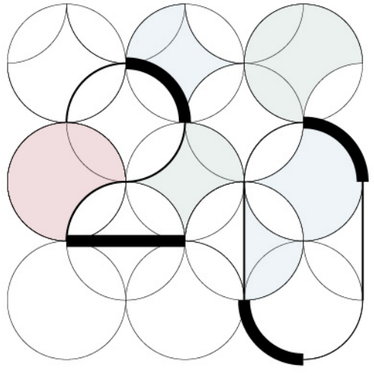
Portfolio

AMBER YUHENG ZHU
CORNELL UNIVERSITY
B.ARCH 20'



AMBER YUHENG ZHU

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01

URBAN EDITING: CROATIA, SPLIT 3.0

Fourth Year Studio */ Spring 2019*

Site */ Split, Croatia*

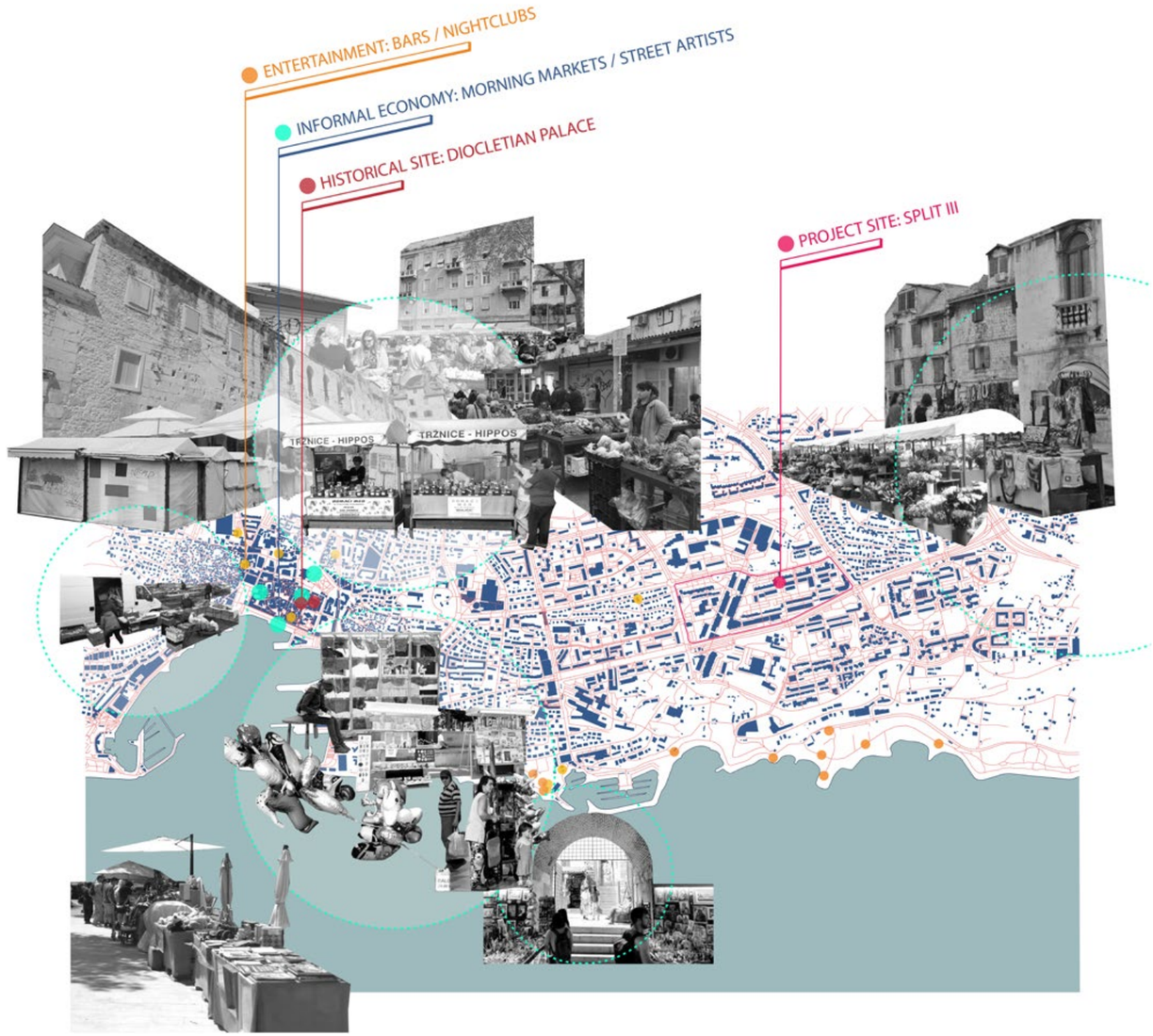
Type */ Individual Design Project*

Instructor */ Saša Begović, Gesa Büttner Dias*

Built in the 1970s, avant-garde brutalism district Split III, Croatia, is successful in its sophisticated street master plan as well as its mega-structure housing. However, as it's now challenged by ever-changing new urban life scenarios, it is urging reformation. As a continuation and upgrade of the urban strategy, this futuristic vision of Split III takes the initiative in rethinking the existing street design, and proposes a community center as a plausible outcome.

How to revive Split III through encouraging new modes of urban mobility and accommodating the community's emerging needs of social engagement? A reinterpretation of Split beyond its previous images of Ancient Roman heritage and Modernism test field, the Split 3.0 - Urban Editing is about researching, editing and improving public space in the city of Split. As in film editing, the design methodology use the "ready-made" elements and Found Realities on the spot, rearrange them, adapt, and transform.

Visiting Critic Saša Begović, Croatian practicing architect, faculty of the University of Split, led a one-week field trip to Split. The design process was significantly benefited from the first-hand knowledge of the local community.



SITE ANALYSIS & DESIGN STRATEGY

Split - Regional Analysis

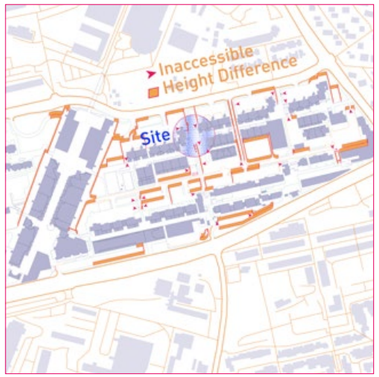
Lack of public amenity within the neighborhood

Distant from historical sites / urban catalyst

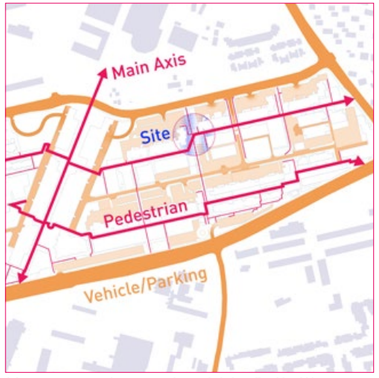
Urban Context

The winning team of the 1968 Split III urban design competition was led by architect Braco Mušič. A Harvard GSD graduate, Mušič had also participated in the Dubrovnik Team X, CIAM congress, and his project established a connection between the mega-structure scale architecture and the re-establishment of the pedestrian zone – the Street.

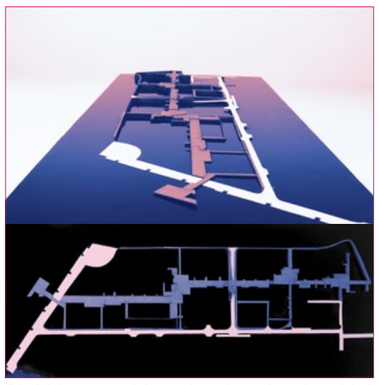
Site - Current Situation



Barriers deteriorate the connectivity

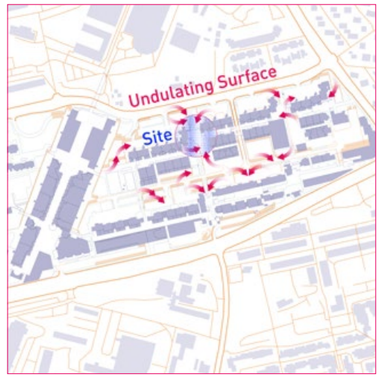


No strong short axis within Split III

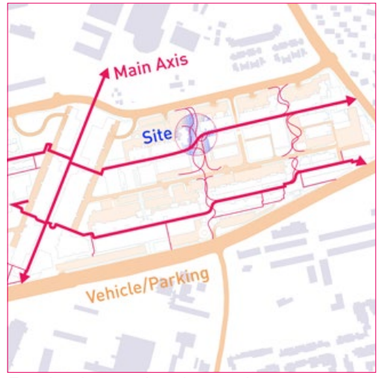


Rigid juxtaposition of pedestrian & vehicle

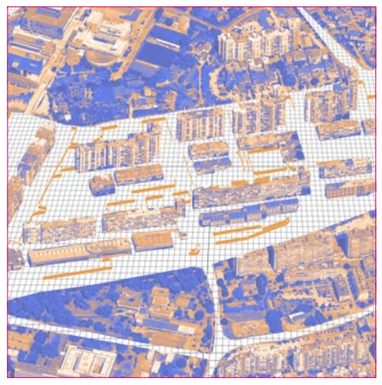
Site - Proposed Strategy



Superimpose an undulating surface

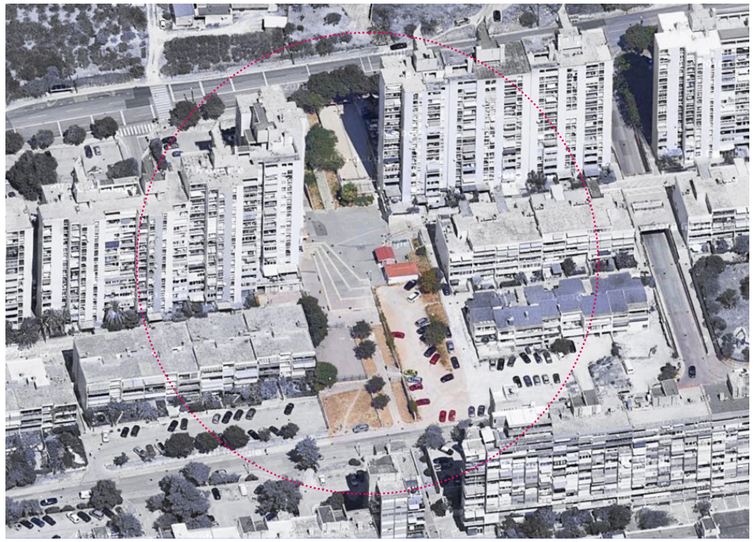


Emphasize on the short axis



Speculative collage - new relationship

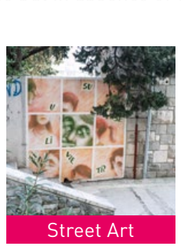
Site Observation - Community Activities



Site selected after analysis. Sufficient space but in absence of community activities

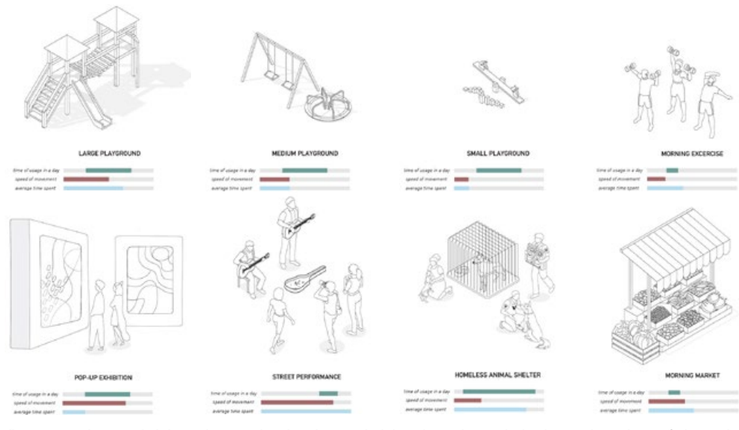
Informal economy

Playground



Street Art

Mobility



Community activities that exist in the neighborhood, and their active time / duration

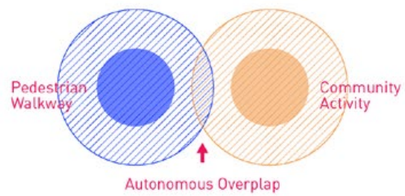
CONCEPT & FORM-FINDING

Before - scattered activities

Gather the existing community activities to a designated area

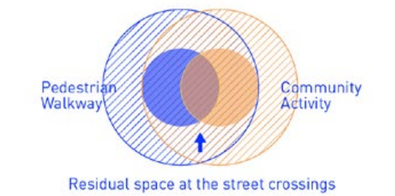
After - centralized network

Before - juxtaposed funtions

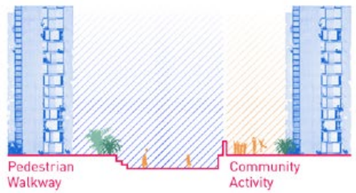


Introduce a new layer of urban catalyst to the street system

After - blurred boundary

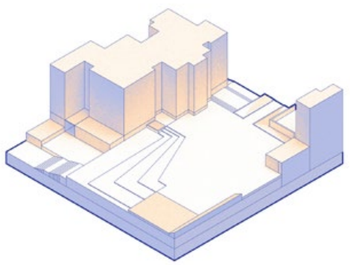


Before - rigid level difference

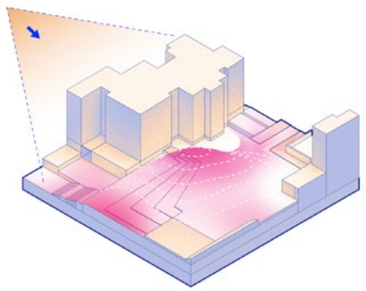


Facilitate the mobility within the Split III neighborhood

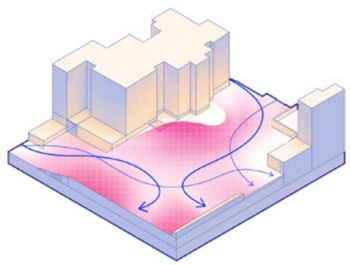
After - continuous surface



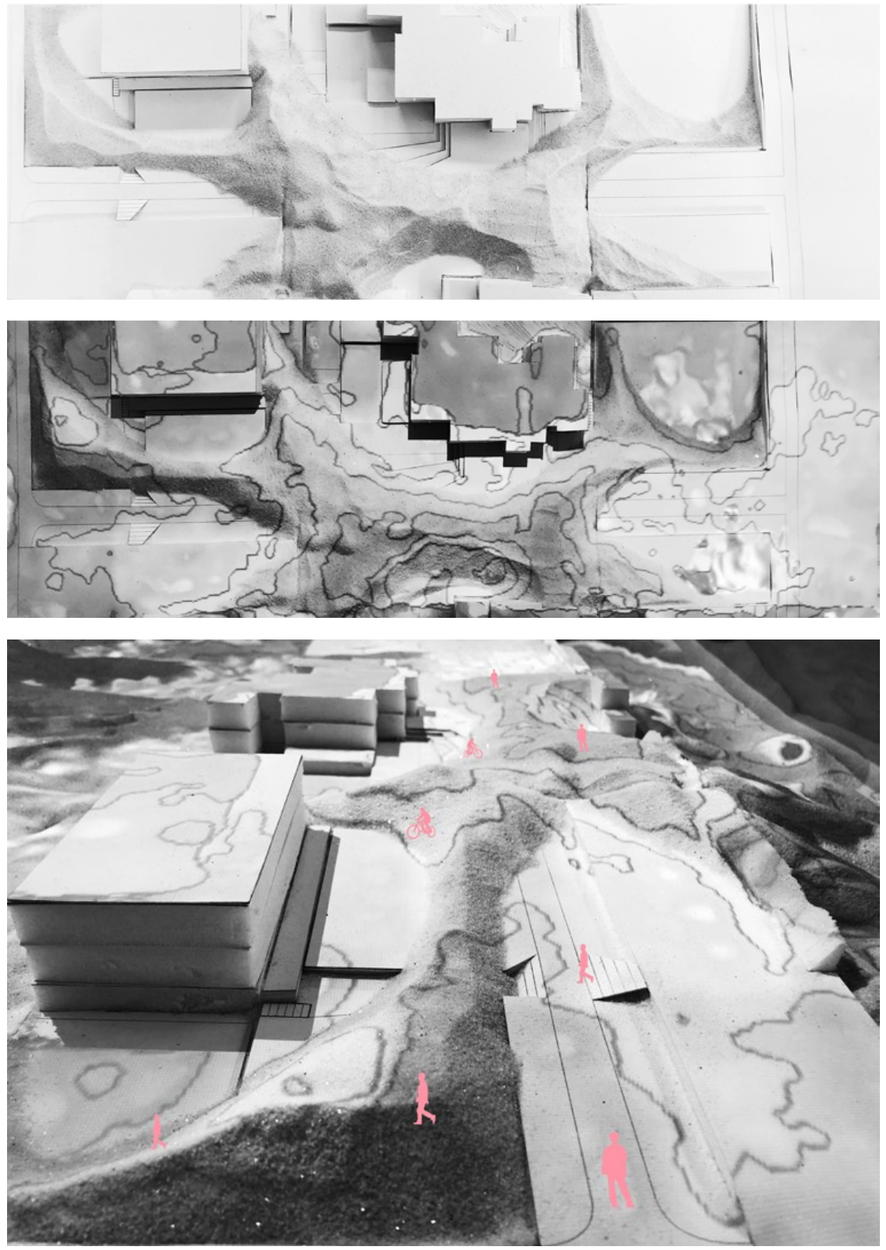
Build a base model of the site



Test the space operation in AR projection sandbox



Reconstruct the surface from contour lines



Agile test with AR projection sandbox, to seek the most efficient circulation network

DESIGN SOLUTION

Children Playground

Community Library

Community Chapel

Street Performance
Amphitheater

B

C

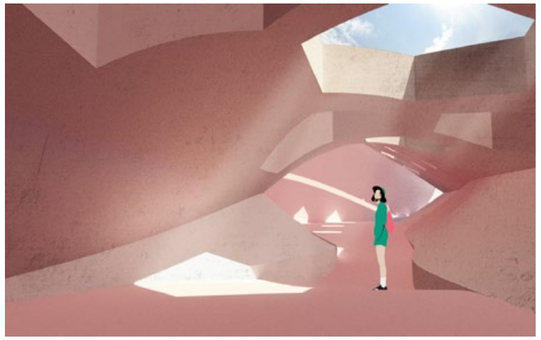
A

Program +

This community center as well as mini plaza at the street crossing guarantees the mobility with the flexible circulations. It also energizes the neighbourhood through encouraging cultural activities.

A - Street Art Gallery

B - Mini Plaza | Street Art Gallery

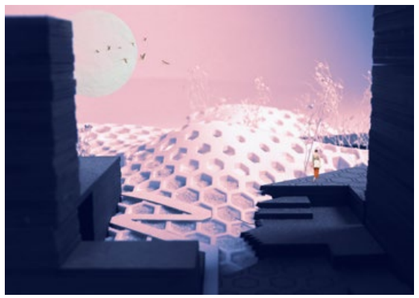


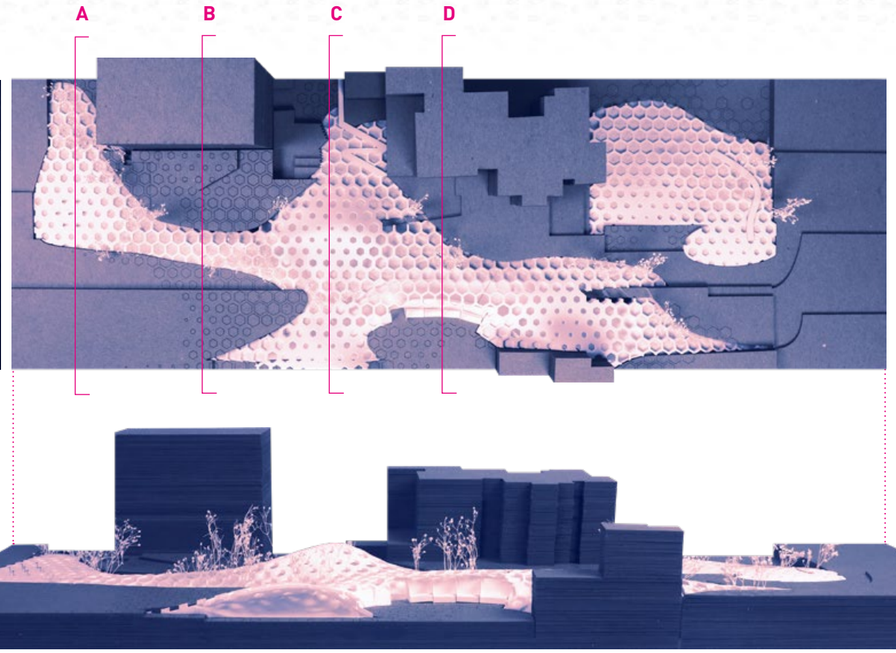
C - Underground Pathway

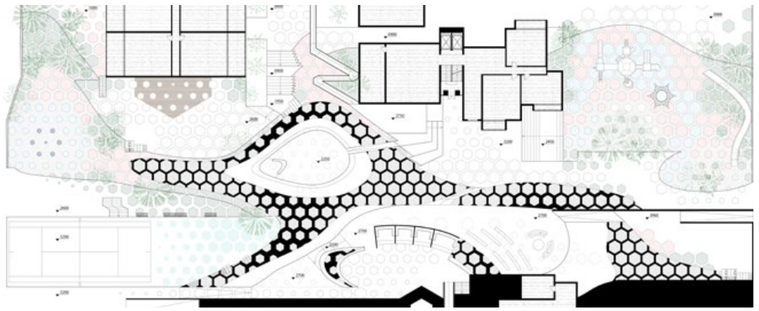
Transverse Section C

The slope transforms the plaza into a playground for children. It also becomes a garden, in which pedestrians are shaded by the trees.

The Chapel at the center provides space for worship and community gathering. The east end of the undulating surface, which connects to the existing retaining wall, is designated as the Street Art Gallery.





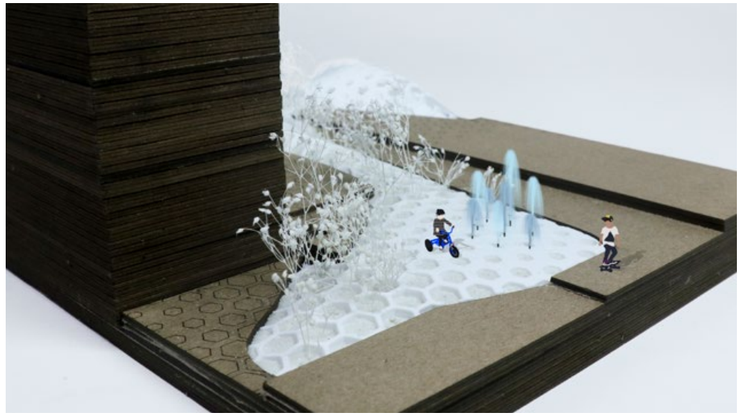


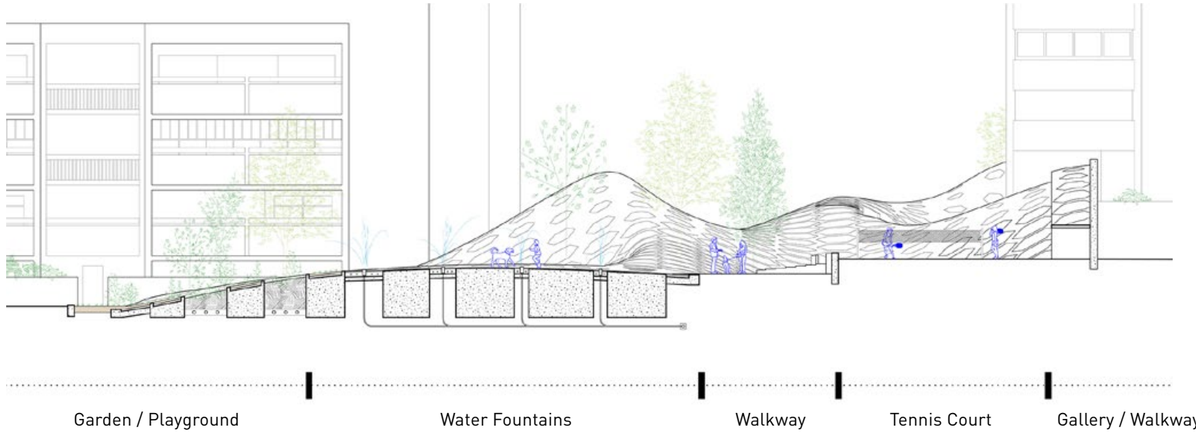
Ground Level Plan + Physical Model

The strategy of organic artificial landscape integrates the residual public spaces at the parking lots and the street crossings, and embeds miscellaneous activities into it.

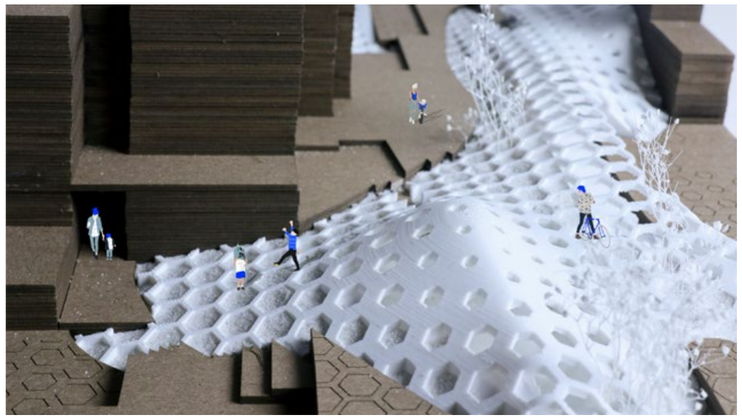
Transverse Sections +

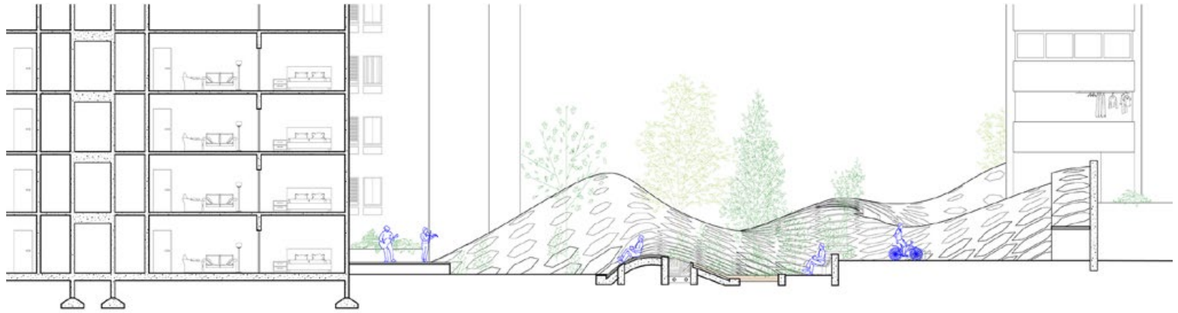
A corner of the parking lot becomes children's playground.



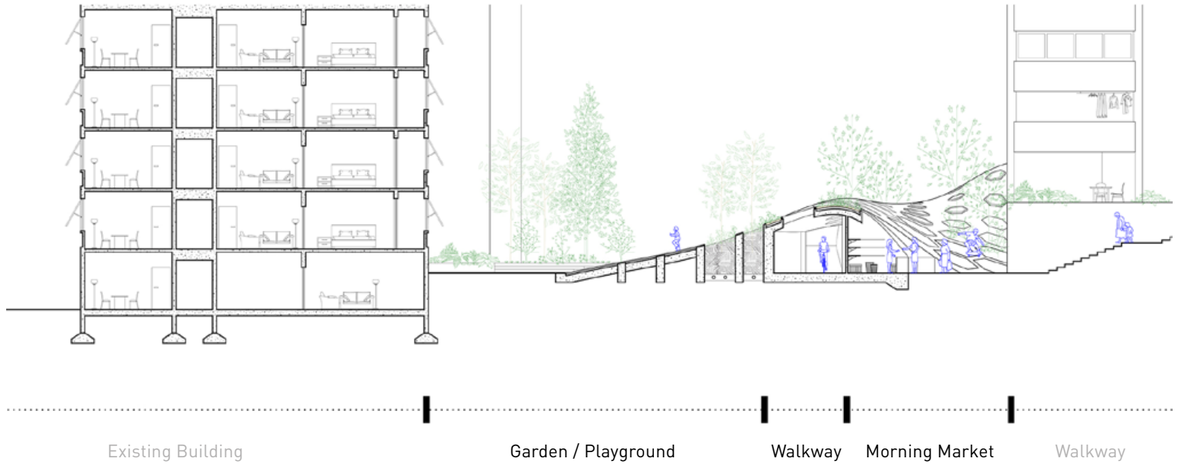


Enhance the accessibility of bikes / scooters / wheelchairs.





The Morning Market activates the informal economy.



02

DENSITY WITH DIGNITY: VERTICAL MAT, COLLECTIVE HOUSING

Fifth Year Studio, AAP NYC Program */ Fall 2019*

Site */ Long Island City, NYC, NY*

Type */ Collaborative Design Project*

Members */ Yuheng Zhu, Lang Dong*

Instructor */ Stella Betts, David Leven (LEVENBETTS)*

Personal contribution includes pre-design site research (100%), schematic design (50%), design development (70%), final design representation (80%). All the drawing included here are my personal work. Physical models are the outcome of collaborative effort.

Long Island City Vertical Mat is a social housing project on the 44th Drive Long Island City, NY . It rethinks the nature of affordable housing and scrutinizes the application of mat strategy within the metropolis that craving for high density. Responding to the genuine needs of the local community, it dignifies urban dwelling by encouraging creativity within the neighbourhood, through the integration of shared maker spaces, artist studios, and public market, thereby also bring up a new urban living paradigm.

SITE RESEARCH & STUDY OF POROSITY

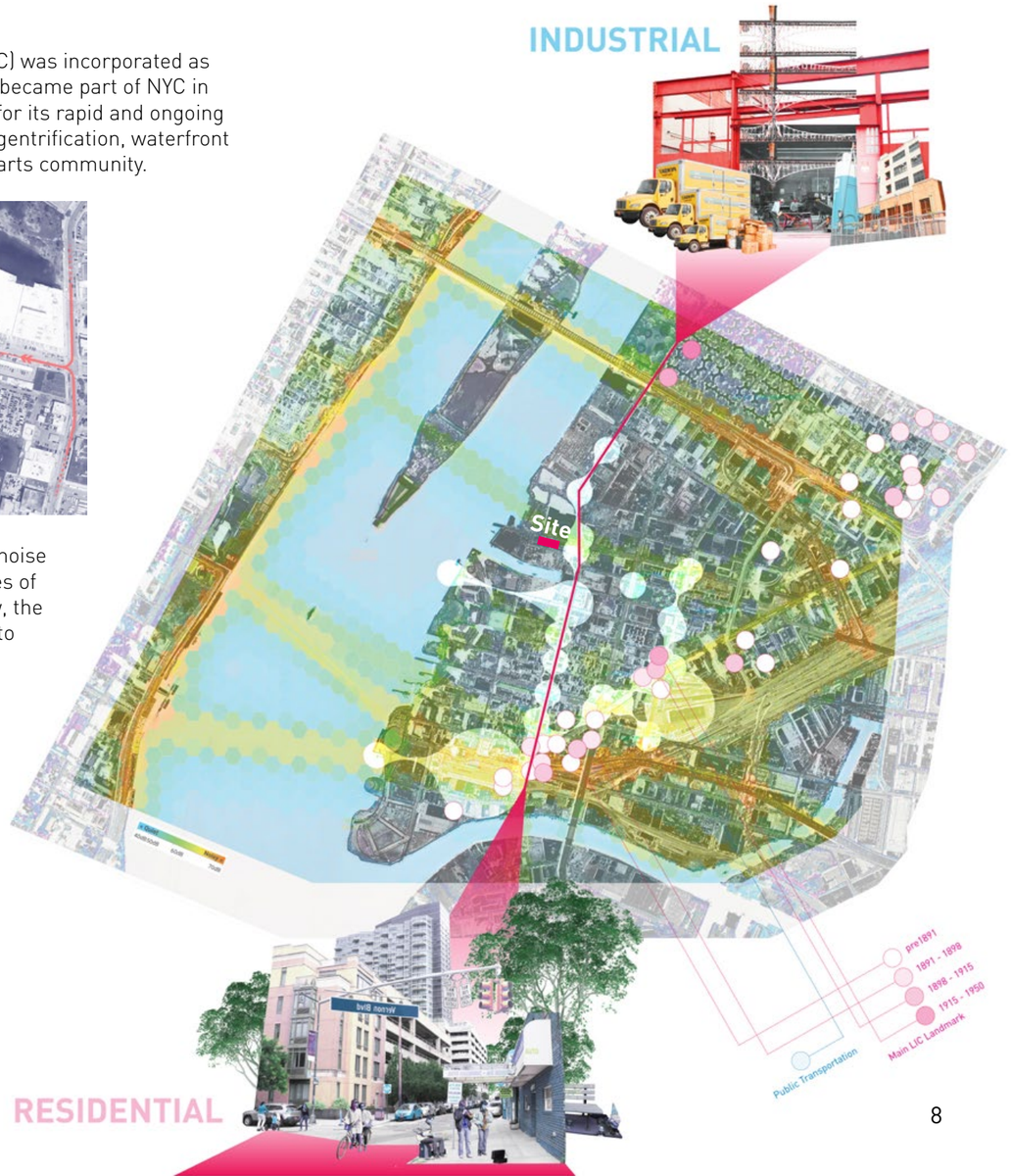
Site Research - Long Island City

Obsession: A collection of observation in LIC. The patches on the buildings document the history of the neighborhood. To an extent, studying them is also a form of "Urban Stratigraphy".

Urban Context

Long Island City (LIC) was incorporated as a city in 1870 and it became part of NYC in 1898. LIC is known for its rapid and ongoing residential growth, gentrification, waterfront parks, and thriving arts community.

As the heat map of noise level and the bubbles of urban catalyst show, the selected site is key to activating the area.

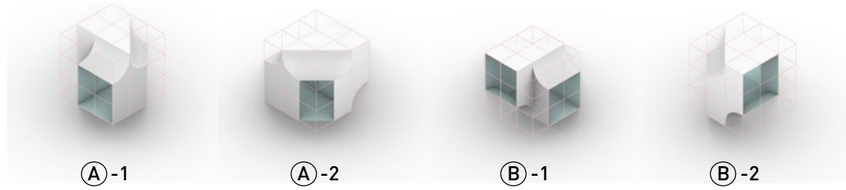


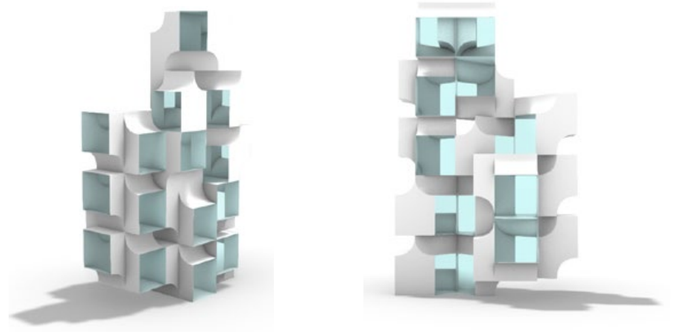
Strategy - Basic Unit Study

Density With Dignity

The module unit study looks into the feature of porosity in high-rise residential buildings. How to guarantee the ventilation and enough sunlight in affordable housing, which are essential to the mental health of the residents, is a main inquiry here.

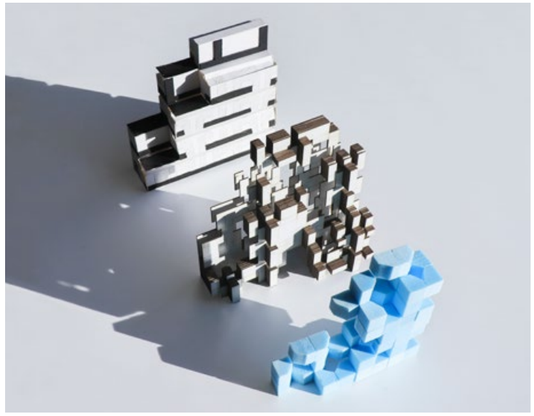
Modular basic units are aggregated following different strategies: mat, tower, and combination of the two.



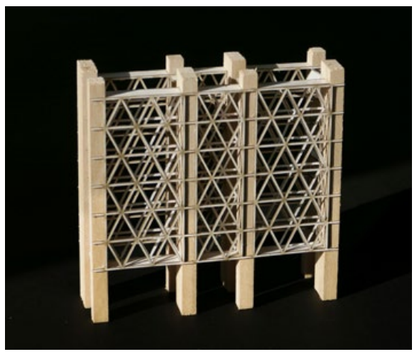


FORM FINDING & MODULE TYPOLOGY

Massing Study - Vertical Mat



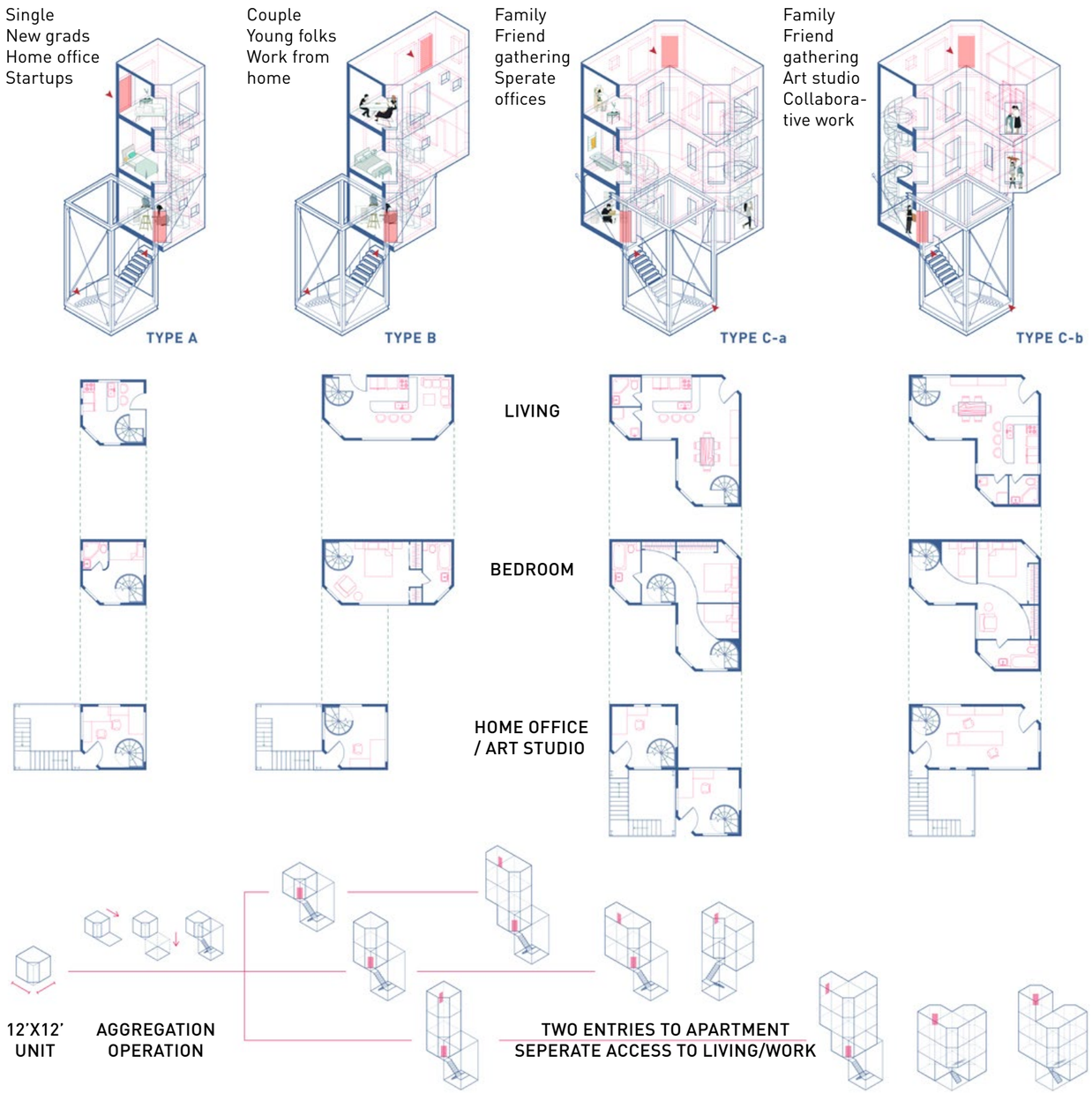
This proposal learns from the mat strategy of housing complex and rethinks it in the demand of high density urban environment. It strives to find a place for the courtyard component of the mat strategy.



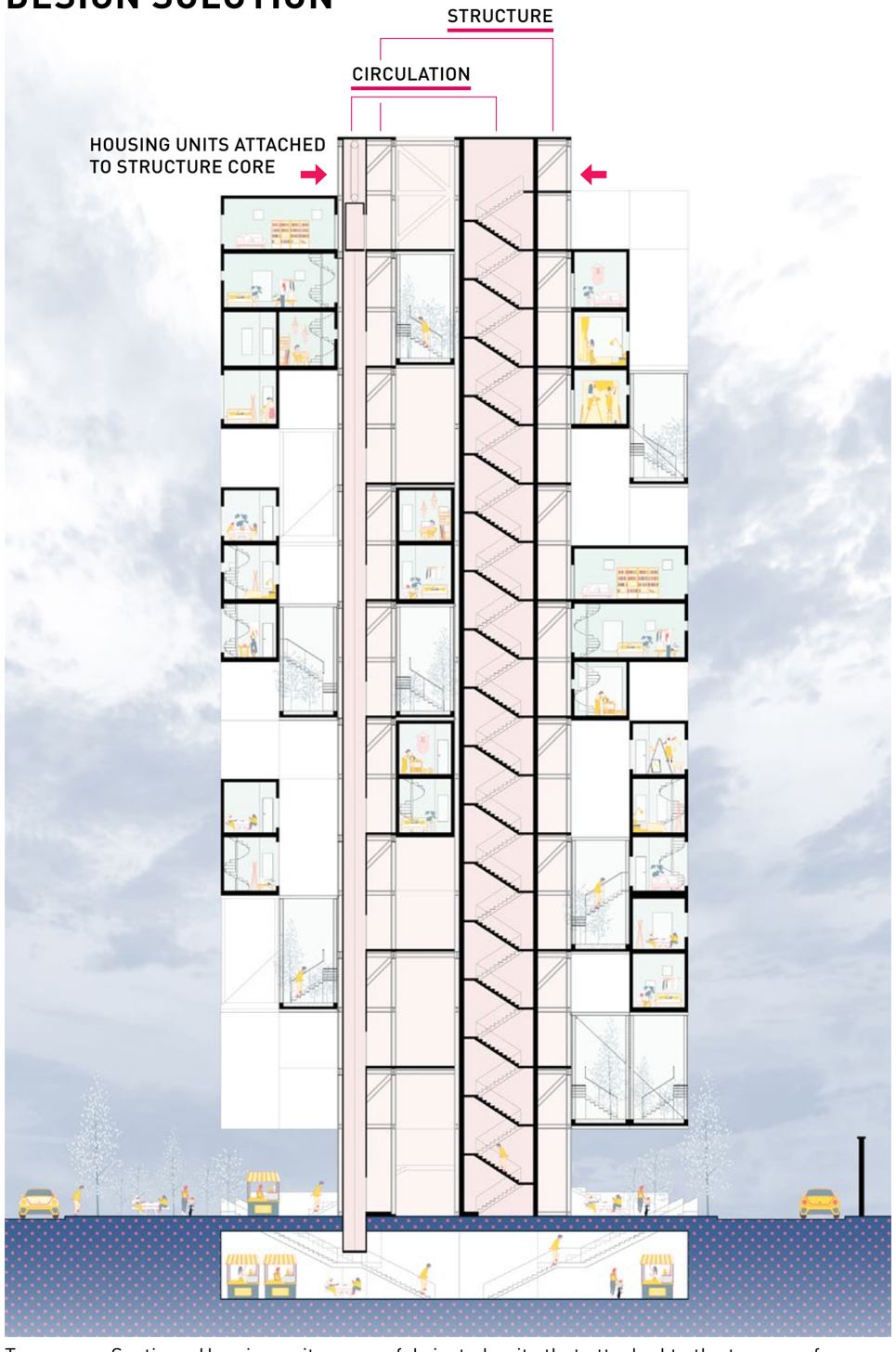
Massing Study + Structure System

The intersecting solid and void guarantee the ventilation and sunlight of each apartment. The structure system of trusses functions as the vertical and horizontal circulation as well.

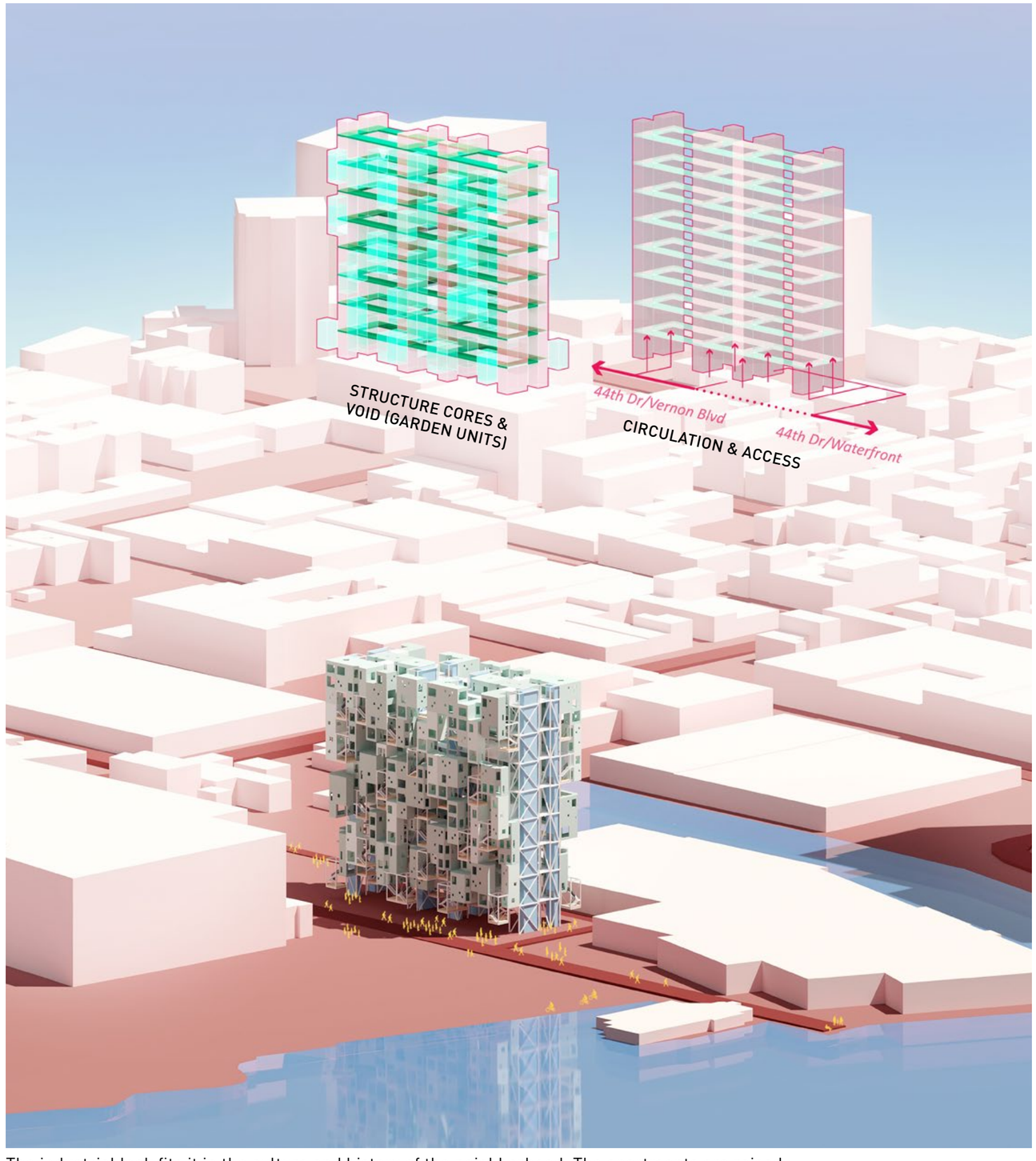
Housing Module Typology



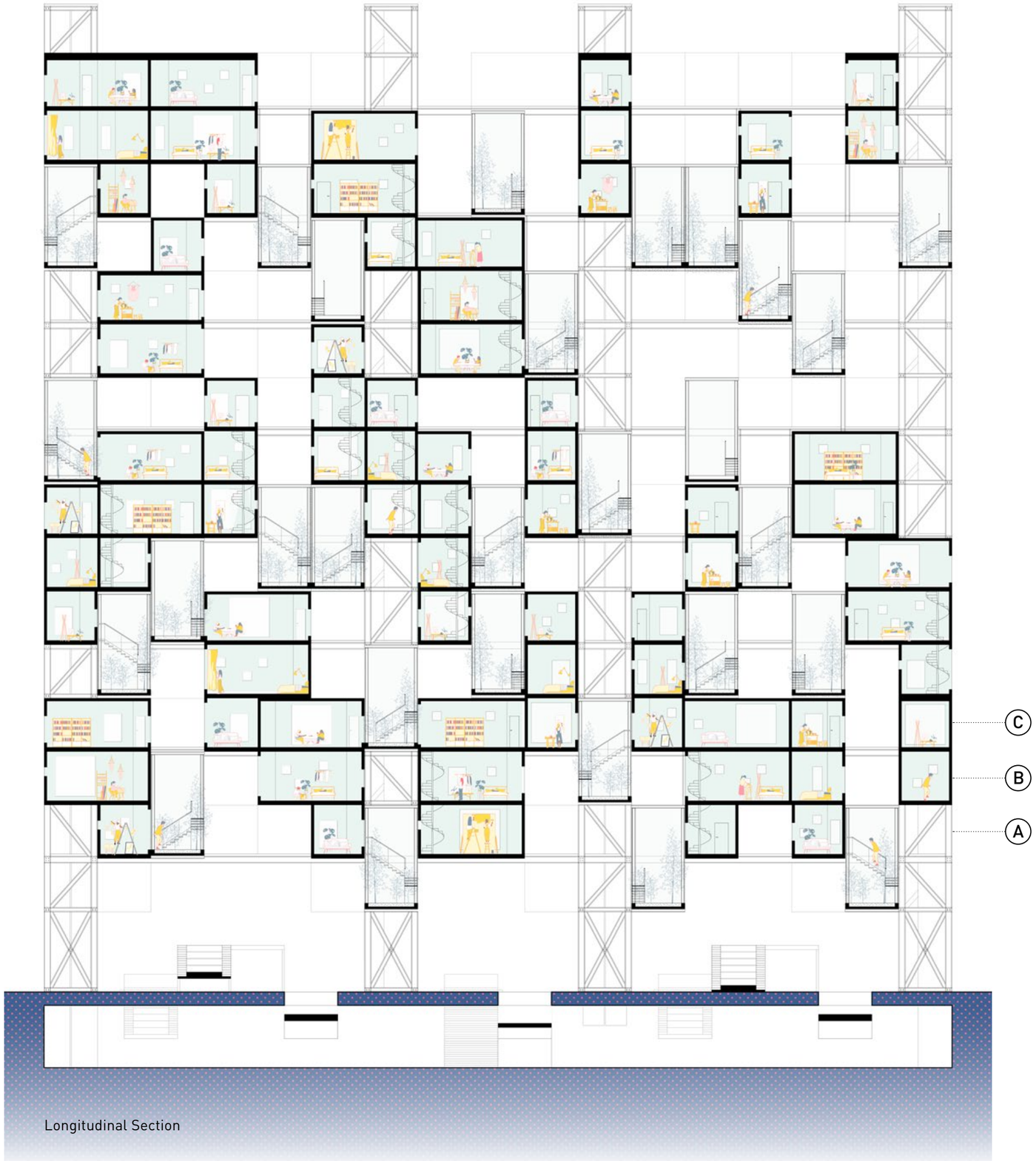
DESIGN SOLUTION



Transverse Section - Housing units are prefabricated units that attached to the trusses of structure core.



The industrial look fits it in the culture and history of the neighborhood. The apartments are raised, leaving the ground level free and open for markets and pedestrian traffic.



Longitudinal Section

Level C

Level B

Level A

Communal space shared by 2 or 3 apartments - Community Workshop / Babysitting

Level A Working Space - Incubator / Home Office / Art Studio / Maker Space + Corridor

Level B Private Space - Bedroom

Level C Living Space - Gathering / Children Playroom / Neighborhood Activity + Corridor

1’=1/8” Physical Model

1’=1/8” Physical Model

This project also explores ways to better the quality of residences by introducing private “garden units” to each apartments, learning from the great experiences the private courtyards/light-wells bring in Nexus World Housing, Fukuoka, Japan.

Shared Work Space **Neighborhood Babysitting**

Between apartments, there are also “shared units”, promoting communication and co-living life of the neighbours, enhancing the coherence of community. Both garden unit and shared unit are accessible from the corridor. These semi-public units serve as the mediator between public space and private space.

03
AN ALTERNATIVE FUTURE: CYCLING + BEIJING

B.Arch Thesis Project */ Spring 2020*

Site */ Beijing, China*

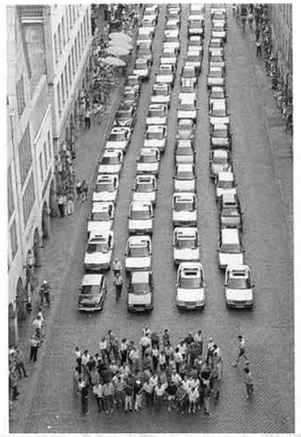
Type */ Individual Research + Design Project*

Advisor */ Martin Miller, Timur Dogan*

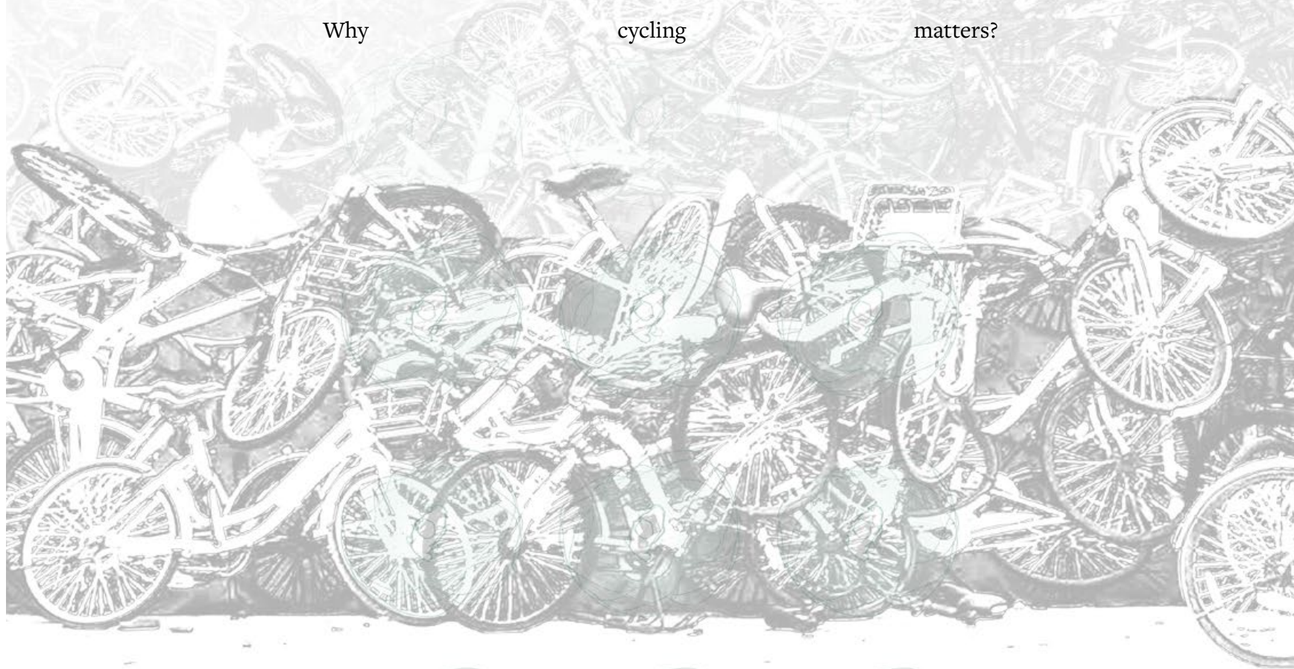
Along with the global trend of inexorable urbanization, the rapidly developing cities are in imperative demand of visionary infrastructure for transportation, for the sake of sustainable and livable urban environment.

This thesis uses Beijing as a test field, seek to mitigate the conflict between the overwhelming Dockless Shared Bikes, and the urban public space compressed by them.

It ends up proposing a future form of subway entrance, in which shared bikes parking is resituated, and intertwined with a layer of miscellaneous urban community activities. It strives to find an alternative future of the urban public space flooded by Dockless Shared Bikes, through which the experience of subway stations as community landmarks is enriched as well.



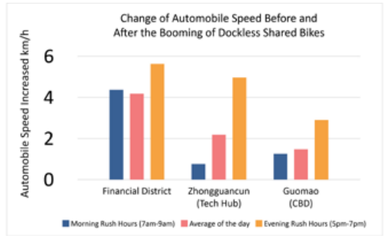
Why cycling matters?



RESEARCH ON ISSUE & CASE STUDY

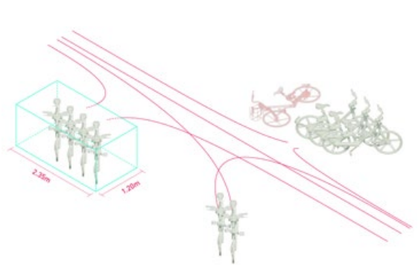
Rationale of Bike Sharing

This thesis project looks into the human scale layer in urban fabric that reacts to the design challenge of transportation. Among the different modes of commuting, cycling is a critical one with many benefits. It enhances road use efficiency, saves energy and reduces air pollution through decreased automobile usage, and have strong positive health effect, both physically and mentally. The popularization of Dockless Shared Bikes in China even further facilitates the coverage of public transportation, as shown in the studies.



• Sun, Yiyun. 2018. <Sharing and Riding: How the Dockless Bike Sharing Scheme in China Shapes the City> Urban Sci. 2, no. 3: 68.
•• Mobike White Paper 2017

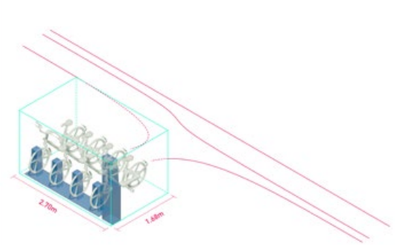
Parking - Dockless Shared Bikes



Con
Vulnerable
Urban clutter

Pro
Spatially efficient
Condensed
Parking freedom

Parking - Docked Shared Bikes



Con
Require fixture
Limited
destinations

Pro
Organized
Protected

Case Study of Infrastructure & Amenity

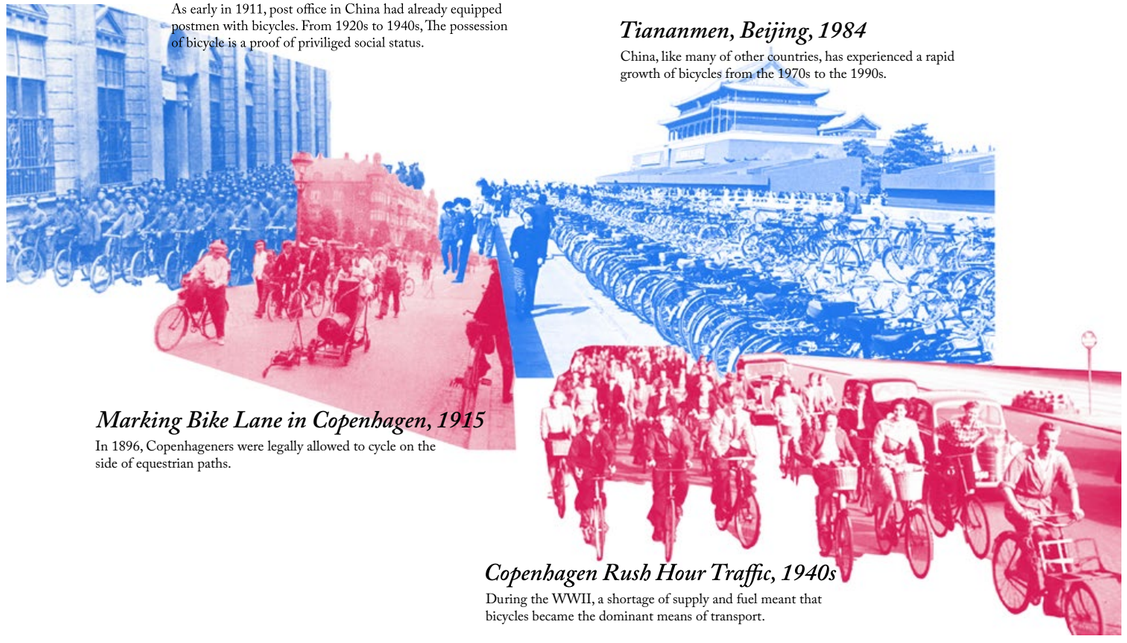
Beijing is one of the cities that overwhelmed by the Dockless Shared Bikes. Similar with Copenhagen, Beijing also has a long history of cycling culture. It already has become part of the regional identity. However, in contrast to Copenhagen, Beijing is in noticeable lack of amenity facilities and infrastructure that serve for bikes.

Postmen Squad, 1911

As early in 1911, post office in China had already equipped postmen with bicycles. From 1920s to 1940s, The possession of bicycle is a proof of priviliged social status.

Tiananmen, Beijing, 1984

China, like many of other countries, has experienced a rapid growth of bicycles from the 1970s to the 1990s.



Marking Bike Lane in Copenhagen, 1915

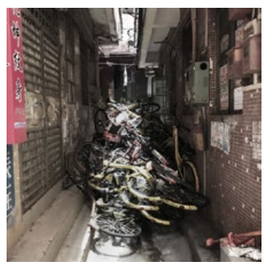
In 1896, Copenhageners were legally allowed to cycle on the side of equestrian paths.

Copenhagen Rush Hour Traffic, 1940s

During the WWII, a shortage of supply and fuel meant that bicycles became the dominant means of transport.

Urban Clutter in China

However, in China, it comes together with severe negative externalities. The unconstrained proliferation of the shared bikes, as an inevitable result of commodification, is driving them to pervade and compress the urban public space. The broken bikes clutter the streets and plazas, and they spontaneously morph the boundary of urban public space.



Case Study: Copenhagen vs. Beijing

Bike amenity, bike parking, cycleway and crossing identified in Copenhagen.

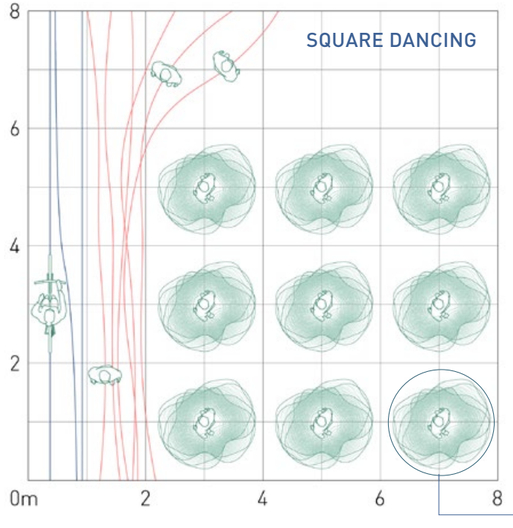
Bike amenity, bike parking, cycleway and crossing identified in Beijing.

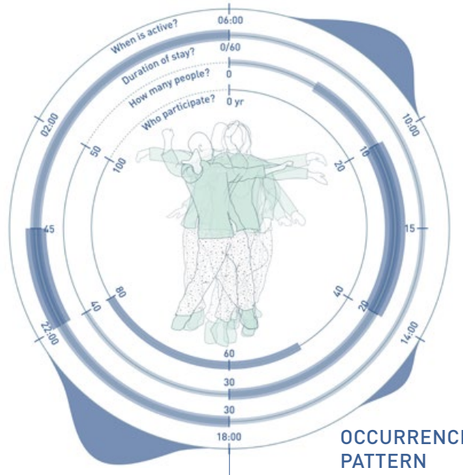
BEIJING'S CULTURE OF PUBLIC SPACE

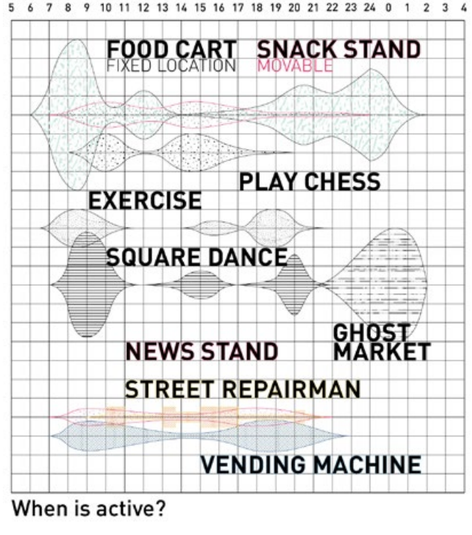
Community Activities Analysis

Diminished Plaza

In the surge of dockless shared bikes, cycling, as part of the city culture, reluctantly stands in the opposite side to the other distinctive cultural activities. The Dockless Shared Bikes excessively occupy the urban public space, and thereby prohibit other potential community activities.







	PLAYING CHESS	FOOD CART - FIXED LOCATION	SNACK STAND - MOVABLE	EXERCISE	GHOST MARKET (鬼市)	STREET REPAIRMAN
Who participate?						
How many people?						
Duration of stay?						
When is active?						
Where is active?						
What is needed?						
How much space?						

RATIONALE OF SITE SELECTION

Opportunity at Subway Station

Informal Bike Parking Behavior

The mini plazas and street crossings at the subway entrances are typical area that the Dockless Shared Bikes converge, as indicated in the diagram on right. Those mini plazas used to naturally collect the miscellaneous spontaneous community activities, which are critical to the social sphere of the urban environment. However, those public spaces no longer function now because of the bike clutters.

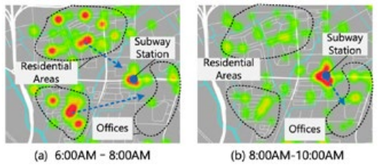


Fig. 1 Temporal Difference in Mobike Trips

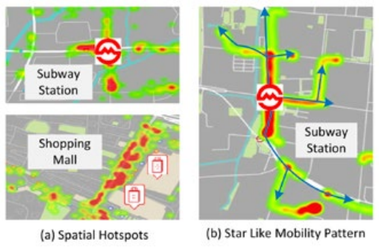
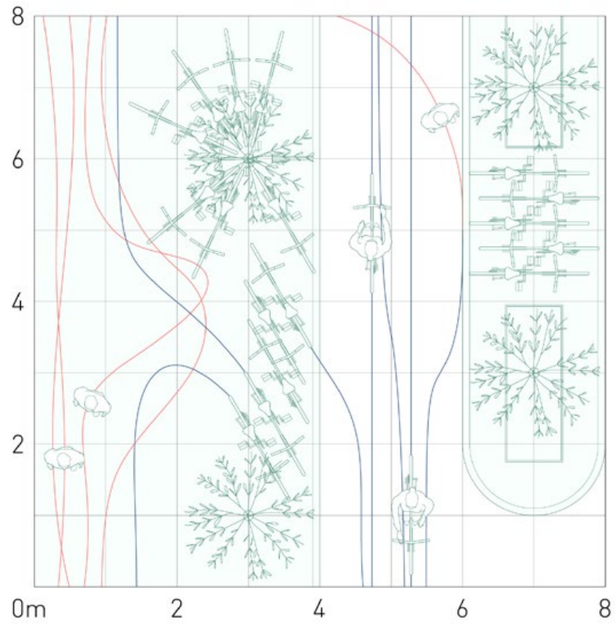


Fig. 2 Spatial Insights of Mobike Data.

• Bao Jie, et al. <Planning Bike Lanes Based on Sharing-Bikes' Trajectories>. https://doi.org/10.1145/3097983.3098056.

Status quo

The heat maps from the referred research reveal that Dockless Shared Bikes converge around the subway stations. Also there is an imbalanced rhythm in the daily bike parking pattern.

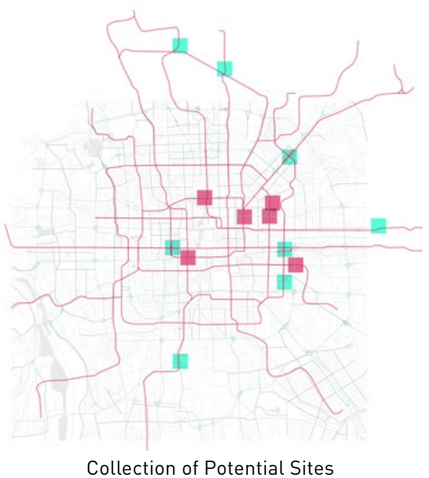


Status quo - Subway Stations in Beijing

Dockless Shared Bike Strong Convergence Points, Significant Overlap with Subway Stations
- Beijing Workday Departure -

• Data retrieved from Gao Ying, et, al. <Spatial-temporal Characteristics of Source and Sink Points of Mobikes in Beijing and Its Scheduling Strategy>. Journal of Geo-information Science 20, Issue 8 (Aug 2018): 1123–38.

- Beijing Workday Arrival -

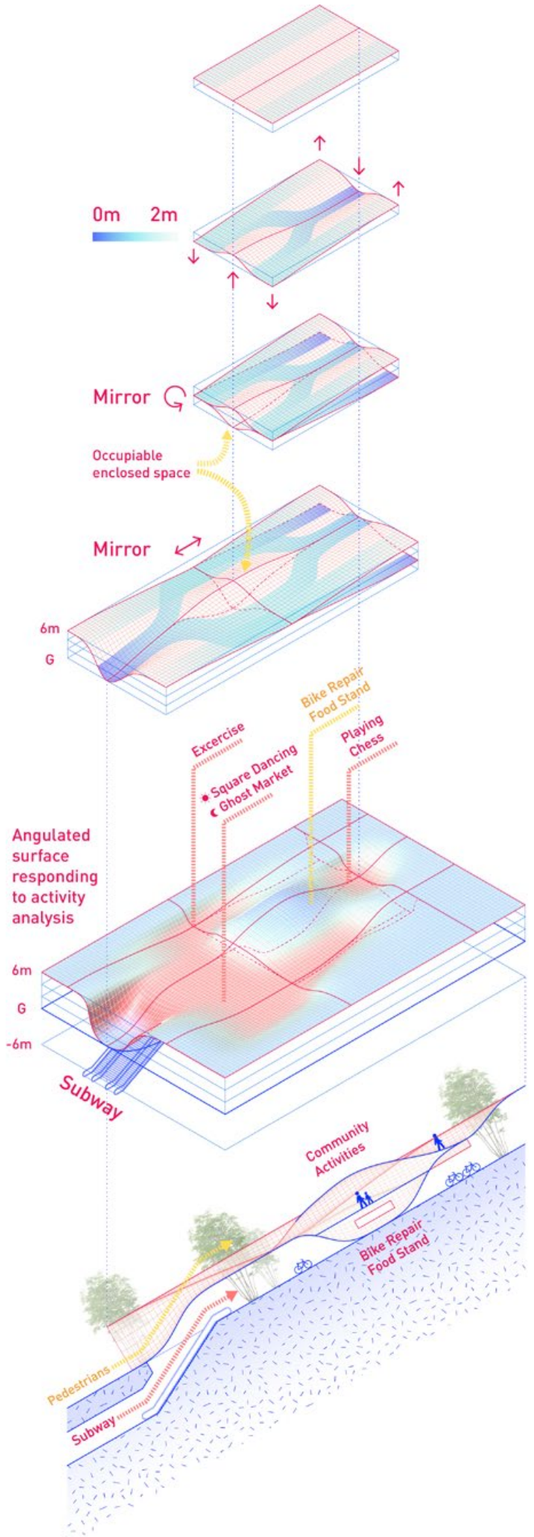


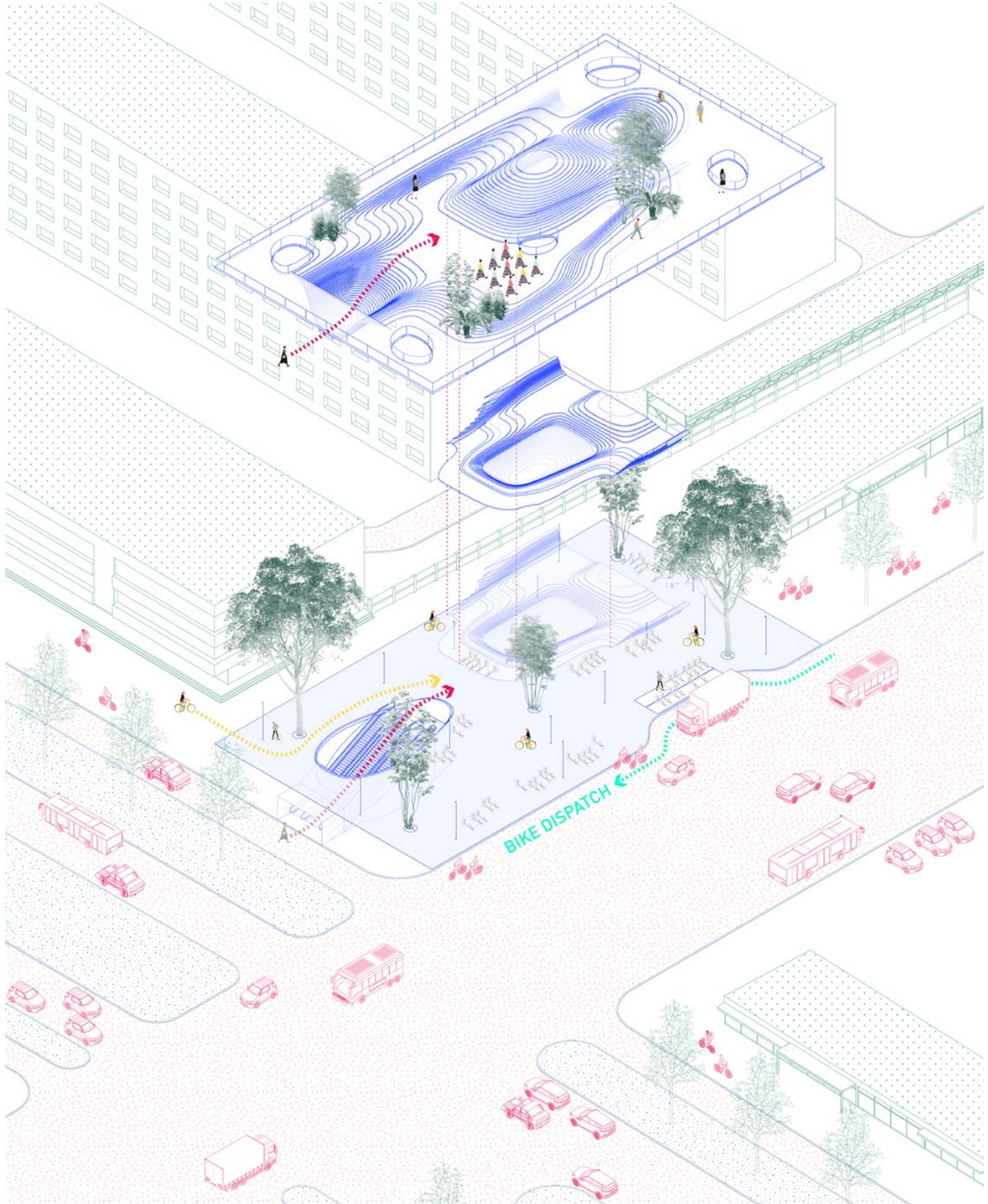
Collection of Potential Sites

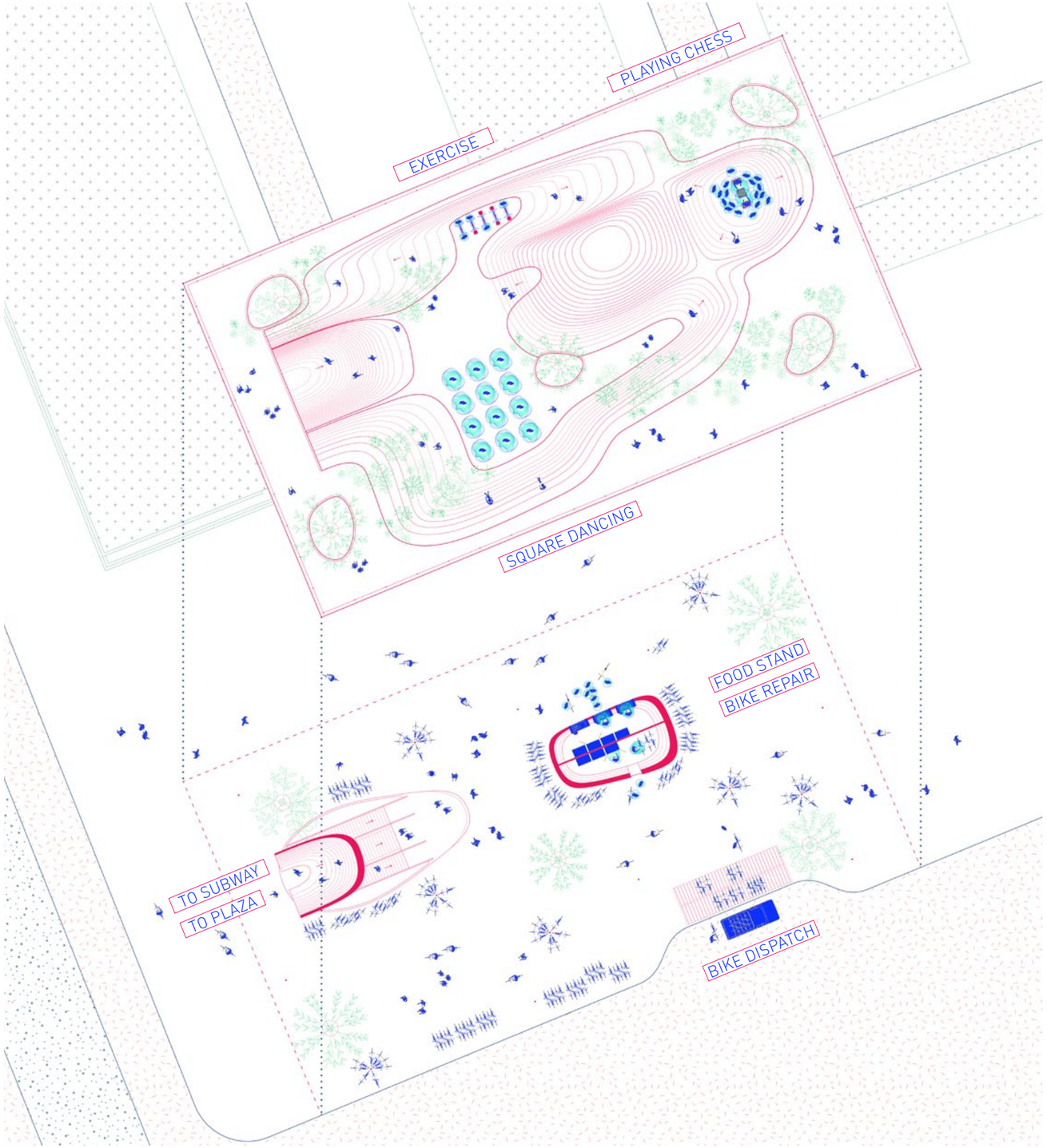
DESIGN SOLUTION

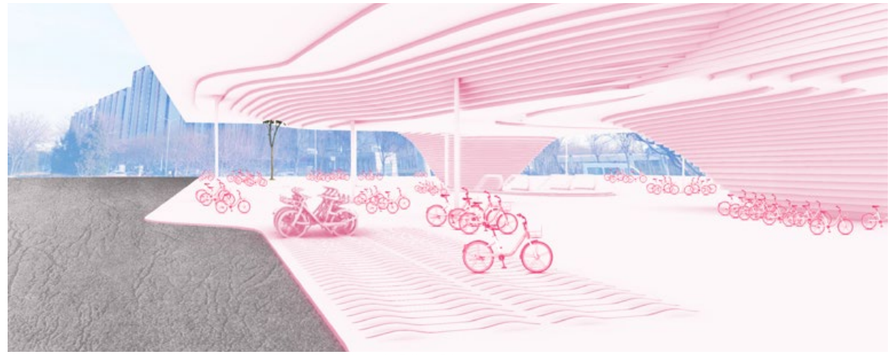
Rethink Subway Station Entrance

This design proposal rethinks the conventional typology of subway station entrance as a box. The new form of the subway station entrance adds another layer to the urban landscape, lifts up the residual public space at the street crossing, and thereby brings back the space for community activities with a respect to the existence of the Dockless Shared Bikes.

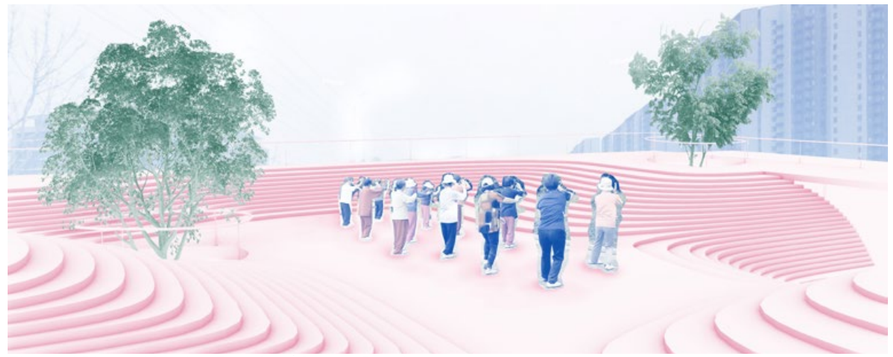








Ground Level - Dockless Shared Bike Parking & Bike Dispatch



Elevated Plaza - Morning Exercise / Square Dancing

Elevated Plaza - Artificial Landscape

Rethink Subway Station Entrance

This proposal repurpose the subway entrance as a double story space, in which the slope to the top plaza is steep that not accessible to bikes. The ground level is open for bike parking, respecting the nature of the Dockless Shared Bike. There is also designated area that encourages organized bike parking, for the convenience of the bike dispatching staffs.

04 URBAN IMAGE-SCAPE: NATURE, OR NEW MONUMENTS?

Fourth Year Studio */ Fall 2018*

Site */ Buffalo, NY*

Type */ Individual Research Project*

Instructor */ John Zissovici*

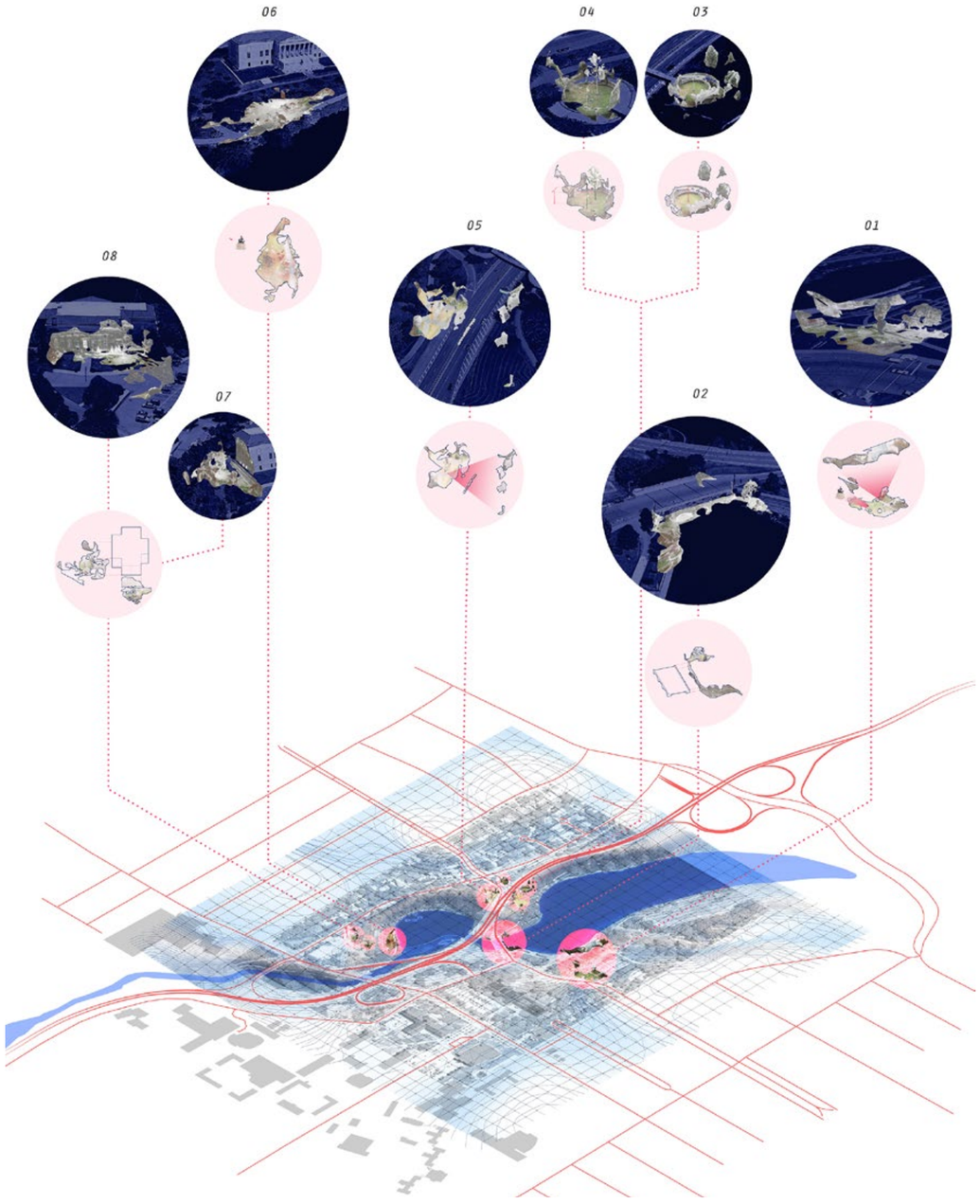
What genuinely is the urban landscape we need in this age? Has the rapidly involving technological imaging changed our perception of urban landscape? What's the consequence? This research project investigates the vast new 'nature' of image flows emanating from networked communication devices, and social media as a form of mass participation, to reflect on how urban landscape is mediated by images of it, and eventually proposes a speculative new networks of recreational space and experience.

Frederick Law Olmsted's 1868 plan of the park system in Buffalo was one of America's earliest and most comprehensive proposal for organizing recreational activity in city scale. The parks are designed to promote Olmsted's theory of 'Ideal Nature' and its benefit to the rapidly urbanizing Buffalo. Is Olmsted's ideology of nature anachronistic now? What's contemporary 'Ideal Nature'? A design, as well as a critique, this project reconstructs an interactive virtual park in Buffalo with AR and photogrammetry, and thereby questions the definition of monument and proposes a vision of new picturesque.

“

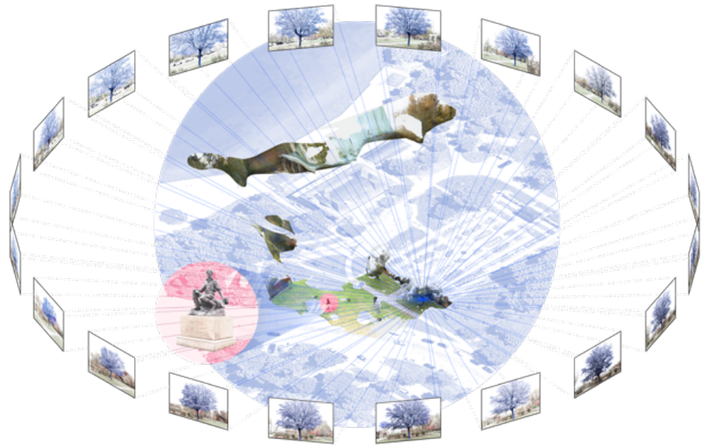
Trees that reinterpreted in the manner of monuments s[t]imulate a new form of mediated recreational experience for the visitors, through an architectural approach.

”



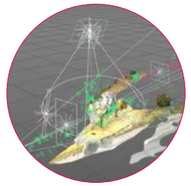
Methodology

A nature feature next to a man-made landmark is chosen to be virtually recreated as a “New Monument“. The virtual spectacles that mediated by Photogrammetry shift visitors’ attention to nature, and endow them with a new perception of the urban landscape.

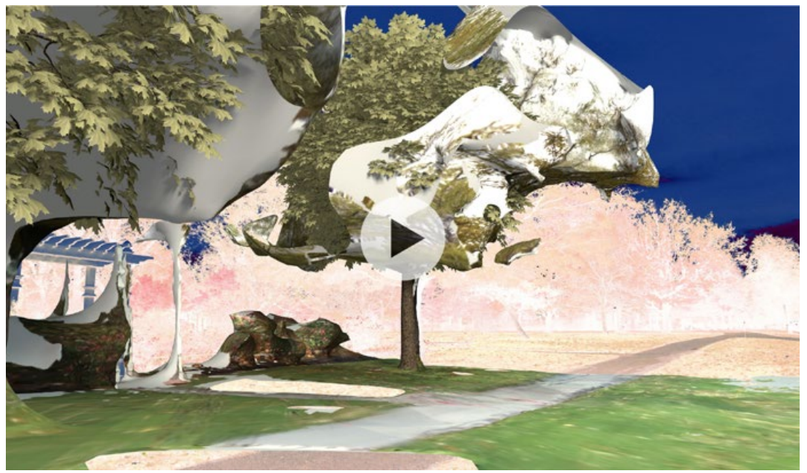


Video Footage

Photogrammetry Model
Generated by Autodesk ReCap



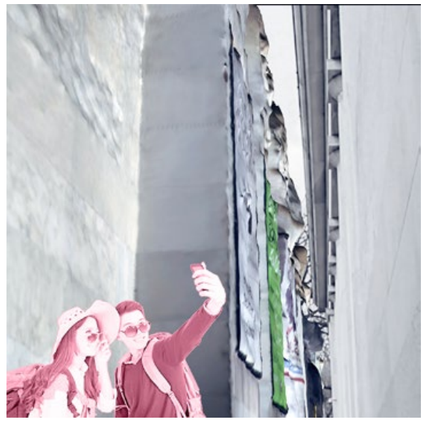
Cinema 4D
Simulation



Final output is a video, demonstrating a sequence of simulated experience walking through the park, and pedestrians’ interaction with the AR scenes.

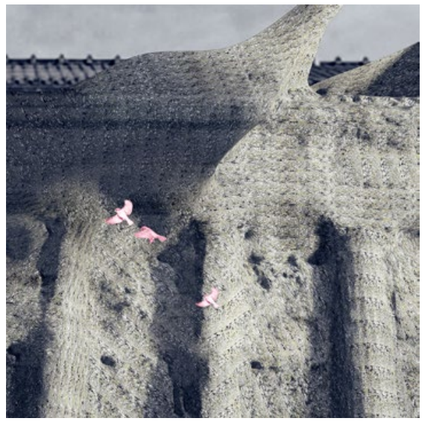
Now tourists tend to appreciate man-made spectacles more instead of the endowed natural scenery. To revisit the virtue of nature, the park landscape is documented and reinterpreted with the help of photogrammetry.

INTERACT W/ AR PROJECTION



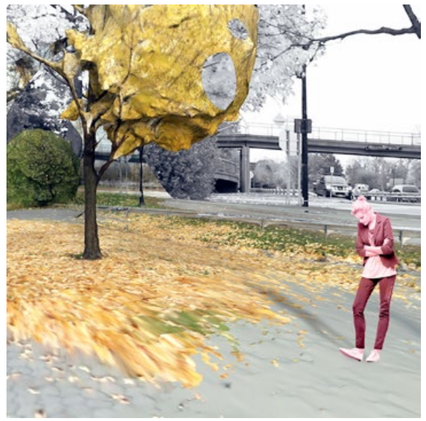
VIRTUAL / REALITY

NATURAL / ARTIFICIAL

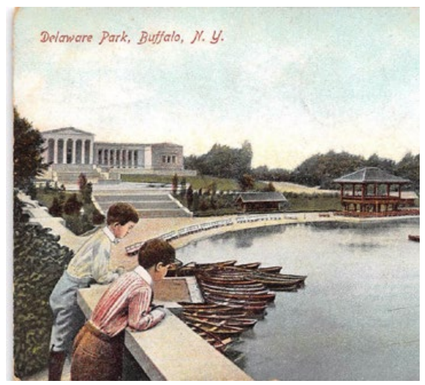


In this virtual space, man-made spectacle and nature has no difference; all is flattened into continuous membrane. Photogrammetry-mediated walkways deliver a non-typical meandering experience.

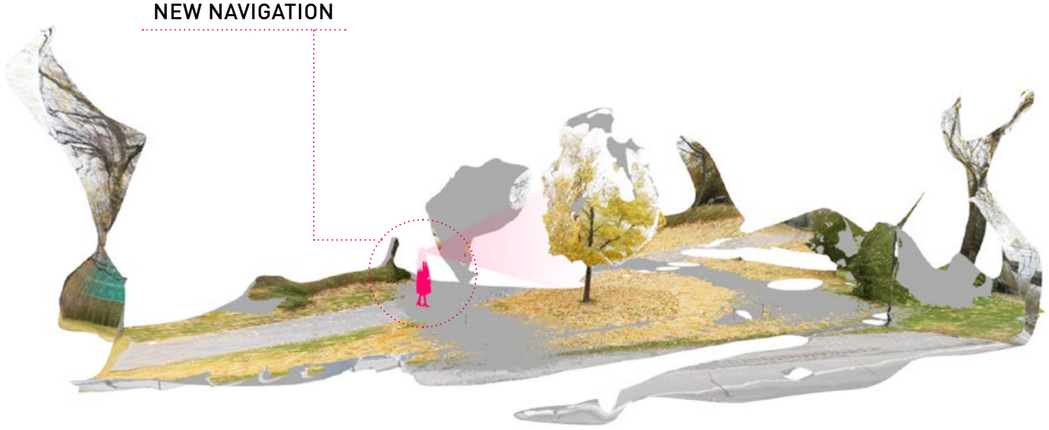
ENGAGE SOCIAL MEDIA



NEW NAVIGATION



Olmsted artificially constructed 'natural' landscapes with their carefully orchestrated scenic views, later to be used to promote the wonders of Buffalo through postcards. Albeit the plan's promotion of nature, the mediated images still have a focus on man-made spectacles.



05

STRUCTURE-DRIVEN DESIGN: ITHACA AVIATION MUSEUM

Second Year Studio */ Spring 2017*

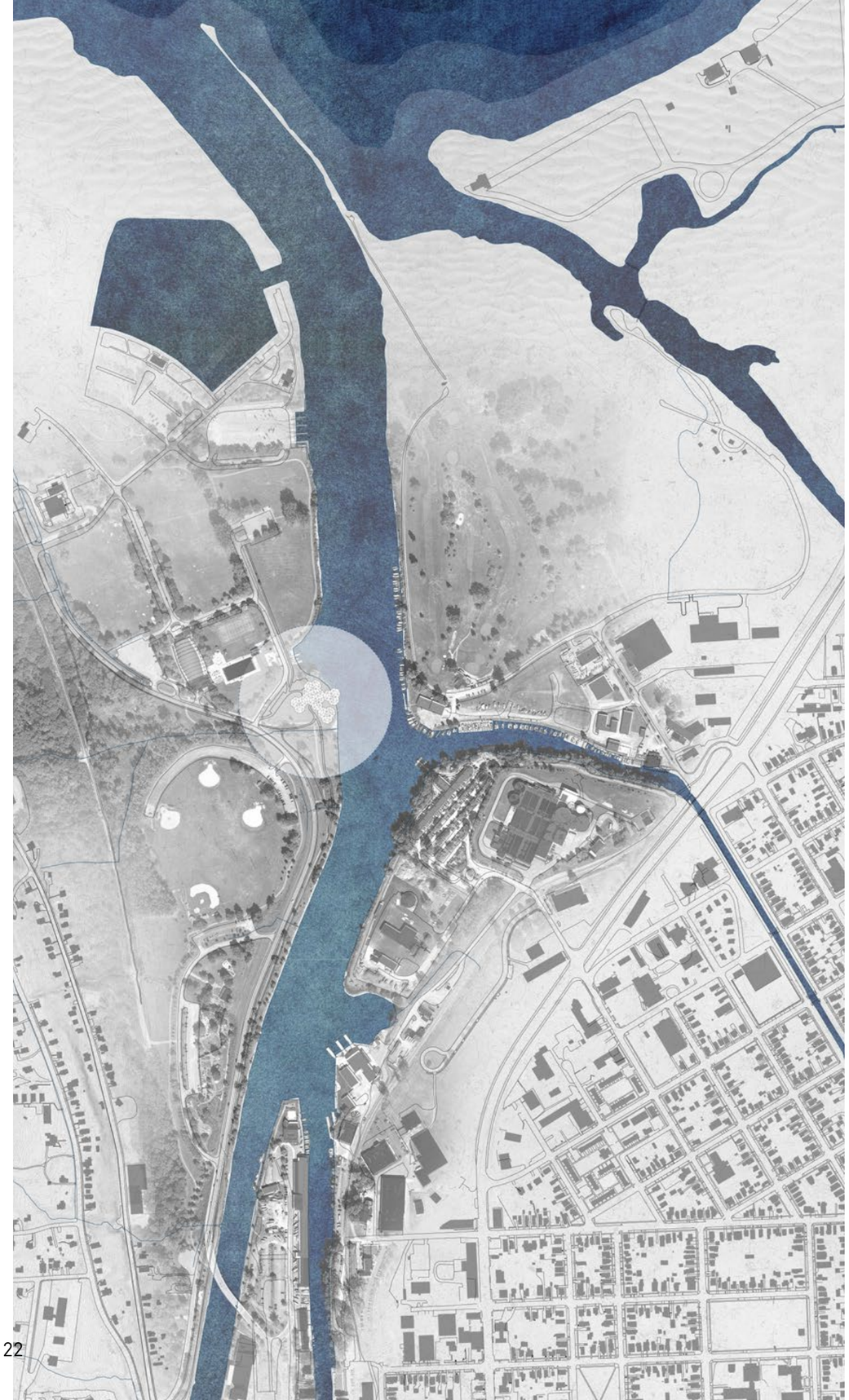
Site */ Ithaca, NY*

Type */ Individual Design Project*

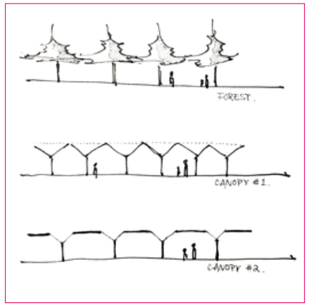
Instructor */ Rychiee Espinosa*

The project is inspired by a field trip to the Glenn H. Curtiss Museum, a transportation museum in Hammondsport, upper state New York. The 60,000 square foot facility is well-known for its collection of aircraft, vintage motorcycles, automobiles, and aircraft engines. Referencing to this featured collection, this foundation studio project proposes an exhibition venue for aircraft, as well as a local landmark in Ithaca.

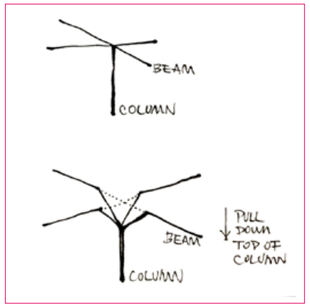
Considering the spatial and structural requirements for exhibiting aircraft, and ADA code, the structure-driven design process involves intensive feasibility study, including structural models in various scales, and construction drawings. The building form's response to its immediate site condition and the farmers market across the river is also scrutinized. How to dissolve the aloofness of modernism museum when it's settled in a suburban community?



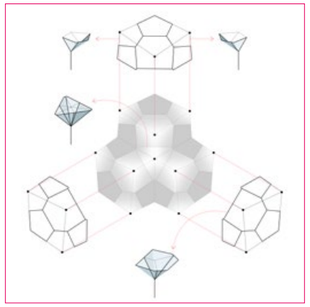
DESIGN SOLUTION



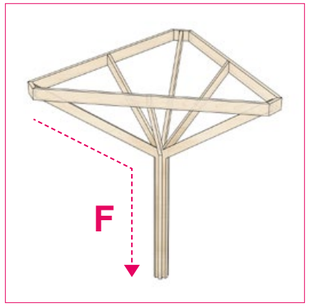
Concept is derived from forest



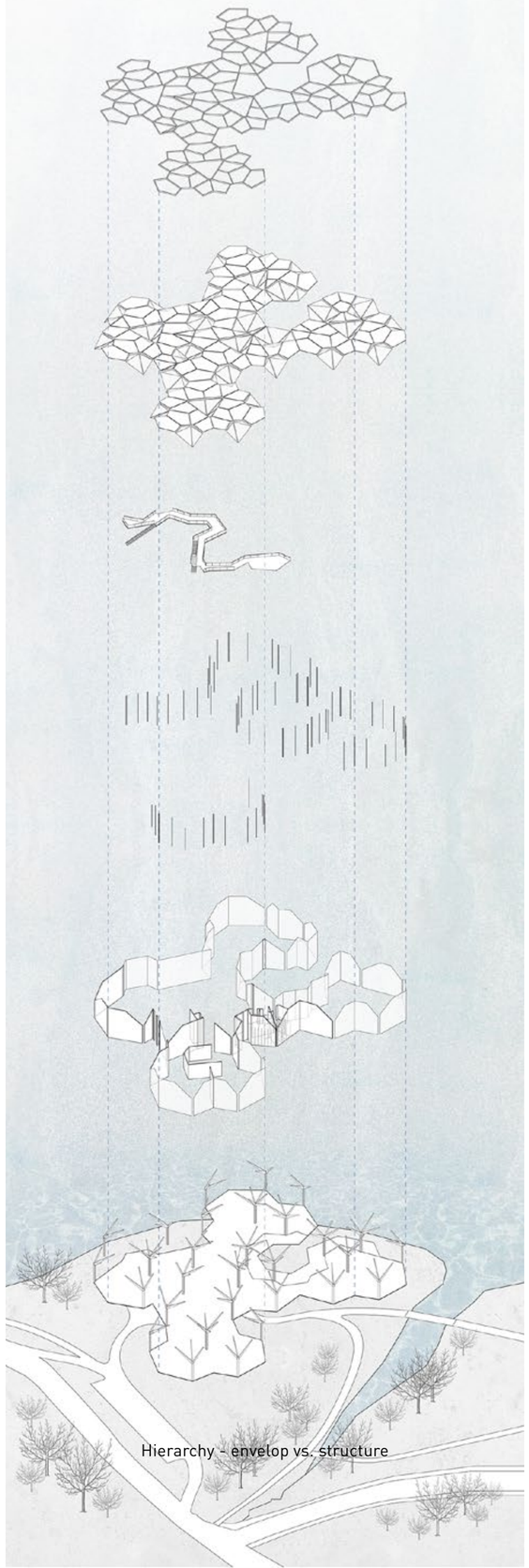
Operation of the branching column



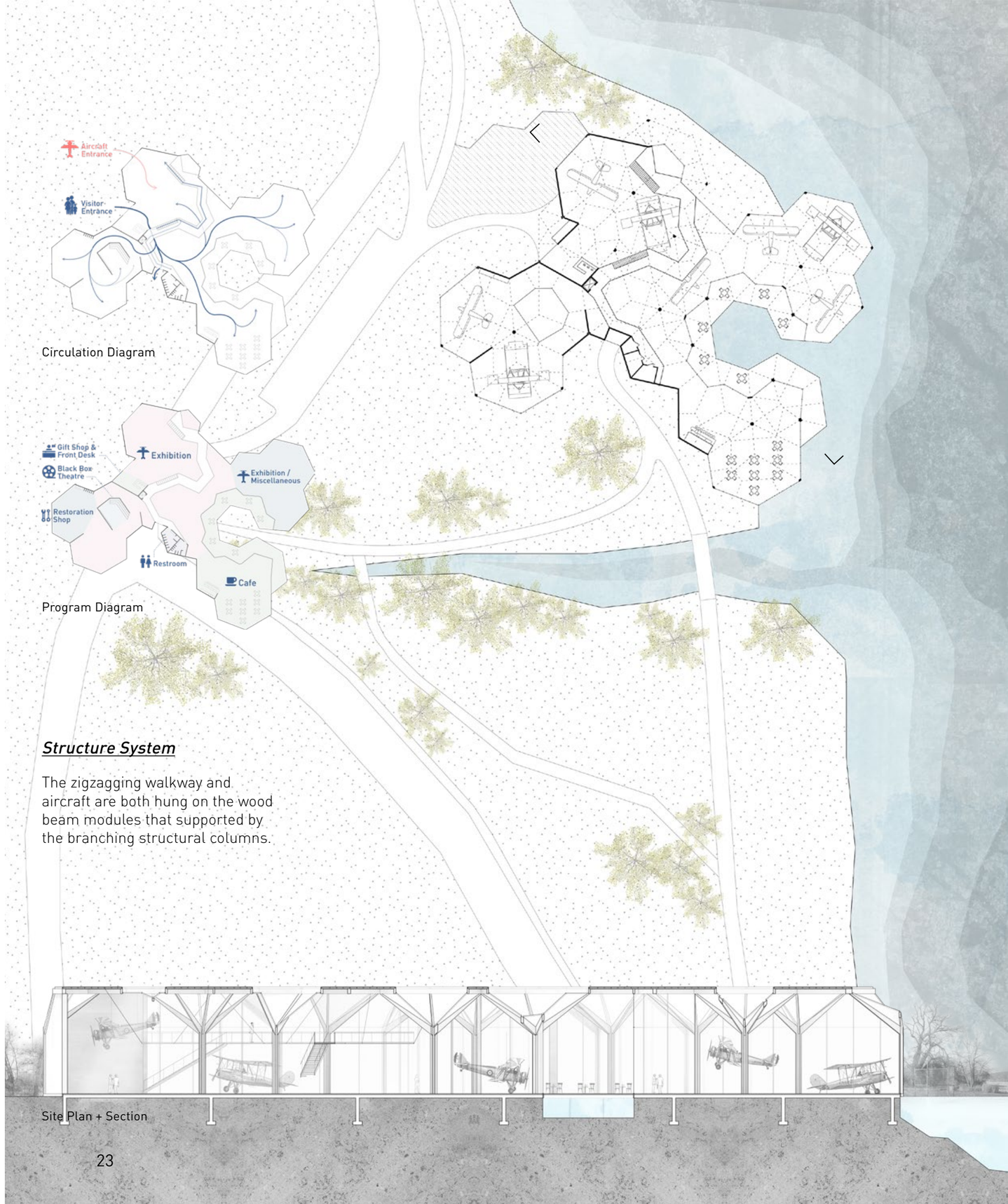
A basic module is composed of four types of branching columns



Structural support + light well



Hierarchy - envelop vs. structure



Circulation Diagram

Program Diagram

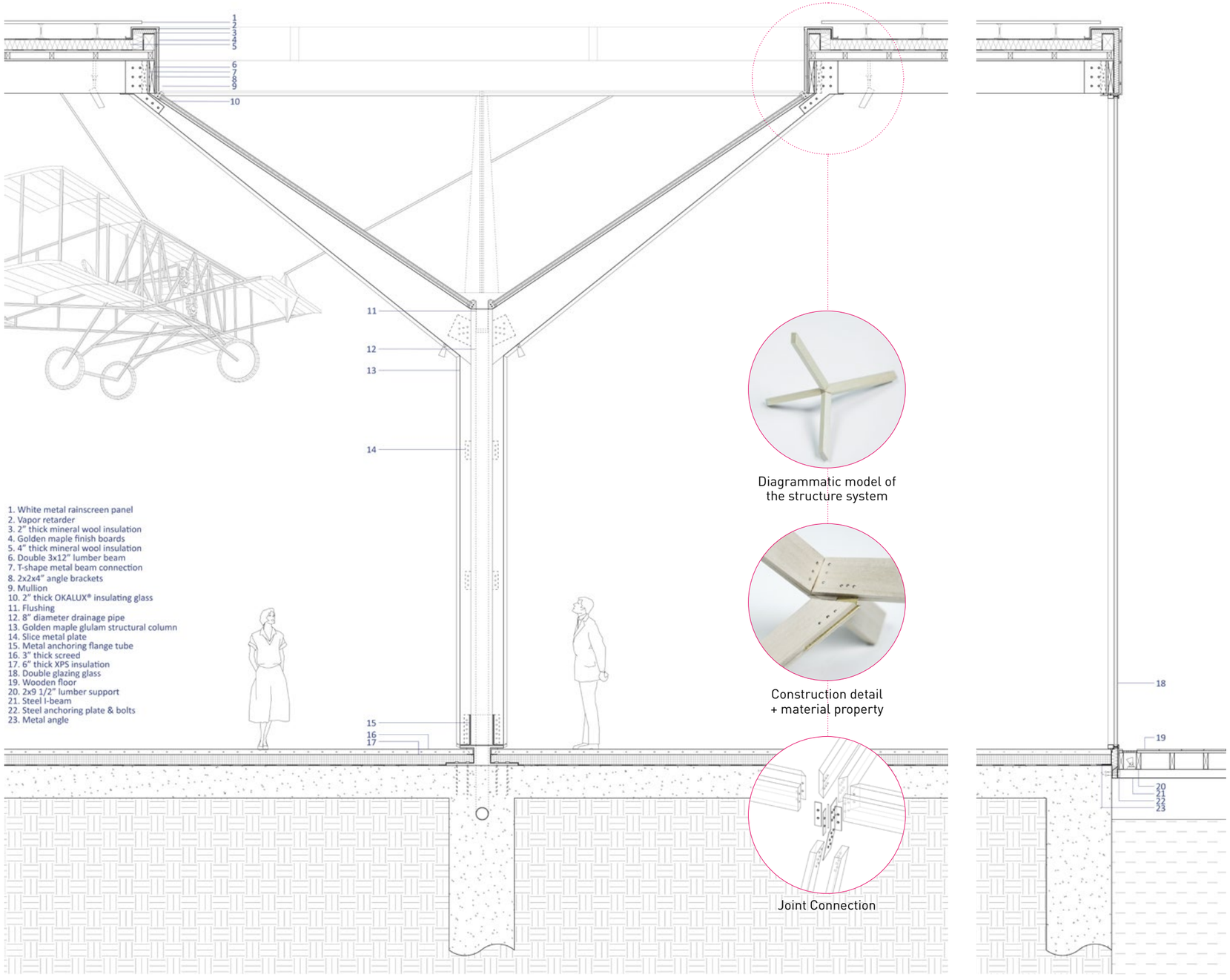
Structure System

The zigzagging walkway and aircraft are both hung on the wood beam modules that supported by the branching structural columns.

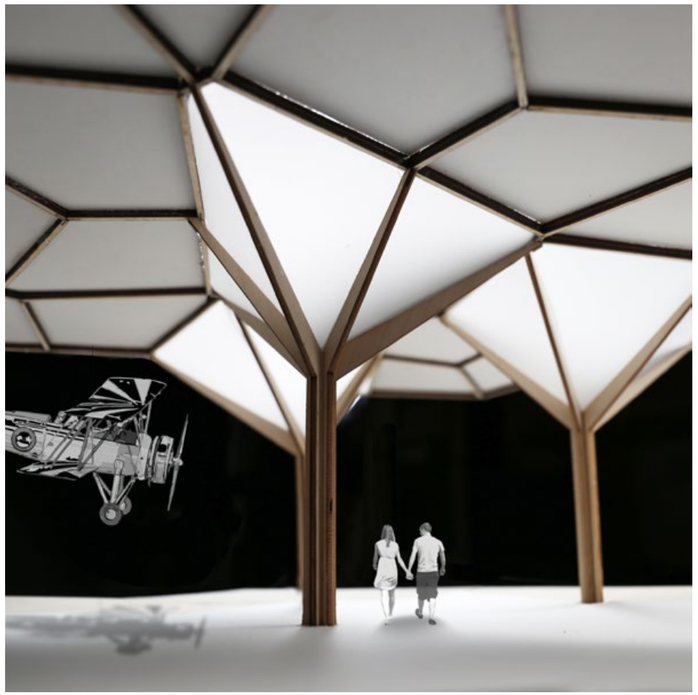
Site Plan + Section

STRUCTURE SYSTEM

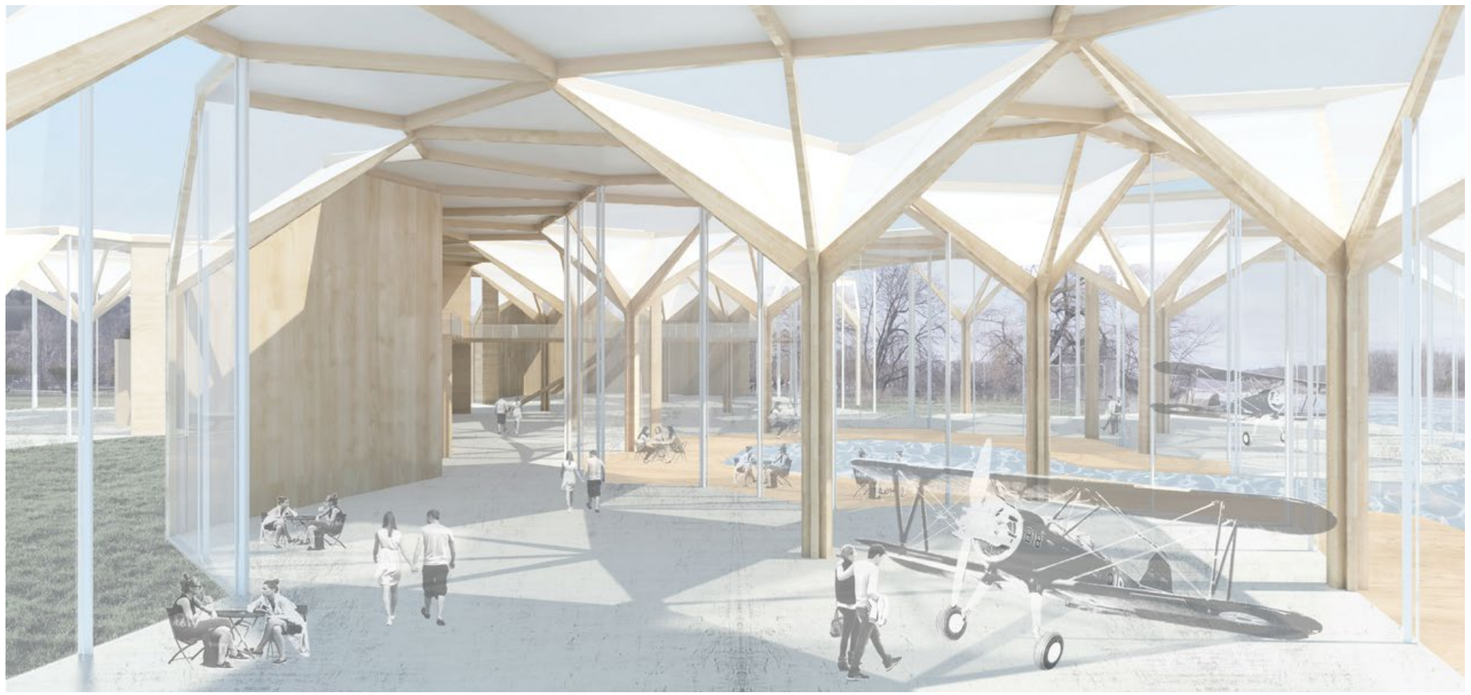
Model study of structure



Detail Section



1'=1/4" Model of the structural column / light well



Render of the exhibition venue at the waterfront

Schematic design study model

Render of the aerial view of the Ithaca aviation museum

06

TUBULAR KNITTING: FIBERGLASS COMPOSITES CHALLENGE

Independent Material Study */ Spring 2018*

Location */ Ithaca, NY*

Type */ Collaborative Material Fabrication Project*

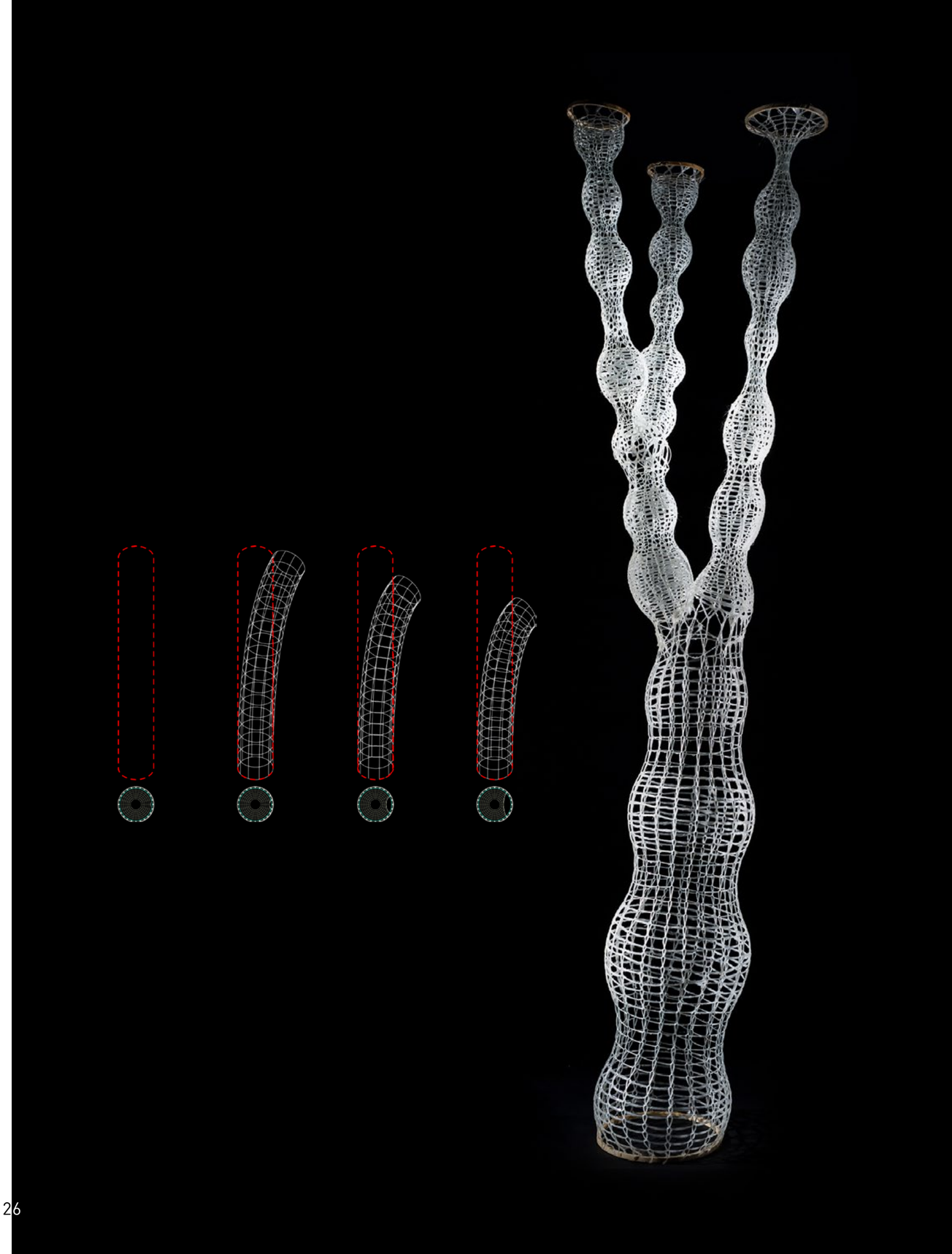
Members */ Yuheng Zhu, "Gloria" Xiaohang Yan, William Qian, Jingxin Yang, Jingjing Liu*

Instructor */ Sasa Zivkovic (RCL Director), Christopher Battaglian (TA), Brian Havener (TA)*

Personal contribution includes the design development, Fiberglass material fabrication, physical study models, material load bearing test, final model assembly.

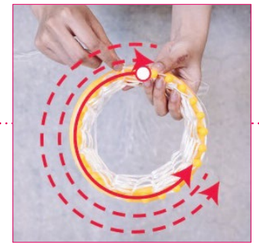
This project is an independent study on the potential of Fiberglass as a building material, directed by faculty of the Cornell Robotic Construction Lab (RCL). It won first place in the 2018 AIA/ACMA Composites in Architecture Design Challenge.

In contrast to traditional Fiberglass application process, "tubular knitting" studies from textile/fabric industry, and utilizes off-the-shelf knitting mechanism to perform Fiberglass rovings. Balloons are inserted temporarily to inflate the tubular knit. After resin impregnation, the balloons were deflated, leaving a cured structure with organic porosity, able to provide the support of wood at 1/10 the weight in a small stool demonstrator.



Core Concept Study

Fiberglass is a common type of fiber-reinforced plastic using glass fiber. Can fiberglass be more than solids panels?



Knitting Technique Study

Material Behavior Study

In contrast to conventional fiberglass fabrication methods, here the glass roving is knitted into webs. We conduct various studies to learn the material behaviour of fiberglass, and methods to control the tubular knit's bending, branching, and diameter variance.

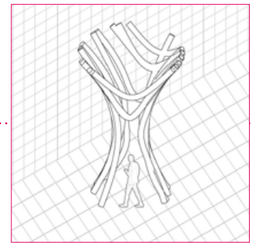
Before Resin Cured

After Resin Cured

Balloons are inserted temporarily to inflate the tubular knit, thereby leaving a durable structure with organic porosity after resin is cured.

A: Fiberglass Stool

B: Wood Stool



Future: Structural Tube

Fiberglass Stool: 621g
Wood Stool: 4620g

The lightweight, spatial and structural tube is potential alternative to traditional column.

Fiberglass Strength Test

Material Behavior Study

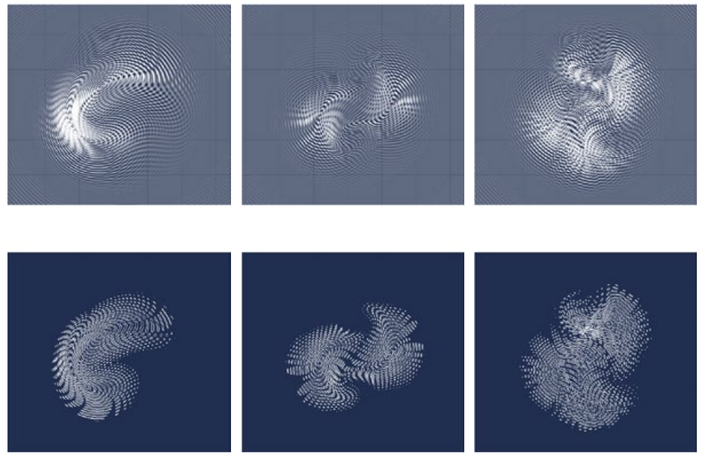
Resin Curing Process

07 PROFESSIONAL WORK SAMPLES

Type / *Professional works at* ***AntiStatics Architecture***
Incumbency / *Summer 2019, Beijing, China*

Unreal Engine VR visualization of I Do jewelry store (Wuhan). The project is designed by AntiStatics in 2018, and constructed in 2019. These renders are my individual work.

Migrated Rhino models into Unreal Engine and enabled navigation in VR for client meeting. Appointed and launched the office's first VR visualization attempt.



The interior schemes and 3d wall patterns of iDo Jewelry Store (Beijing), in Design Development.
These design attempts are conducted by me under instruction of Martin Miller, Design Director of the office.

Worked in the AntiStatics Design Team of "WOVEN GROVE" Hyper-Light Bamboo Tower at Design China Beijing 2019.

This study model is a collaborative effort of Yuheng Zhu (me), "Yoyo" Yueyao Li, Xin Zhong.

Aiming for a parametric design exploration of bamboo-weaving technique, the final model is a 6.8m x 3.5m bamboo tower installation that exhibited in The Opposite House, Beijing.