BEYOND THE BOUNDARY
Use Symbiotic Structures for the Diversity of the Existing Space

Master Thesis
Chalmers School of Architecture
Architecture and Urban Design
Spring 2017
Mengyao Zhang

Examiner: Jonas Lundberg
Tutor: Kengo Skorick

CHALMERS
# Contents

## Introduction
- Abstract 05
- Claim 06
- Discourse 06

## Research
- Reference 1 08-09
- Base Architectural System 10-11
- Prototype 12-24

## Background
- Contextual Forces 26-29
- Reference 2 30-32
- Base Organization System 33

## Design Proposal
- Building System 35-39
- Drawings 39-50

## Discussion

## Reference

## Contact
INTRODUCTION

The process of a transforming a building is often seen as a process of its own transformation and renewal. Sometimes, the process will be accompanied by structural damage, material replacement, functional changes, which means a lot of time and manpower loss.

In this case, the symbiotic building offers a variety of possibilities. It could create new built volumes in already-urbanized areas preventing the creation of new infrastructure, allowing to allocate resources to the redevelopment of existing ones. This master thesis will try to explore the diverse space possibility of the symbiotic structure.

The strategy of the design derives from landform architecture. It starts with the subdivision of the site which results in the network circulation. Then establish the landform according to the 3d circulation which is the logic of the variety height difference of each platform. In this way to activate the space and students could have the possibility to explore their own way to use the space.

The project is developed through site analysis, literature and case studies. Starting from the rereading of critical issues of urban fabric, upgrading and retrofitting the low-quality social buildings that was obtained through articulated interventions of volumetric addition. How to add new structures to the original buildings, how to reduce the destruction of the original building, how to achieve the unity of old and new buildings. To solve this problem will be the main line and guidance of the design.

By using the way of symbiotic structures, this project wants to find a way to establish new circulation between new and old buildings according to the three-dimension landform. In other word, try to find a flexible way to form the building system.

Examiner: Jonas Lundberg
Supervisor: Kengo Skorick
Claim

Use the form of symbiotic building to interfere the existing space. In this case, the aim will be trying to active a district in campus.
House NA
Architects: Sou Fujimoto Architects
Location: Tokyo, Japan

Designed for a young couple in a quiet Tokyo neighborhood, the 914 square-foot transparent house contrasts the typical concrete block walls seen in most of Japan’s dense residential areas. Associated with the concept of living within a tree, the spacious interior is comprised of 21 individual floor plates, all situated at various heights, that satisfy the clients desire to live as nomads within their own home.

A Thousand Yards
Architects: Penda
Location: Beijing, China

Multiple repetitive unit spaces may result in the feeling of lost.
Base Architectural System
Relationship between height difference and spatial boundary
Prototype 1
The range of sight view corresponding to a single height difference

Prototype 1
The range of sight view corresponding to height difference
Prototype 1
Morphological changes in continuous three-dimensional space

2 peaks

6m

Semi-open → Open

12m

Private → Semi-open

6m

Semi-open → Semi-open

12m

Private → Private

3 peaks

6m

Private → Semi-open → Open

12m

Private → Private → Semi-open

6m

Semi-open → Semi-open → Open

12m

Private → Private → Semi-open
Prototype

Imaginary context

Single wall

3600mm

720mm

720mm

720mm

Three-sided enclosure with a courtyard

Prototype

Imaginary context

Frame of the courtyard

Entry on the wall

Starting point
Morphological changes in an imaginary context

2D circulation
Logic of centroid
Voronoi

Overall, the size of each area is concentrated in two ranges and also in an obvious group form.

Horizontal
Verticality
Diagonal

Accessibility

Common area groups
Connections per platform based on the distance between every adjacent platforms

Area changes are concentrated in the corner area, and the area distribution is more average.

Horizontal
Verticality
Diagonal
The area changes little, the larger areas only appear in the upper part.

Overall, the size of each area is concentrated in three ranges and also in a obvious group form.
Morphological changes in an imaginary context

2D circulation

Logic of centroid

Voronoi

3D circulation

Accessibility

Verticality

Diagonality

Connections per platform based on the distance between every adjacent platforms

Common area groups

Area changes are concentrated in the corner area, and the area distribution is more average.

Accessibility

Horizontal

Verticality

Diagonality

The area distribution is quite average.
BACKGROUND
Public space in the campus plays an important role in teachers and students life, and is also an important part of teaching environment. It is important to provide multi-level public space to meet the needs of campus functions and enhance the campus environment quality.

And Chalmers campus planning just lack of semi-open public space for students.
The site located in the campus of Chalmers. It is a outside courtyard between A-building and V-building.

The courtyard links two teaching buildings and also has four entrances to them, but few people use it. Its east side is blocked by small hills.
Reference 2: Organization
Inspirational Evidence

Milstein Hall at Cornell University
Architects: OMA
Location: Ithaca, New York, USA
21st Century Museum of Contemporary Art, Kanazawa

Architects: SANAA
Location: Kanazawa, Ishikawa, Japan

The Museum is located in the center of Kanazawa, near Kenroku-en garden and the Ishikawa Prefectural Museum of Art. The building has a circular form, with a diameter of 112.5 metres. This shape aims to keep the appearance of the overall building volume low, to mitigate the scale of the project and allows access from multiple points of entry. The transparency of the building further manifests the wish to avoid the museum being perceived as a large, introverted mass.
DESIGN PROPOSAL

Logic of Circulation Based on Context

Logic of centroid
Logic of Circulation Based on Context

2D circulation

3D circulation

Logic of Centroid

Platforms

Connections per platform based on the distance between every adjacent platforms

Voronoi
Common area groups

Quantity of accessible path of each platform
Section of the platforms

verticality

horizontal

diagonal
## Function

<table>
<thead>
<tr>
<th>Function Type</th>
<th>Cafe/Kiosk</th>
<th>Meeting Group</th>
<th>Room</th>
<th>Pin-up Exhibition</th>
<th>Space</th>
<th>Free Space</th>
<th>Corridor with Glass Roof</th>
<th>Corridor without Glass Roof</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility/Privacy Level</td>
<td><img src="image" alt="Accessibility Level" /></td>
<td><img src="image" alt="Privacy Level" /></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone Location</td>
<td><img src="image" alt="Zone Location" /></td>
<td><img src="image" alt="Zone Location" /></td>
<td><img src="image" alt="Zone Location" /></td>
<td><img src="image" alt="Zone Location" /></td>
<td><img src="image" alt="Zone Location" /></td>
<td><img src="image" alt="Zone Location" /></td>
<td><img src="image" alt="Zone Location" /></td>
<td></td>
</tr>
<tr>
<td>Feature of Each Zone</td>
<td>Interior Easy to get access Center of the courtyard</td>
<td>Interior Flexible Higher privacy level Good sight view</td>
<td>Interior Flexible Natural light Next to A-building</td>
<td>Outside Flexible Natural light High accessibility Next to V-building</td>
<td>Inside Natural light High accessibility Next to V-building</td>
<td>Inside Natural light High accessibility Connect V-building and A-building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State of Each Zone</td>
<td><img src="image" alt="State of Each Zone" /></td>
<td><img src="image" alt="State of Each Zone" /></td>
<td><img src="image" alt="State of Each Zone" /></td>
<td><img src="image" alt="State of Each Zone" /></td>
<td><img src="image" alt="State of Each Zone" /></td>
<td><img src="image" alt="State of Each Zone" /></td>
<td><img src="image" alt="State of Each Zone" /></td>
<td></td>
</tr>
</tbody>
</table>
Section
This project started with the thinking of the places that the transformation could happen. At first, it is just a simple idea that creating an additional place that offer extra space. It could be some small volume that stick to an existing building. That is the original idea of this master thesis. Then I feel that this form could be used to change the spatial performance of a district. So it developed towards the thinking of circulation influence when adding some extra parts.

How to arrange multiple layers of height difference is the first problem to be solved. Here I need to thank one of my guest tutor Jonas Runberger. He gave me the advice of landform buildings which inspired me a lot.

The final result is more like a continous landscape between a series of buildings. At the same time, offer some free using space for the students and also break the barrier in the site.

Through the exploration in the establishment of the circulation system, this master thesis offers a way to solve the circulation problem with a flexible option that could adapt to any context.
Thanks to

Doing the master thesis is like a journey which is filled with various flavours of candies. Sometimes sweet, sometime bitter. However, it is a meaningful and also unforgettable time because all of you, my dear friends.

Without you, I could’t imagine completing the model. Thank you so much for your dedication and patience, Yupeng. So glad to meet you here and wish you all the best. Tianhai and Ruowen, thank you as well for your helping for making the model.

And also my beloved friends, thanks for accompanying and supporting me all the time, Zhiyu, Wenhui and Yiwen.

Then it’s my tutor Kengo, thanks for the longtime patience and selfless dedication. Also Jonas Lundberg, Jonas Runberger and Daniel, thanks for your important advice.

Finaly, my parents, thanks for your supporting and understanding.

Reference

Book


Web


Contact

Mengyao Zhang
lyzhangyao@hotmail.com
+46 737168095