blind, vision detection is especially important. They have all sorts of different levels of vision damage and see the world differently. Developing a method for stimulating their vision and other sensors is critical.



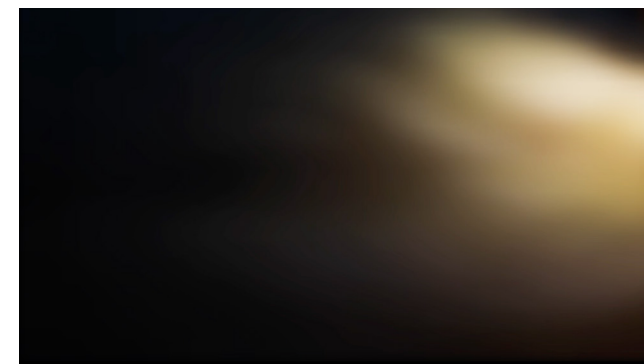
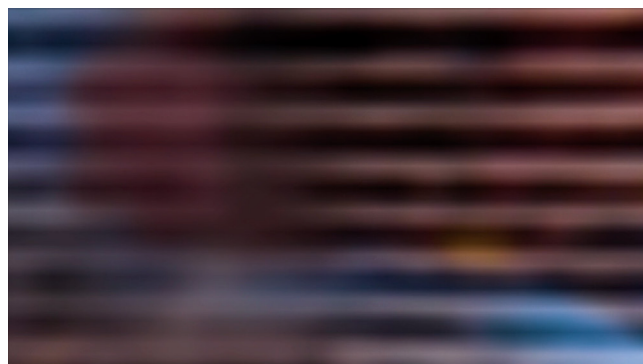
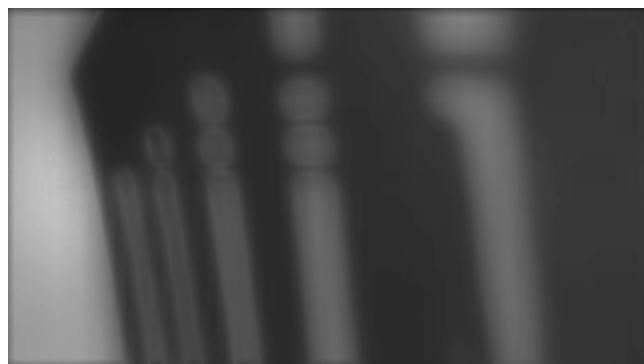
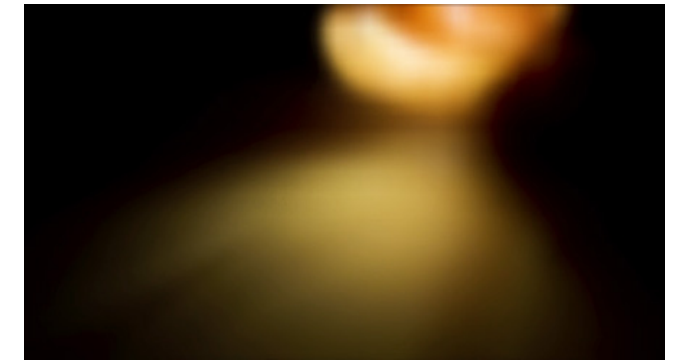
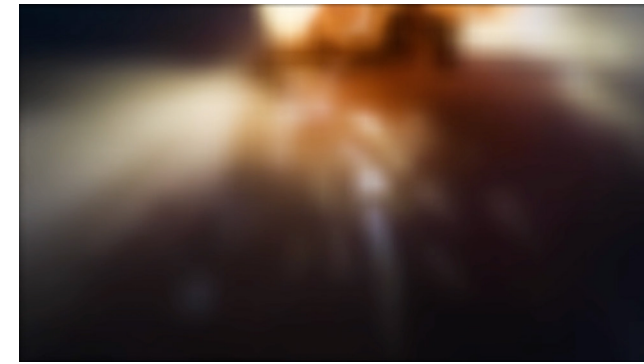
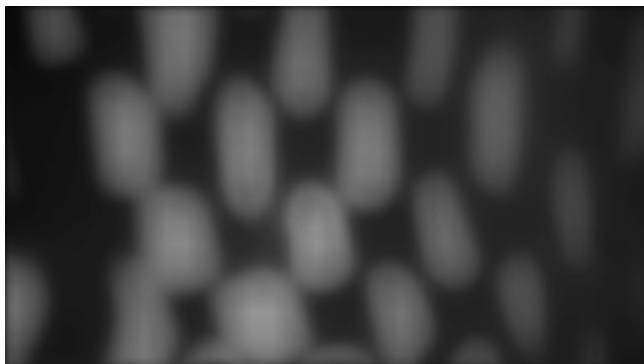
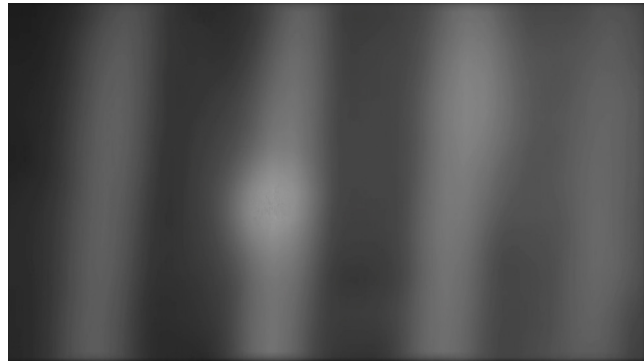
SPACES & LIGHT RESEARCH

The space organization and environment materials are playing an important role in direction and place indication. I made a series of models to mimic the typical landscape spaces and tested how space influences people's experiences. Spaces affect the light and shadow changes and rhythm in different conditions.



MATERIALS RESEARCH

The materials are also critical for us to receive information. Materials also change our perception of the environment. I made the research of typical landscape materials, collected and assorted based on the use and attributes. I found some materials are high contrast or have vivid color, or create certain patterns, which will be helpful for stimulus sight.



STIMULUS EXPLORATION - VIDEO

To better understand what the world is looks like in visually impaired people's eyes and test my findings for previous research, I conducted a video for applying my theory. The video shots the color indication, pattern, and rhythm, also the light effect, to verify my findings.

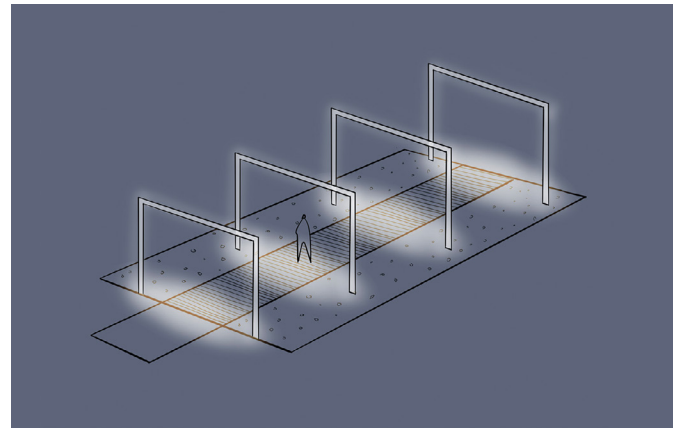
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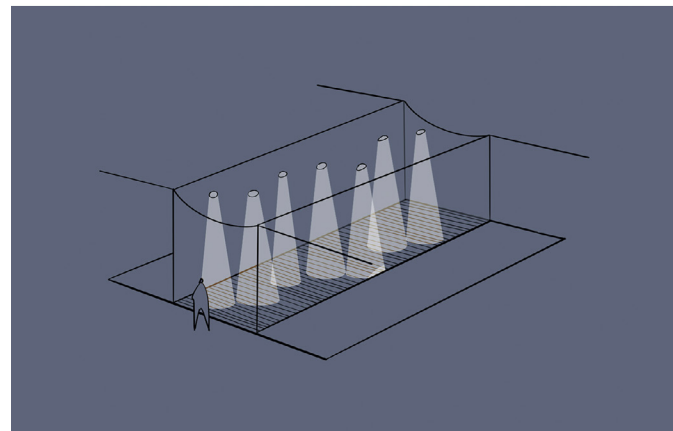
PRINCIPLES

Through these studies, I think the visual stimulation is mostly caused by contrast and rhythm, they can work well in place identification and navigation. The strong contrast lies in the color and brightness. The rhythm is created by the pattern change.

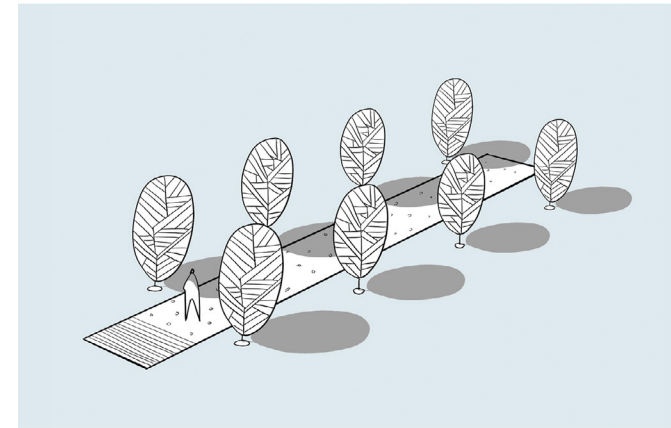
The solutions for enhancing spatial awareness, navigating people moving through space can be summarized as the following: the pattern repeat, color employ, lighting indication. The idea of building an environment system and organization can help both visually damaged and abled people moving through the space. The build of a system or organization of space indication and navigation will benefit people crossing the space boundaries and perceiving the environment.



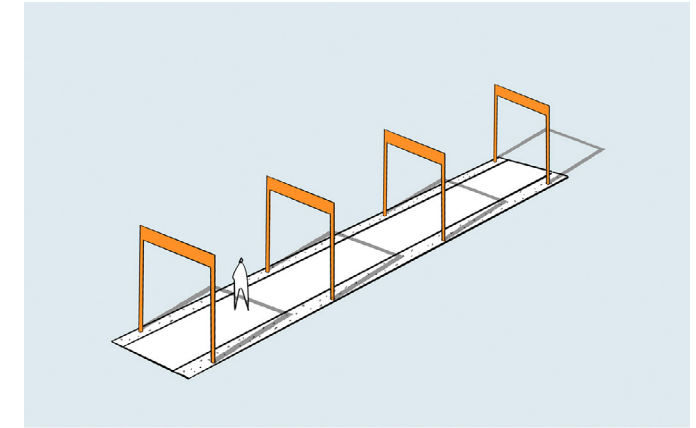
LIGHT INDICATION



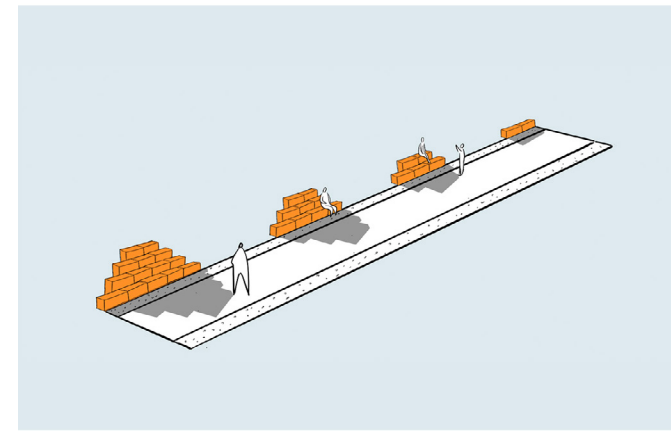
LIGHT INDICATION



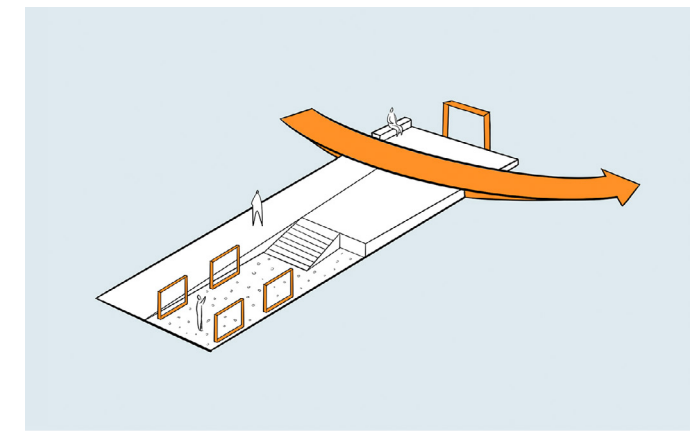
SHADOW PATTERN
EVENLY REPEAT



SHADOW PATTERN &
COLOR SYSTEM



SHADOW PATTERN
REGULAR REPEAT



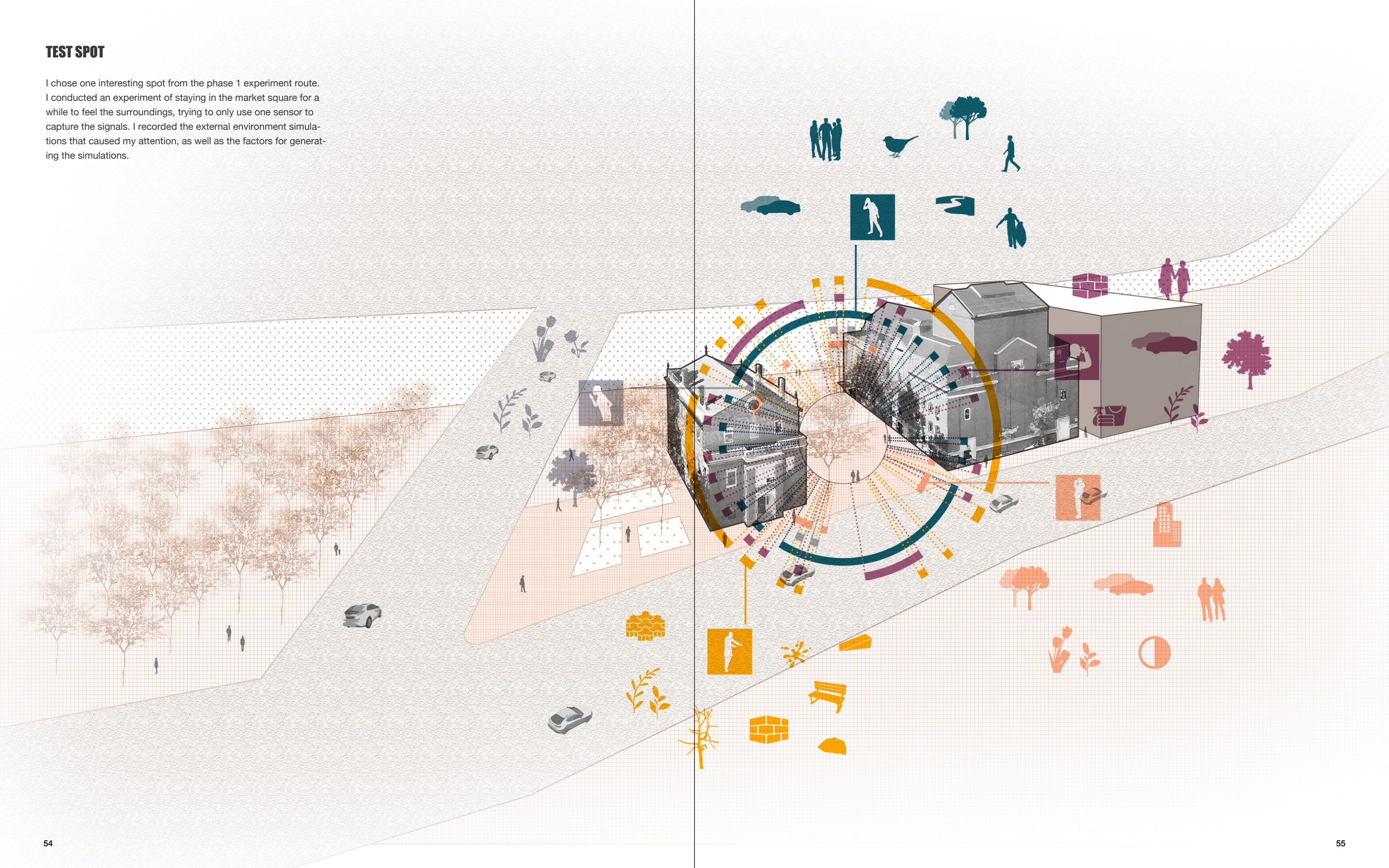
COLOR SYSTEM
POP UP

**HOW CAN WE DO
TO TRANSFORM
SPACE FOR
EVERYONE?**



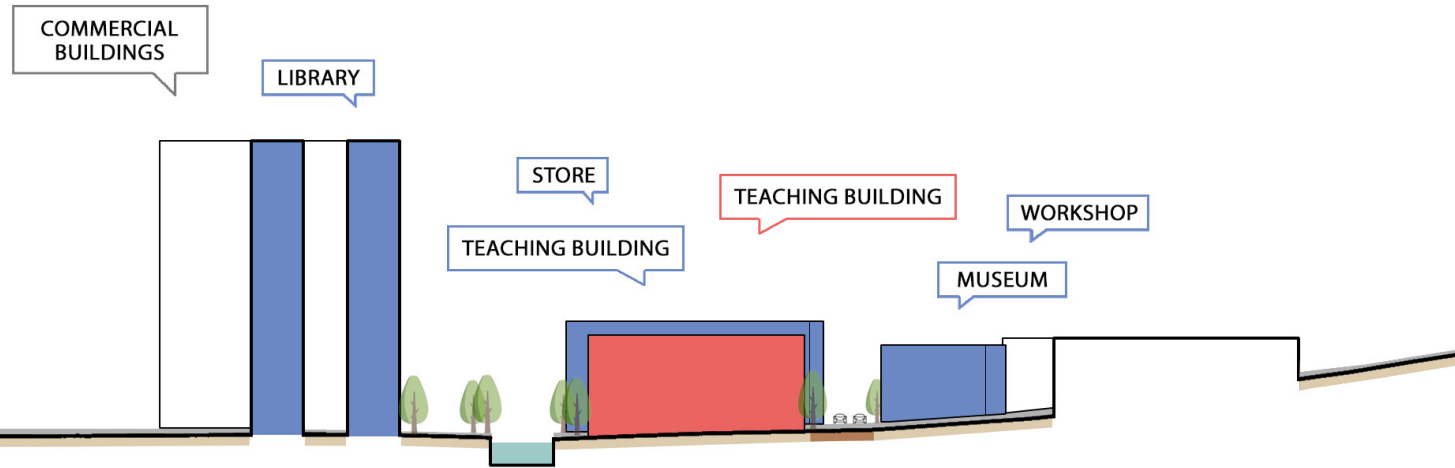
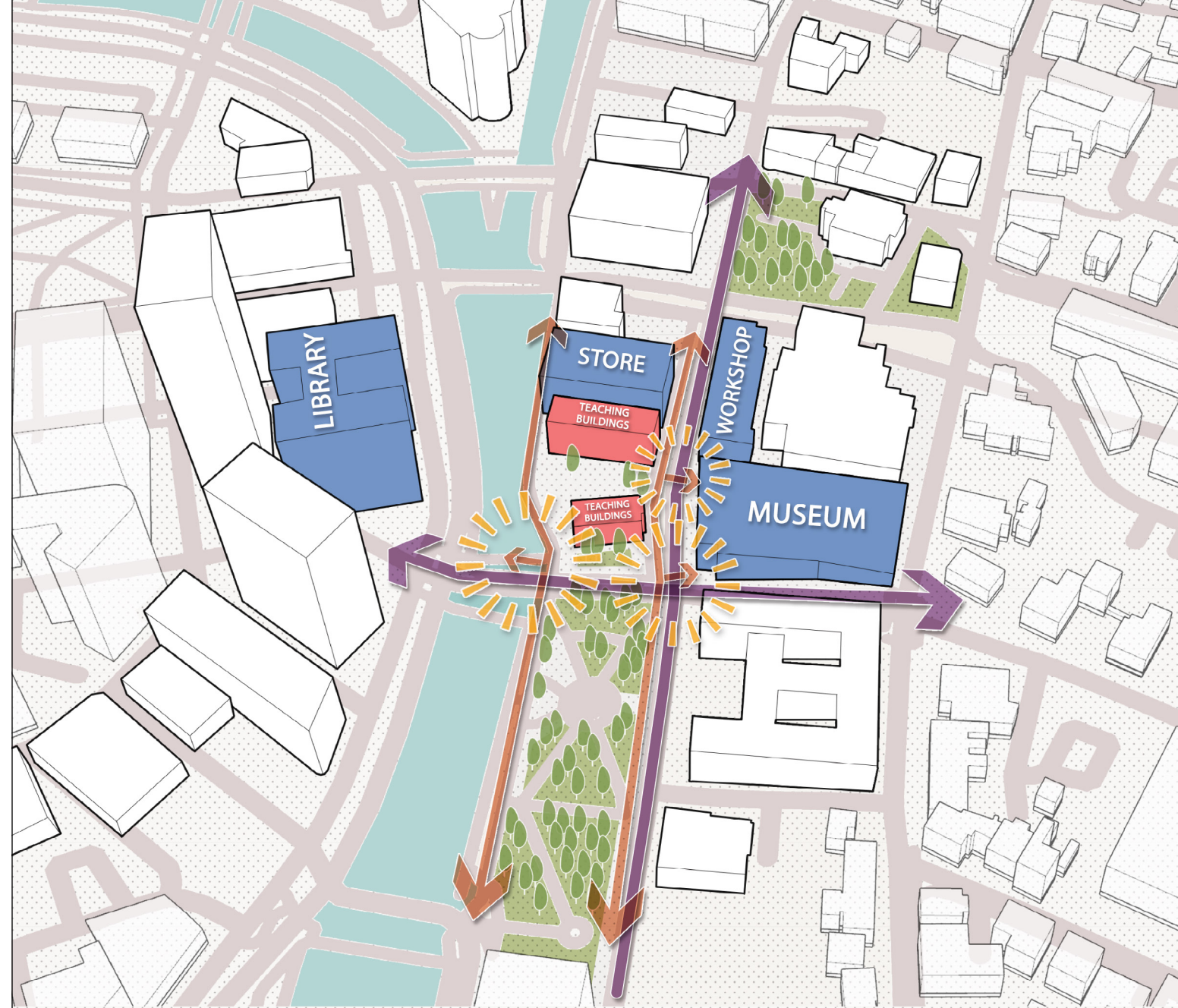
TEST SPOT

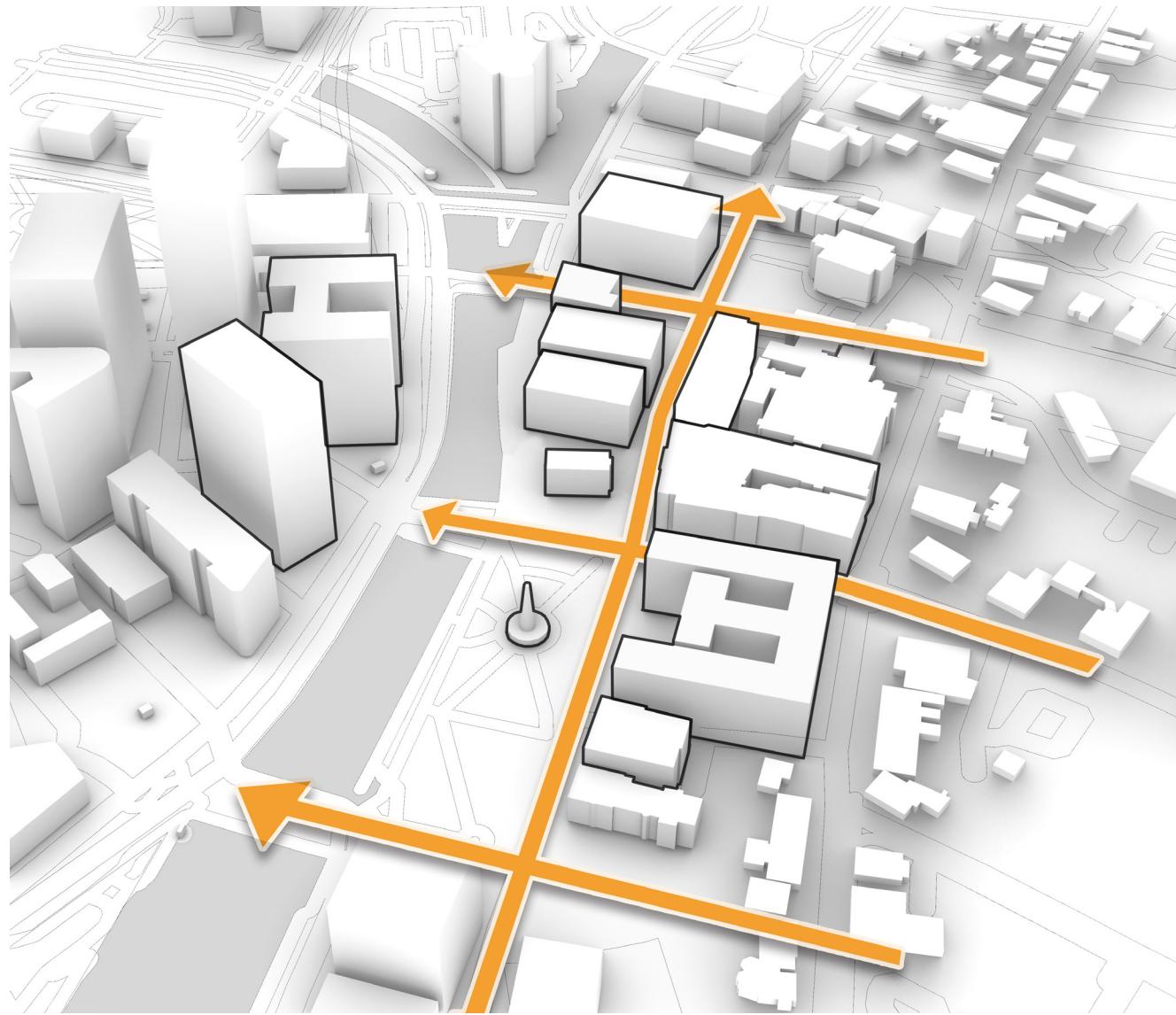
I chose one interesting spot from the phase 1 experiment route. I conducted an experiment of staying in the market square for a while to feel the surroundings, trying to only use one sensor to capture the signals. I recorded the external environment simulations that caused my attention, as well as the factors for generating the simulations.



EXISTING CONDITIONS

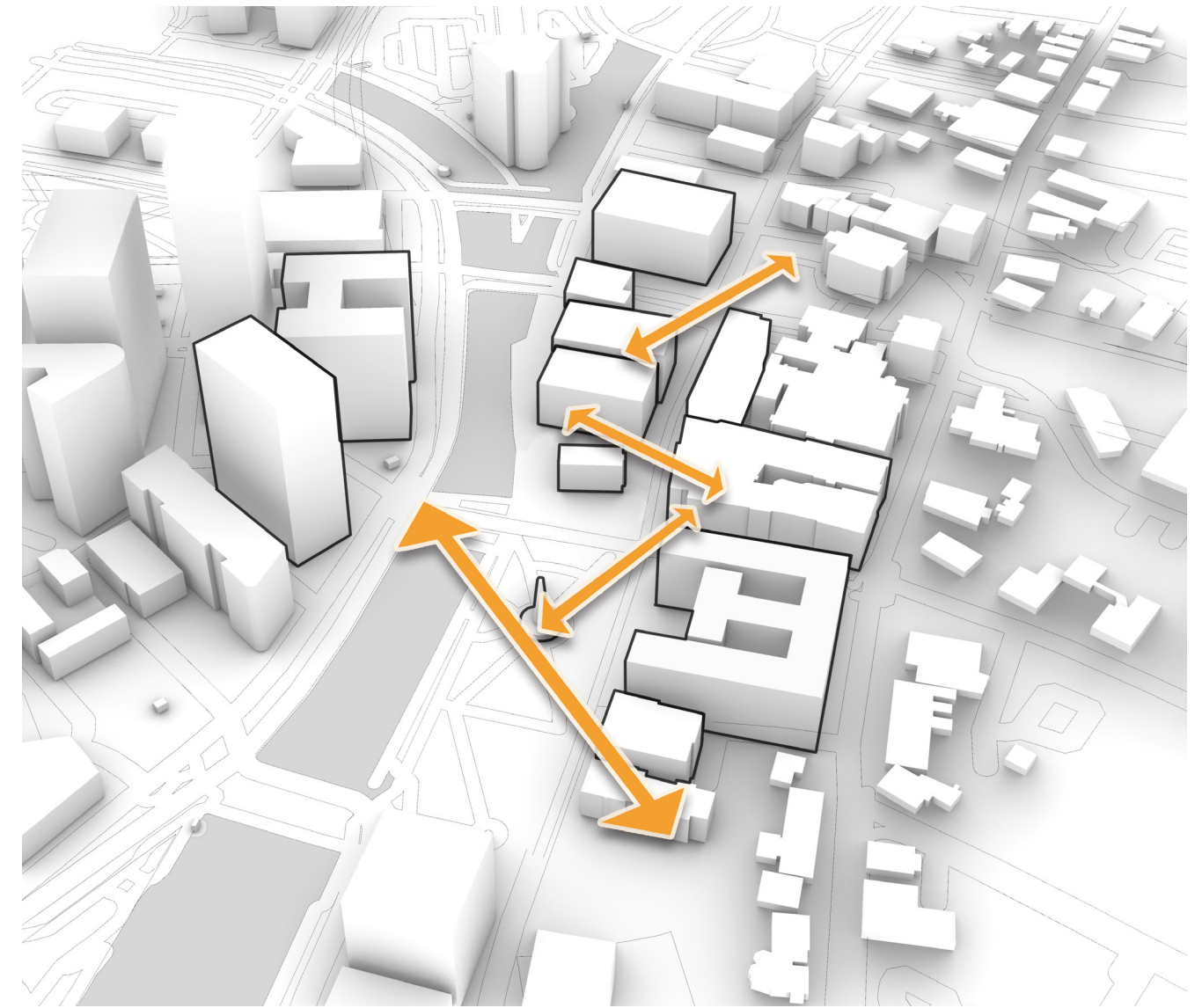
The testing spot market square is surrounded by river and city roads and is a critical transportation node for people to move through all sides of directions. Several school buildings stand around the square, including the museum and library, which are two important school facilities and used often by students. Students often walk through the square to cross the two sides of the river for commuting. The market square becomes one of the gathering points as well as transportation knots. Students and pedestrians use this place to cross the two sides of the river and hold some events. The current transportation system is complex and dangerous for pedestrians, facing multiple road crossing points.





EXISTING CONNECTION

The existing connection between spaces is fragmented and has multiple road crossings. Pedestrians have to face the complex route and make decisions of which route should be taken for their destinations.

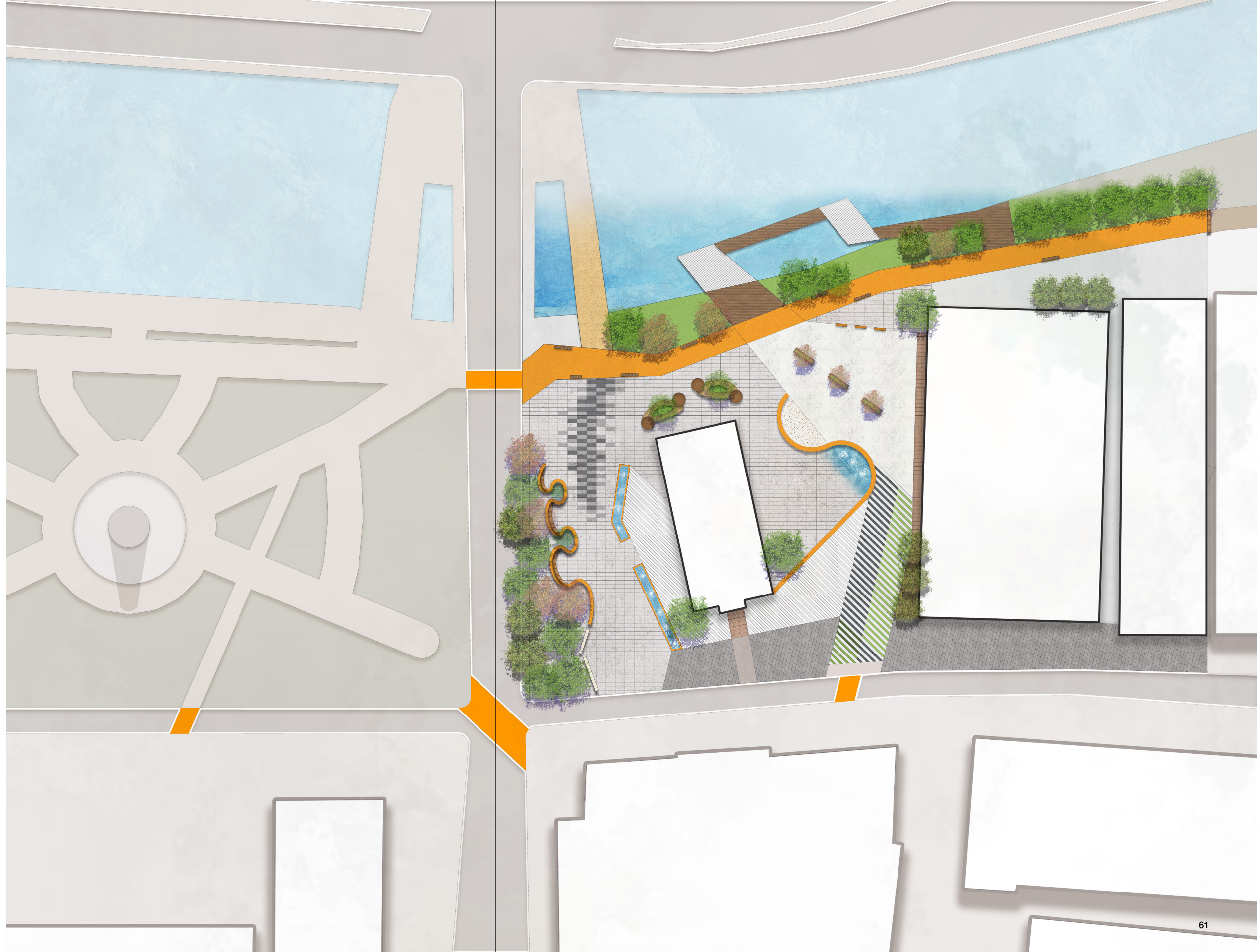


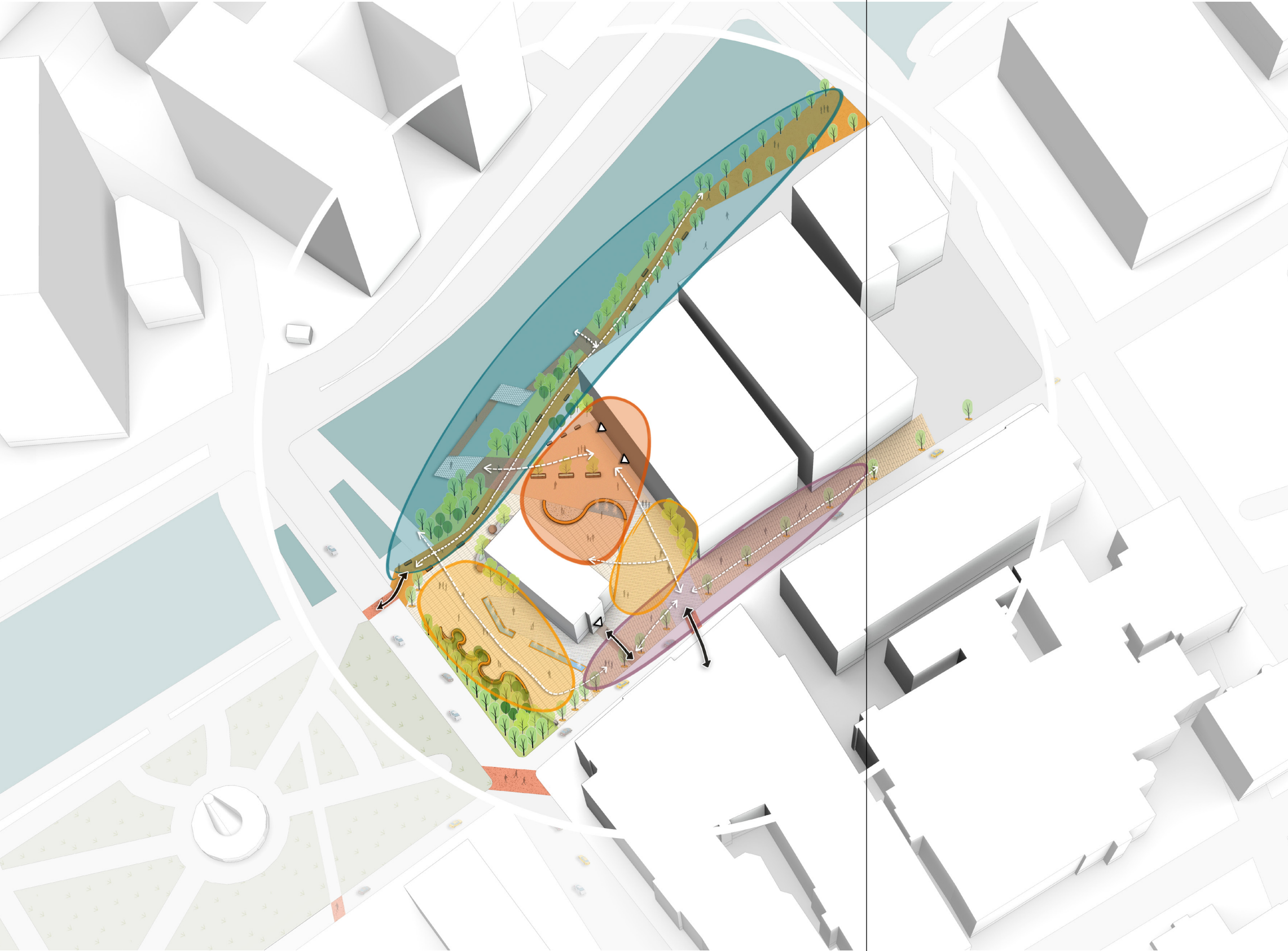
PROPOSED CONNECTION

I proposed a refined connection around the market square which will reduce the road crossing points and strengthen the connection between spaces. Pedestrians will have a smoother and logical transition between each place and face a lesser risk of the crossroad.

PLAN

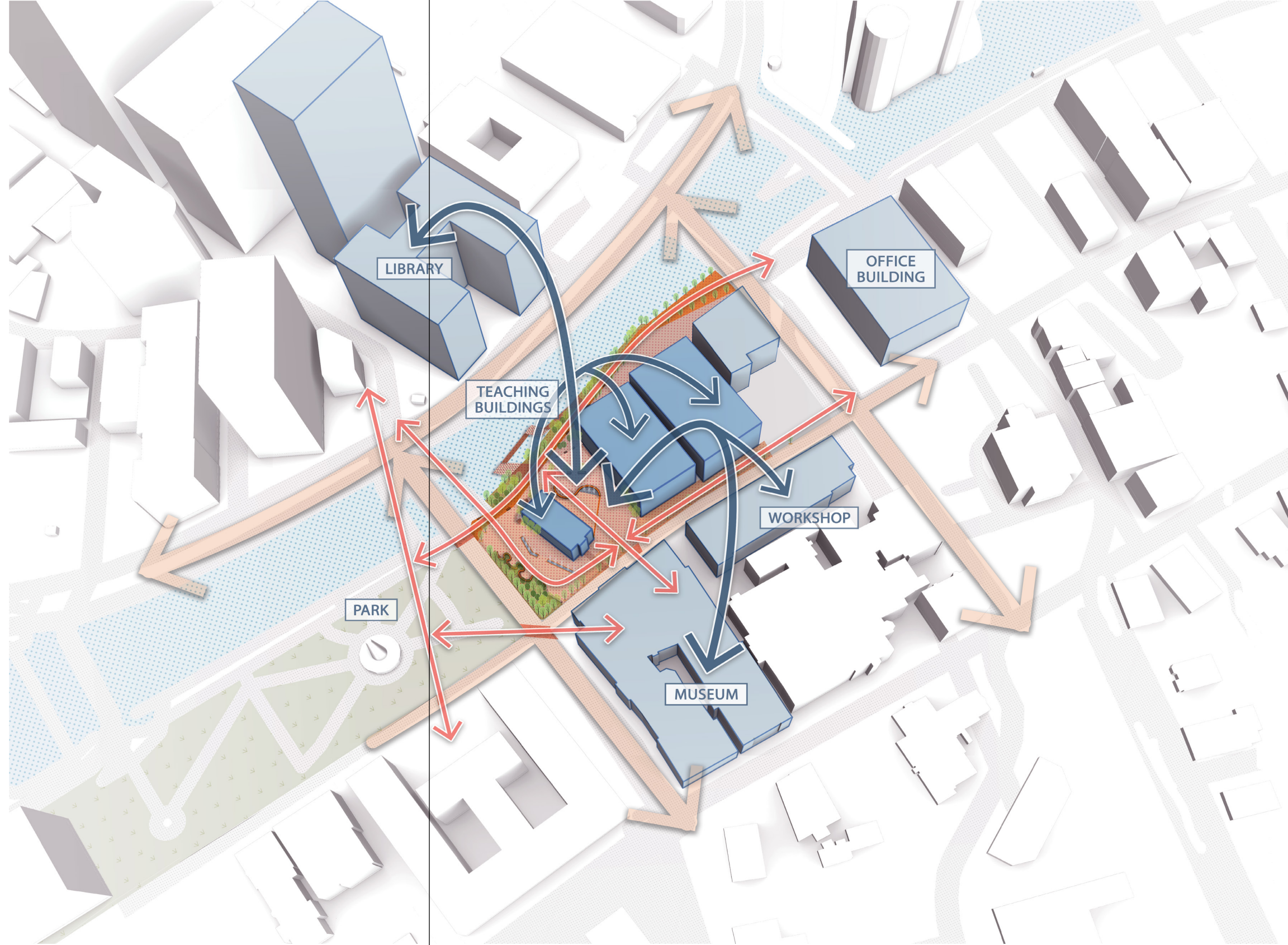
The reformed market square uses various pavements to direct people's movement and hint at the transition of spaces. By placing landscape elements such as water fountains, curvilinear benches and so on, to stimulate multi-sensory to convey space information and navigate people. The new market square connects two sides of the river and also makes the connection with nearby parks, crossroad buildings, providing a smoother transition between spaces.





ZONES & FLOW

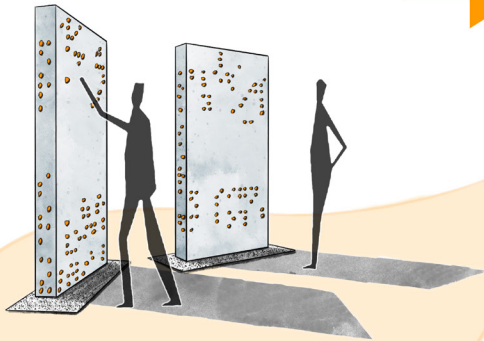
Square is divided into several zones: the entrances, corridors, plaza, and riverside. Fulfilling the function as a transition point and gathering space. Zones are connected by a paving system and highlighting the boundaries for people to recognize and navigate. The vision-impaired people can rely on the indication elements to activate their sensors for recognition and navigation. The normal people also will earn enhanced space experiences from this sensory accentuated landscape.



CONNECTIVITY

As an important shared space both for the school students and the public to walk through and rest, the square is responsible for connecting surrounding buildings and spaces. The new connection across from the roadside to the other riverside, linking the fragmented spaces as a system, serves for people to move through quickly and directionally.

The **tactile signs** tell me about the route and place information.



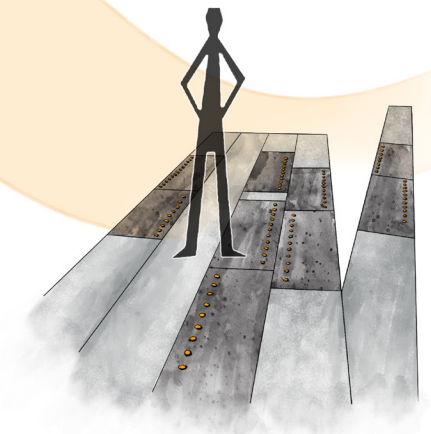
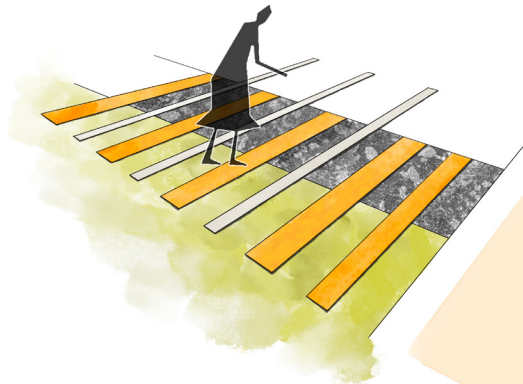
creek shape paver hints the water feature ahead



water feature's **mist and sound** stimulus multiple sensors

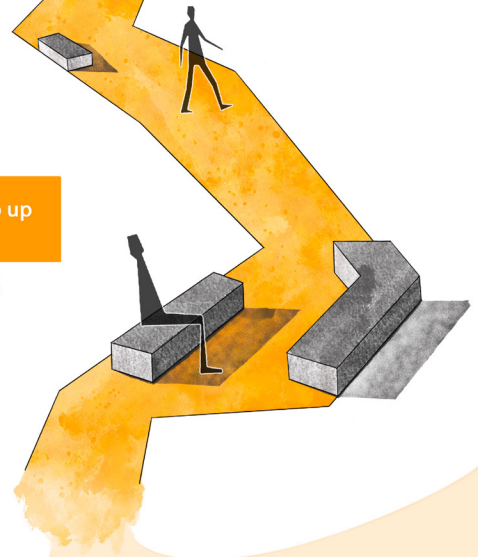


The **paving pattern** directs the route and indicates the spatial change.



reflective dots indicate the forward direction during daytime and night

Bright color painted road pop up directs to next destination

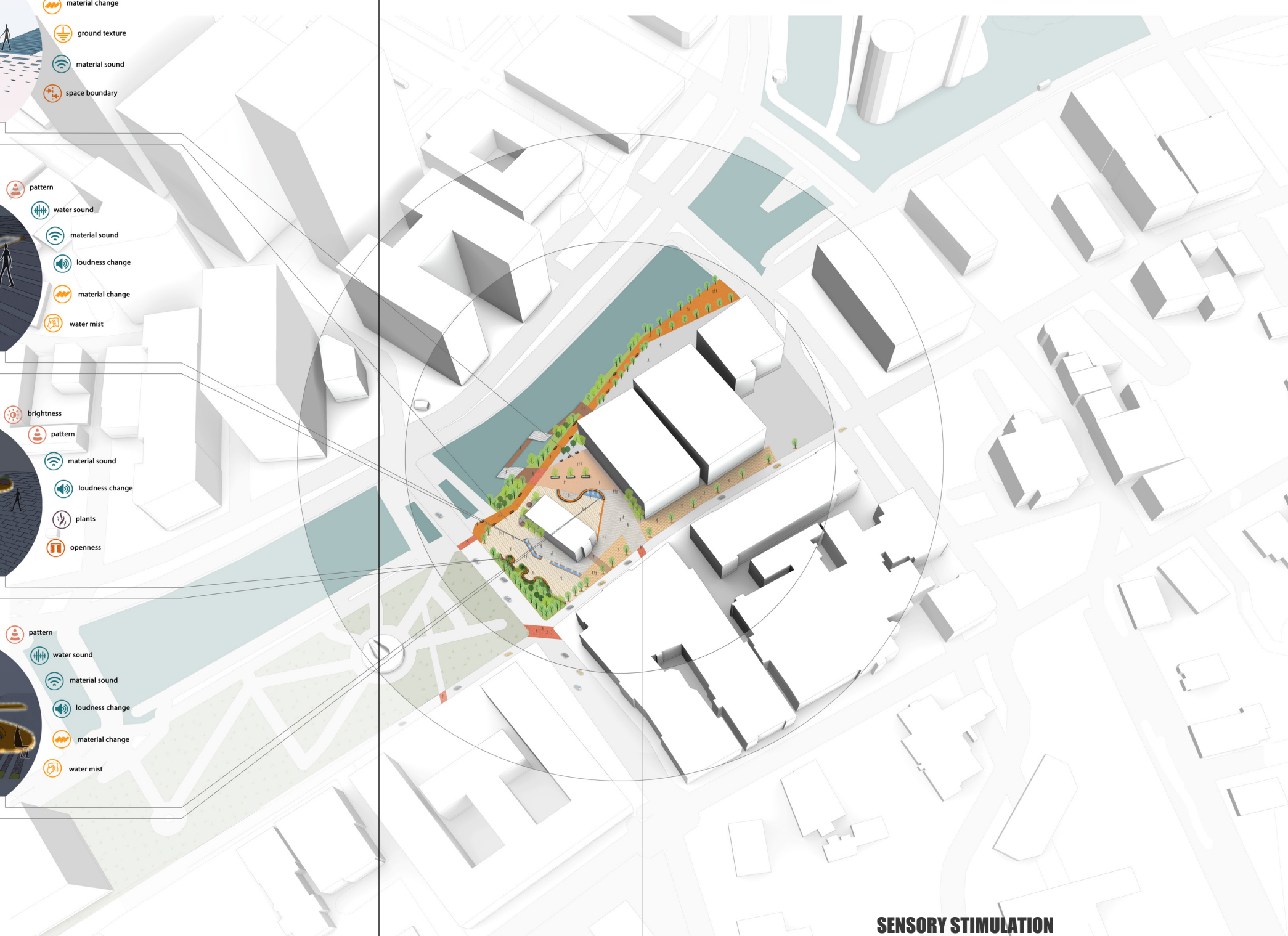
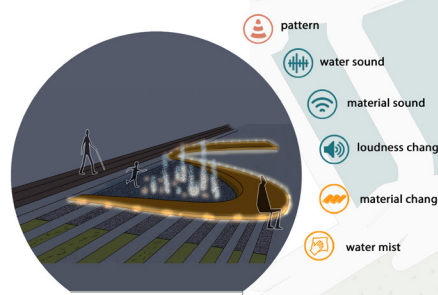
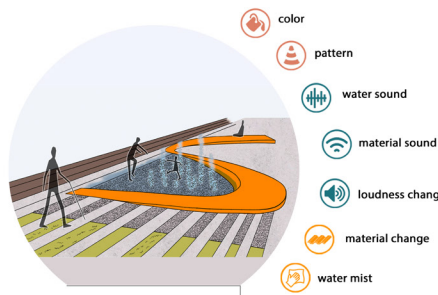
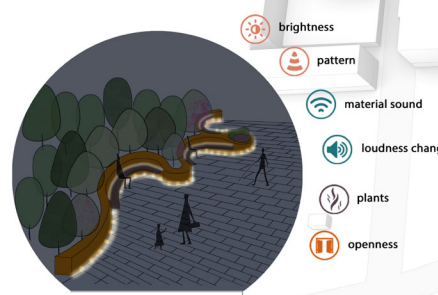
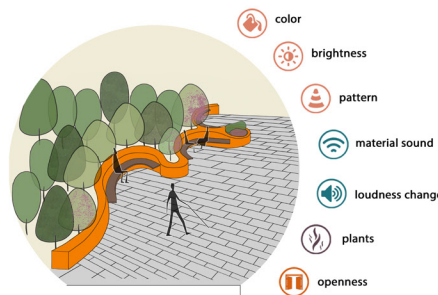
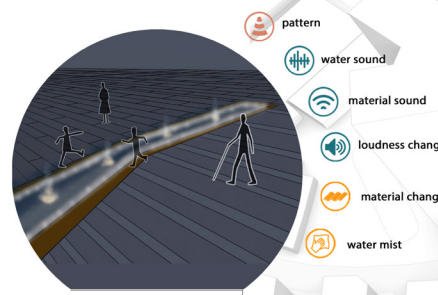
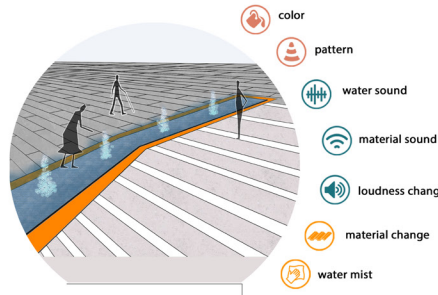
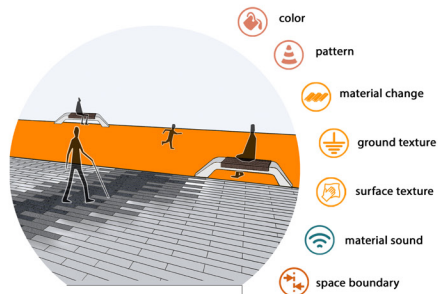


liner curve bench with strip light navigates me both daytime and night



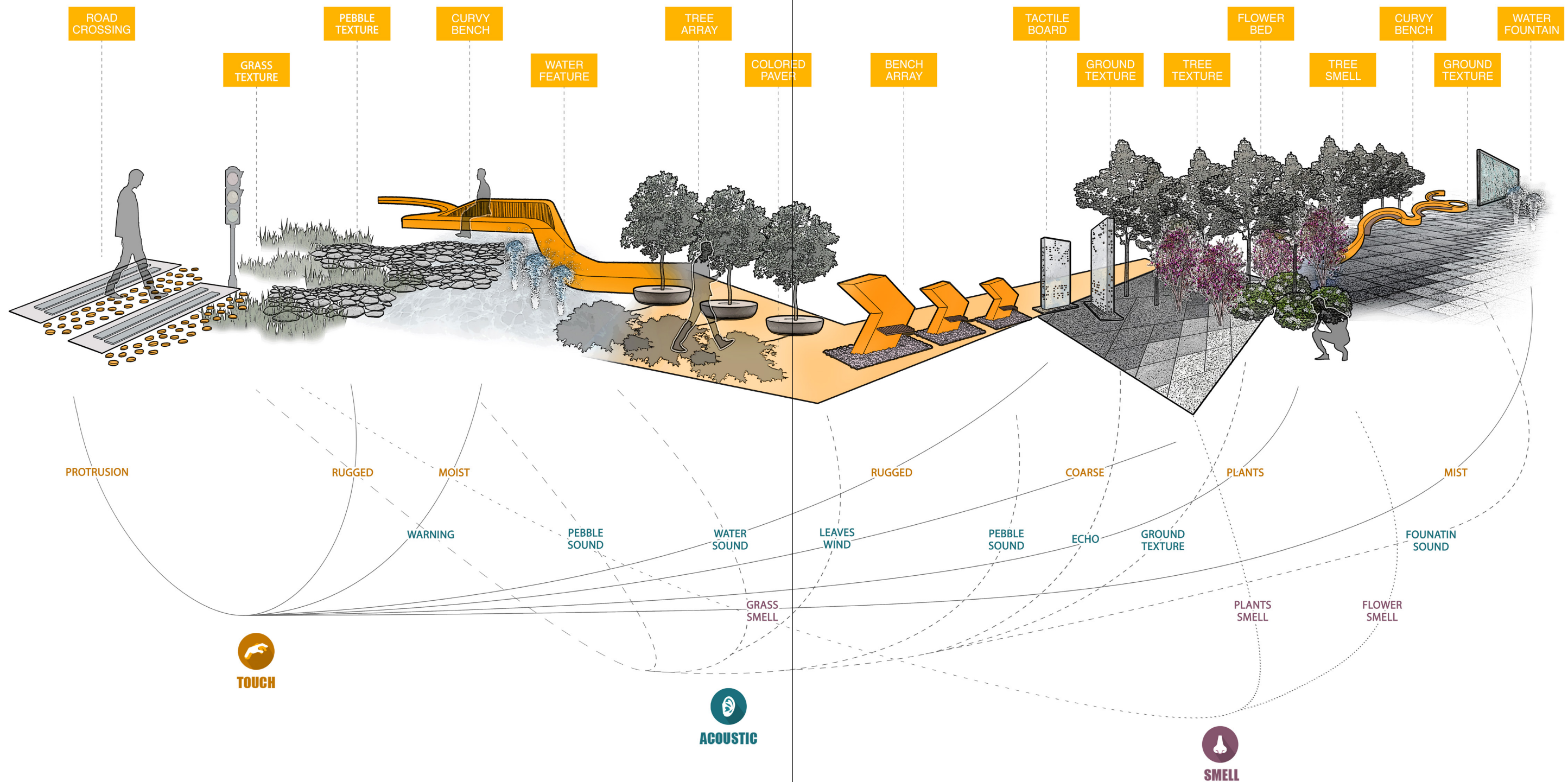
ROUTE MAP

Renovated square directs people through stimuli, including visual impact, texture change, paver alternate, activated smell, and acoustic. The whole square is linked together as a system, the installations navigate people and tell them their next destination.



SENSORY STIMULATION

The directing nodes on the square activate people's multi-sensory, conveying information and navigating. The designed space stimulates people differently during the day, night and seasons.

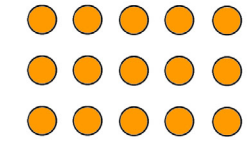
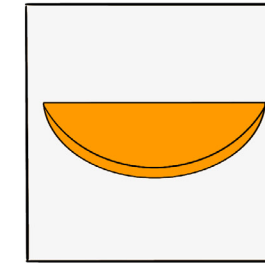
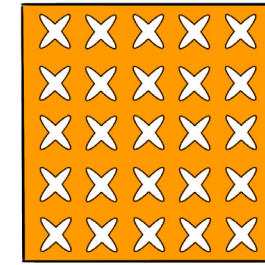


SENSORY MAP

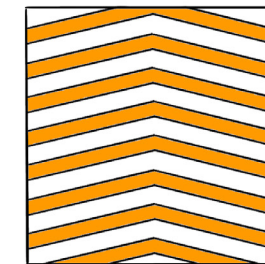
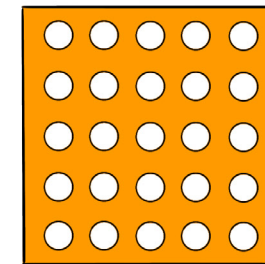
By stimulating touch, acoustic, smell through various ways, to enhance the space experiences and function as navigator.

PAVING SYSTEM

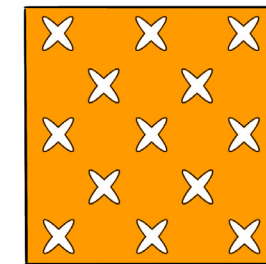
Walking through the city, we always meet the critical points for hints at the boundaries or direction change. The building entrance, road crossing, slope change are three common and important points worth being aware of. A consistent indication paving system will help people recognize the change of transition.



ROAD CROSSING



BUILDING ENTRANCE



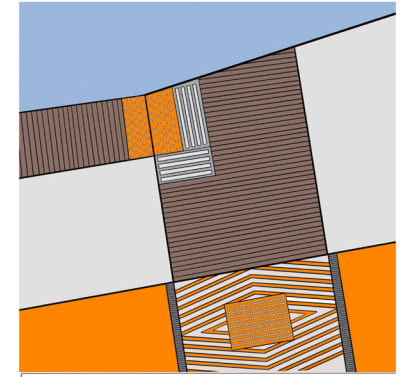
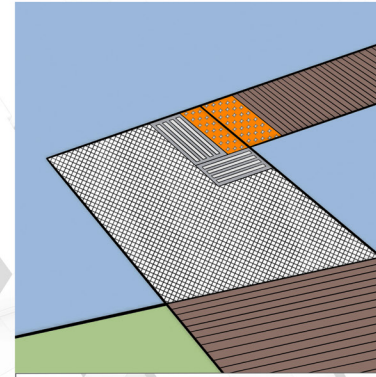
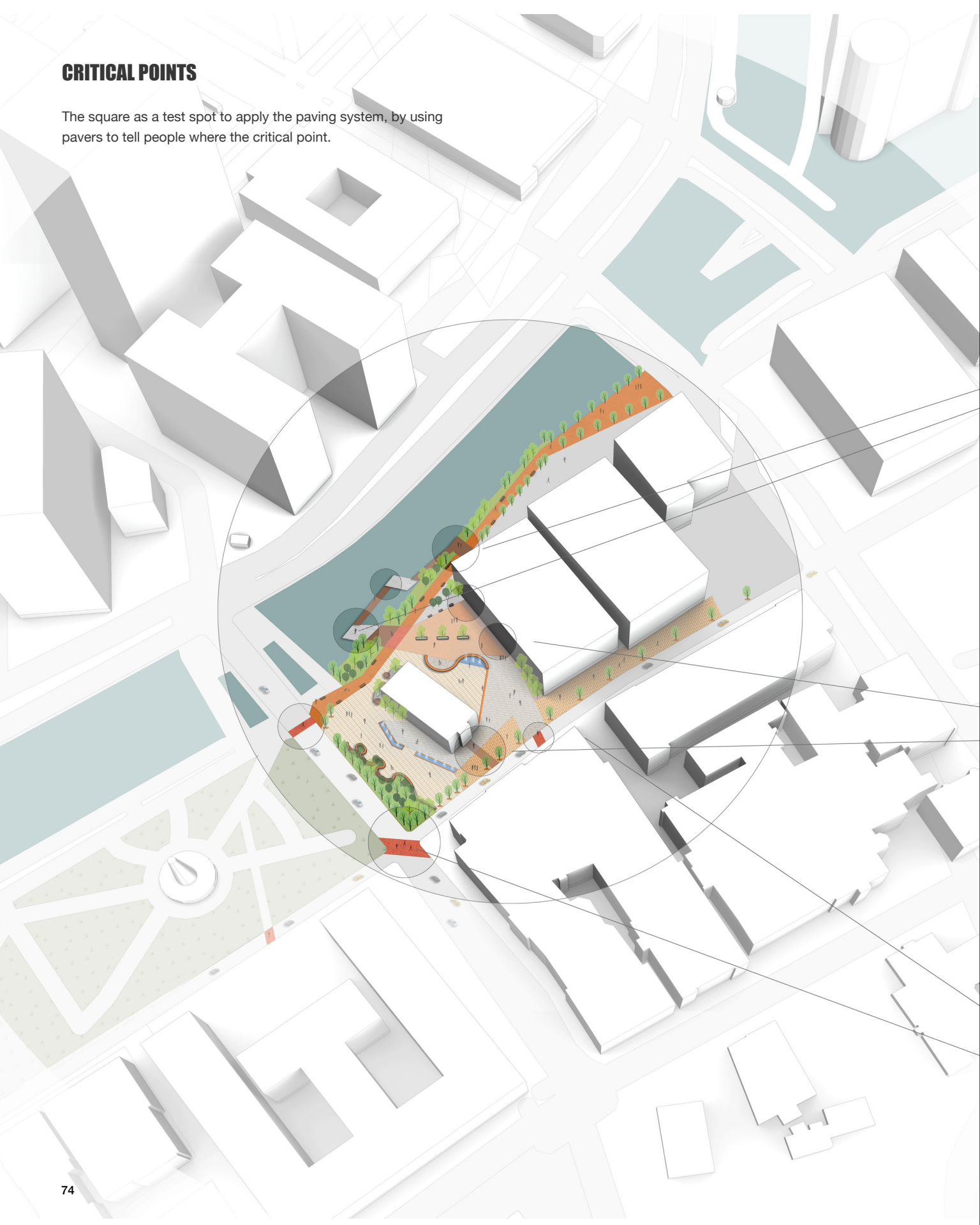
SLOP INDICATOR



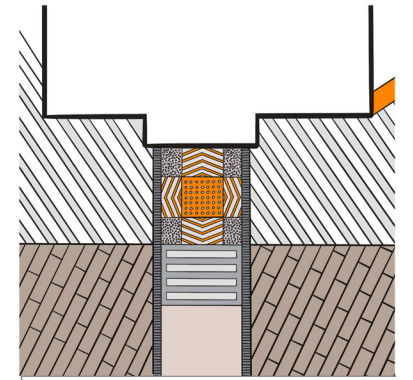
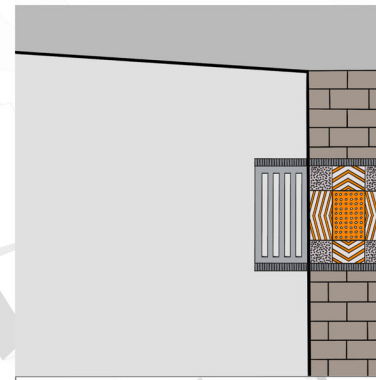
TRANSIT POINT

CRITICAL POINTS

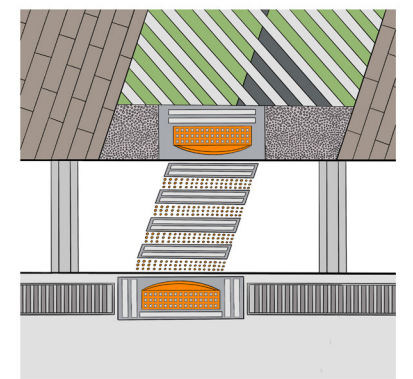
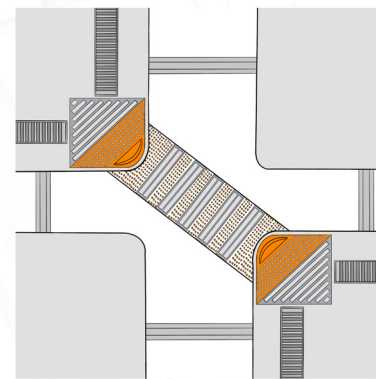
The square as a test spot to apply the paving system, by using pavers to tell people where the critical point.



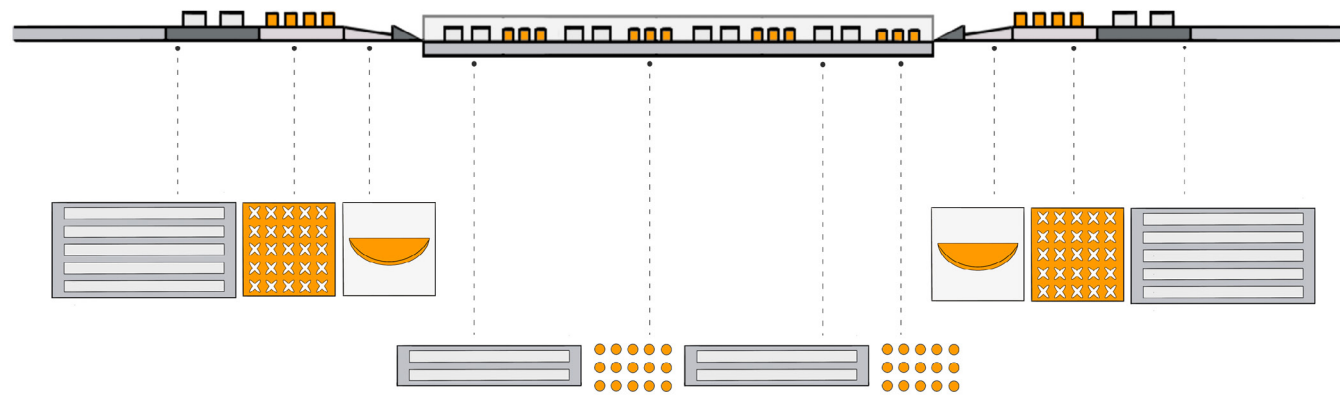
SLOP INDICATOR



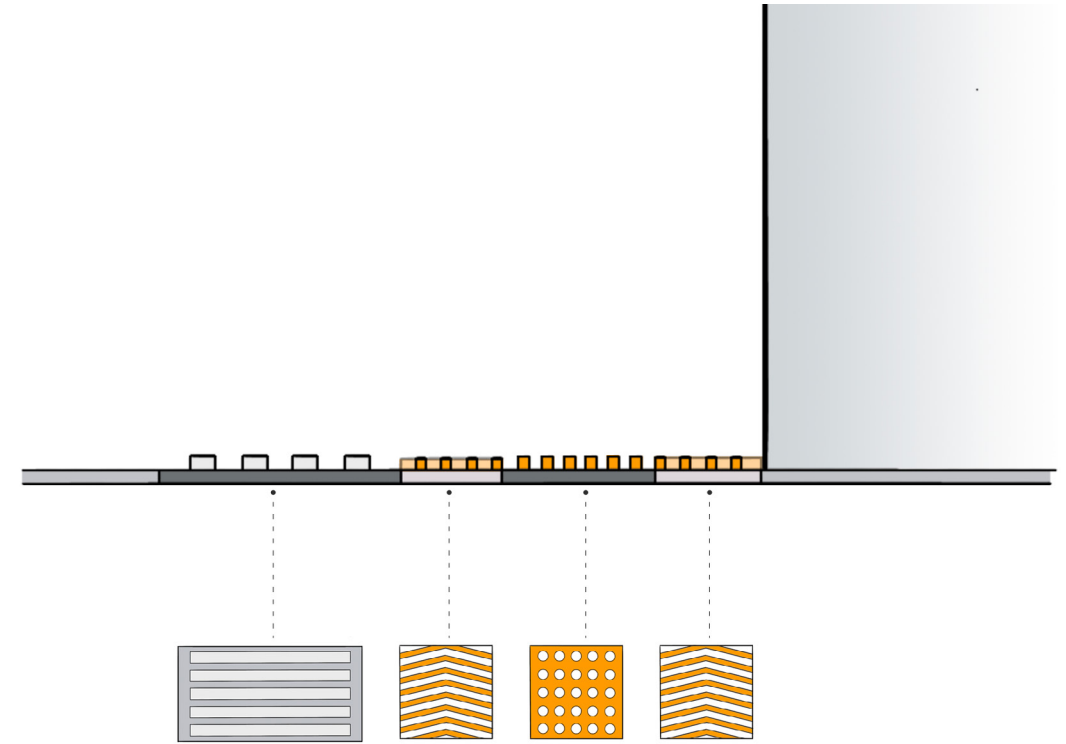
BUILDING ENTRANCE



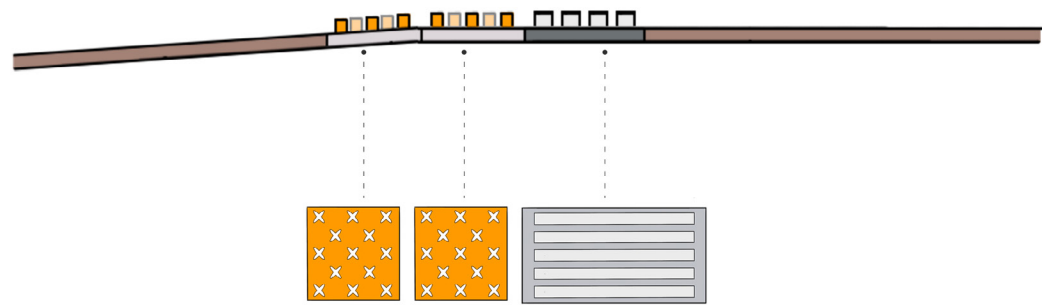
ROAD CROSSING



ROAD CROSSING



BUILDING ENTRANCE



SLOP INDICATOR

CRITICAL POINTS SECTIONS

The sections show the enlarged details of ground paving. The protruding paver will stimulate the touch sensory, the vivid color pops up to attract visual attention. The regular paving system helps people identify the spaces and also slow down the vehicles and other pedestrians.



FUTURE VISION

The modification of limited space won't bring visually impaired people back to the city and benefit pedestrians from being aware of the surrounding environment, helping them to move through the city. Reconsidering the relationship between pedestrians and spaces, connecting fragmented city pieces, and building into a navigating system, will both promote friendly communication between pedestrians and the city.

REFLECTION

Design is made for humans and serves humans. However, people with disabilities are sometimes excluded from having full experiences in public space design. Public space belongs to everyone and should serve equally regardless of individual differences. How to provide enhanced space experiences and motivate multisensory to emphasize the critical nodes, connect the fragmented spaces, direct people walking through intersections safely and indicatively are the main research aspects for building an inclusive public space.

I focused on visually impaired people as an experimental group for researching inclusive design, aimed to transform the city spaces into connectivity and directing systems by sensitive sensory input that serves well both for visually impaired people and normal people. In phase 1, I researched how visually impaired people perceive the environment and what sensors they rely on for receiving information. Holding with my research results of sensory working mechanisms, and the how of the compensation sensors help, I moved to phase 2 to further explore the solutions for both visually impaired and normal people to perceive the environment and move through the spaces. With the help of the findings from my solutions research, I focus on people who still keep limited ability of sight. To obtain the principles that both benefit everyone's navigation, I conducted a series of studies of space compositions, lighting effects, and materials properties. Following the stimulus experimental test video to verify my theory, I came up with the principles such as using repetition, pattern and color stimulation, sequence building to activate sensory and build a system for high-lighting space experiences and directing people walking through space boundaries and nodes.

In Phase 3, I applied my theory in a spot for testing. I picked an important spot in the phase 1 study for conducting deeper exploration. By re-design the connection between the site and its surrounding buildings and spaces, a new pedestrian route will

navigate people moving through space nodes. To achieve the goal of indicating the direction and emphasizing the space experiences, a series of space indicators are designed to stimulate multi-sensory, accentuate space experiences, and navigation. The proposal of a continuous application of the paving system will help solidify the organization. The site and its surroundings are connected as a whole system by repeatedly stimulating people's visual, acoustic, touch and smell. However, only limited space transformations won't help build friendly space experiences for visually impaired and normal people. Reconsidering the relationship between pedestrians and spaces, connecting fragmented city pieces, and building into a navigating system will promote friendly communication between pedestrians and the city.

I hope my thesis research could benefit us to rethink the responsibility of design and reposition the relationship between pedestrian and city space. The design has the power to make a difference to our accustomed thinking and cognition and has the potential to bring changes to someone's life. I always believe the city belongs to people, to pedestrians; the city is served for people and respect to everyone. Landscape design, as a tool for transforming space, should stand on people's perspective, and make the communication happen mutually.

The world is not perfect but we can break convention and make the changes.

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