ZHOU SHU | Portfolio

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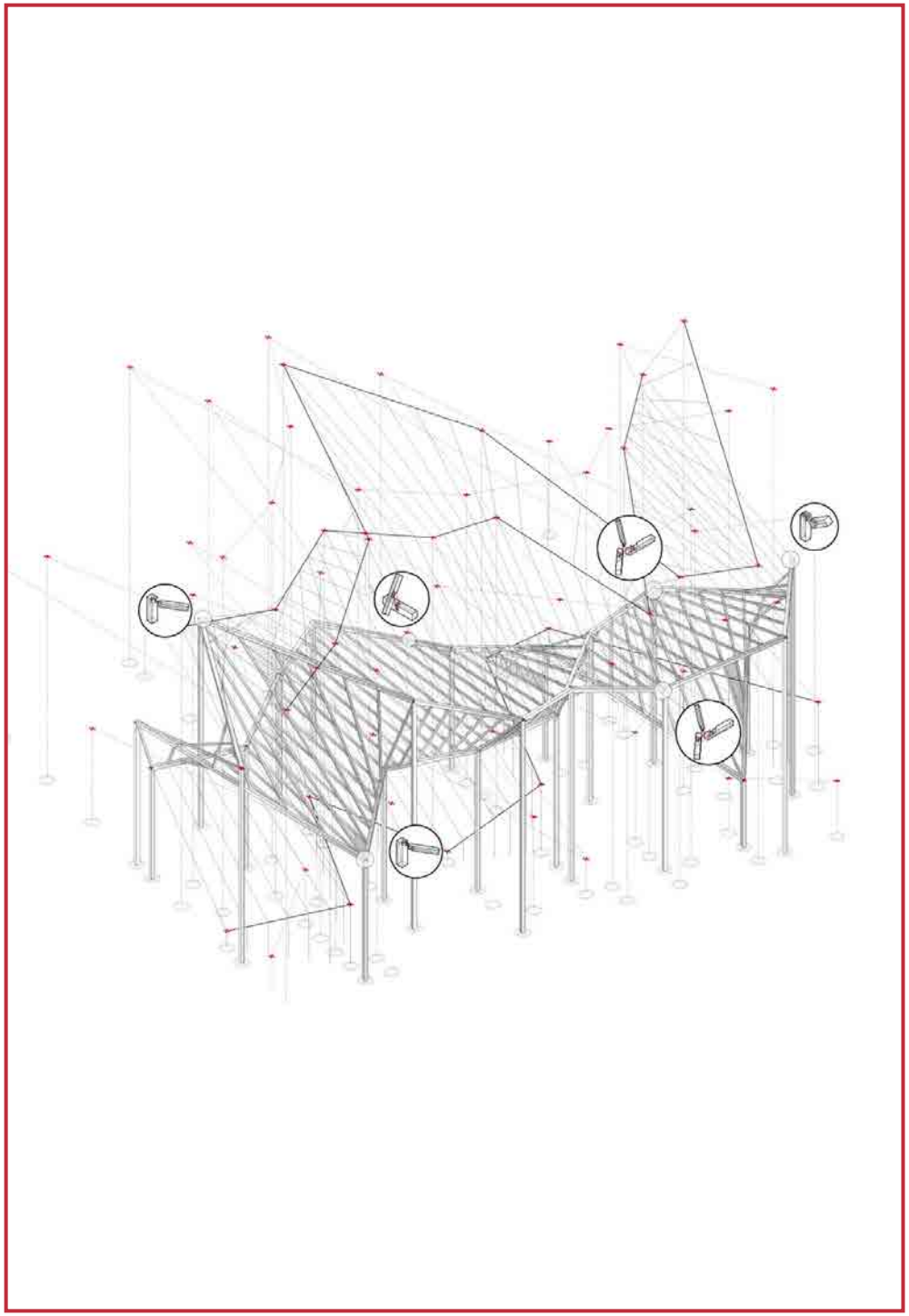


01 Future Construction Frame

[spontaneous construction]

ModRule: A User-Centric Mass Housing Design Platform, DADA Digital Factory, Tongji University, Shanghai
2-Week Workshop, Team Work, June 2015
Tutor: Gao Yan
Contribution: Concept 40%, Analysis 80%, Model 50%, Drawing 50%

This program is cooperated with one of my classmates based on the project done in *DADA digital factory 2015*. The purpose is to help create an easy-manipulated system by which people can design their own living spaces. Meanwhile, the system will calculate the exact shape of all construction components which can be easily machined. As a result, the whole **autonomous building phase** will be done from bottom to up and conducted efficiently.

Social Problem

China is undergoing fast urbanization, more and more people are swarming into the city, making price of housing unaffordable for ordinary residents. People are thus trapped in old apartments and use all kinds of methods to enlarge their living spaces by adding new structure on existing building.

Public corridors are occupied
@ Longchang Flats, Shanghai

All the self-built units made a strange new building
@ Kowloon Walled City, Hong Kong

Buildings are crowded with each other
@ "City Village", Shenzhen

Keypoint

- How to help people build on their own?
- What will the future building look like under people's independent construction?

Reasearch

The research is done considering four different aspects. The residents' need, the construction of existing building, the potential material to be used, the way to process. Apparently, these factors influence each other which lead to a multithreading thinking process.

Resident

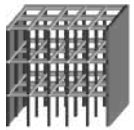
41 years old, resident, have another

Requirements:
cheap material, easy to build, little time

36 years old, tenant, have no appartment

Requirements:
easy to fix and disassemble, low expense

Basic Structure



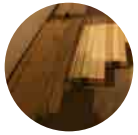
Frame Structure

Characters:
widely used, easy to add secondary structure

Shear Wall Structure

Characters:
mainly used in old buildings, less flexibility

Potential Material



Wood

Characters:
cheap, light, easy to manufacture

Concrete

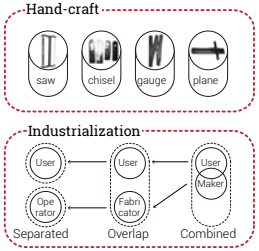
Characters:
high strength, cheap,

Steel

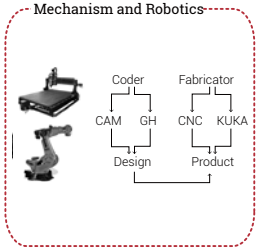
Characters:
expensive, light

Processing Method

PAST



PRESENT



FUTURE

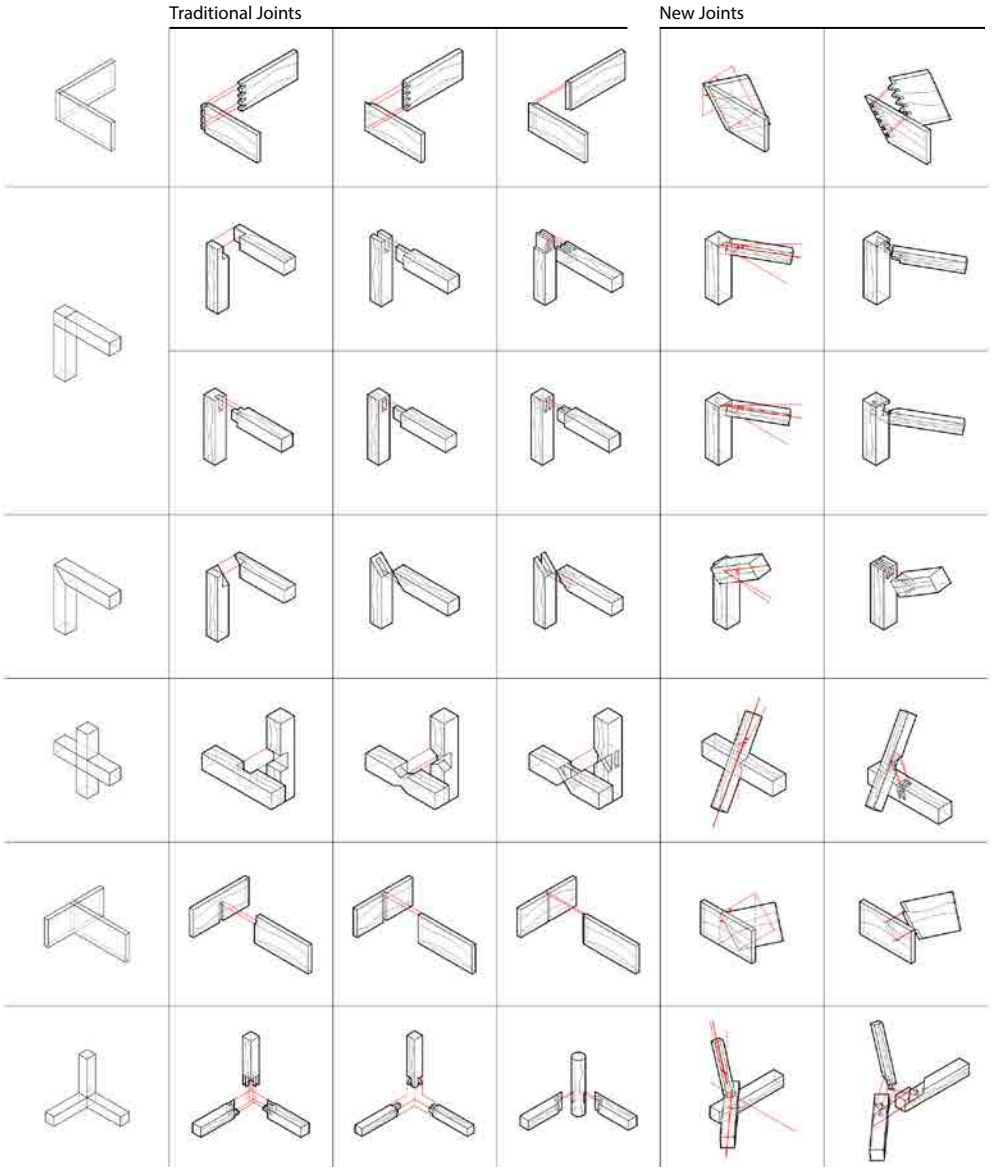
Keypoint

- We choose wood.
  It is light to handle, and it is not quite expensive for ordinary people. With the help of CNC, people can easily process this material.
- New design will not be limited by orthogonal frame struture.
  Users' participation will make the final result irregular. But the advanced machine including robot technology will help make digital models into true architectures.

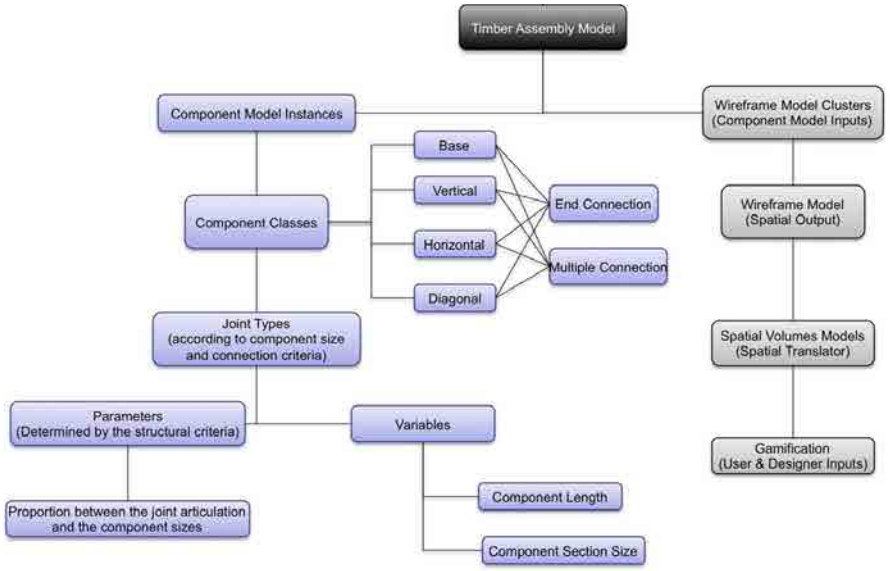
Further Reasearch

The further research is focused on the timeber joint.

Traditional Chinese people have created many different types of joints including column-column, column-board, board-board. Studying the old craft can help us figure out the regulation and design new joints with more complicated conditions.



Flow Chart



Procedure

Wood Precessing



Phased Achievements

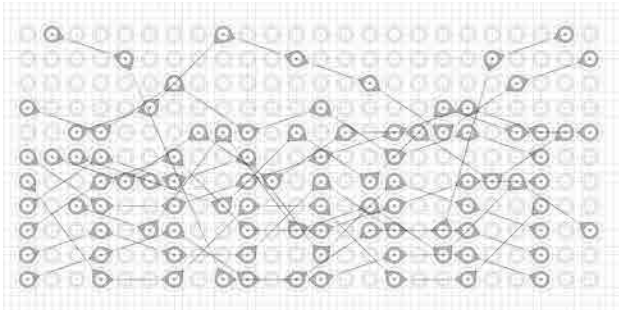
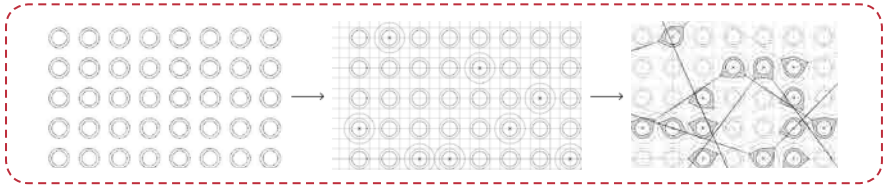


Design

Phase 1

On a grid pattern, there are many circles representing the main columns. People would need to connect a series of circles in a continuous line. The line represents the beam. One red line will match one green line.

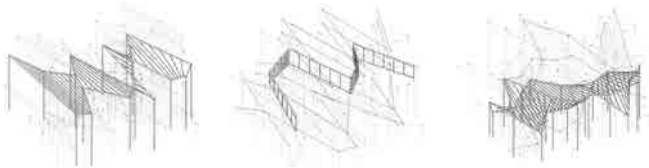
The potential structure can be either an orthogonal frame or an abnormal one.

Phase 2

People then may set heights for columns. Some space can be high and wide while others can be low and narrow.

Within the system, people can also make timber frame as structure for floors or walls or twisted three-dimensional future spaces.

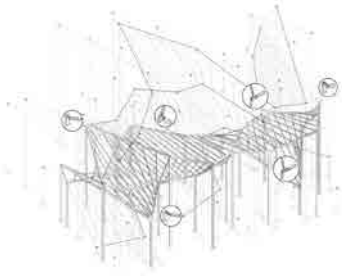



Phase 3

People may make different designs and all of them can be presented together. So it is convenient for people to compare and choose the ideal one.

Joints of the chosen timber frame will be created by algorithm automaticlly according to angles between each two wood sticks.

Then the digital model of each component will be sent to CNC Factory. With the processed wood, people can build their own design quickly.



02 Light for Sakura

[interaction device]

International VELUX Award, Tongji University, Shanghai
Team Work, Oct 2013
Contribution: Concept 50%, Model 20%, Drawing 30%

The Tongji Sakura Festival is held every year in early April. It is not only a grand festival for the campus but for the citizens in Shanghai.During the daytime, tourists flock in, enjoying the beautiful scenery in the sun. Citizens come shoulder in shoulder and it's hard to take one's way. But when night falls, the sun disguises its glory, everything seems cold and lonely. We are trying to create an atmosphere for the activities at night to bring the avenue back to life, hoping the festival can be extended all day long.

Intention

We intend to modify the ground tiles and endow it with an ability to record the trace of the walkers during the daytime and reflect it at night. Based on it, we hope to connect the day and the night. Meanwhile, the light from the ground can serve as lights for sakura appreciating as well.

Keypoint

- How to record the trace of walkers?
- How to interpret tourists's traces in daytime with lights at night?

Design

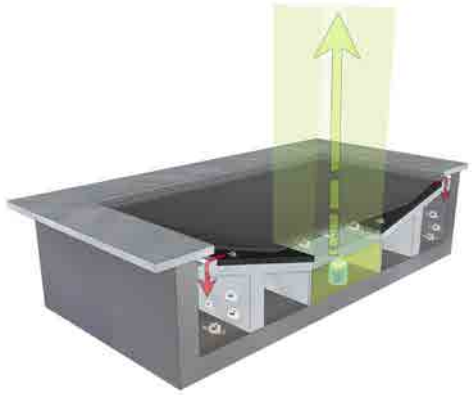
Working Principles

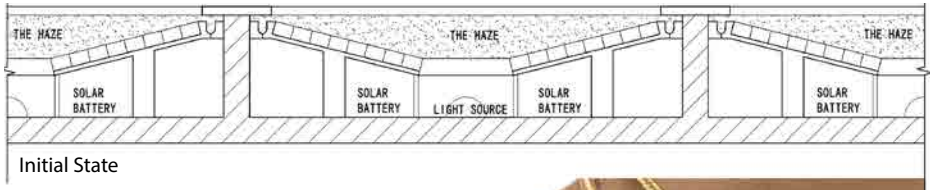
We use rubber surface, solar panel, air hole to fulfill our purposes.

Rubber Surface: the surface is elastic, when people walk on it, it will sag and push the turbid air into the under level.

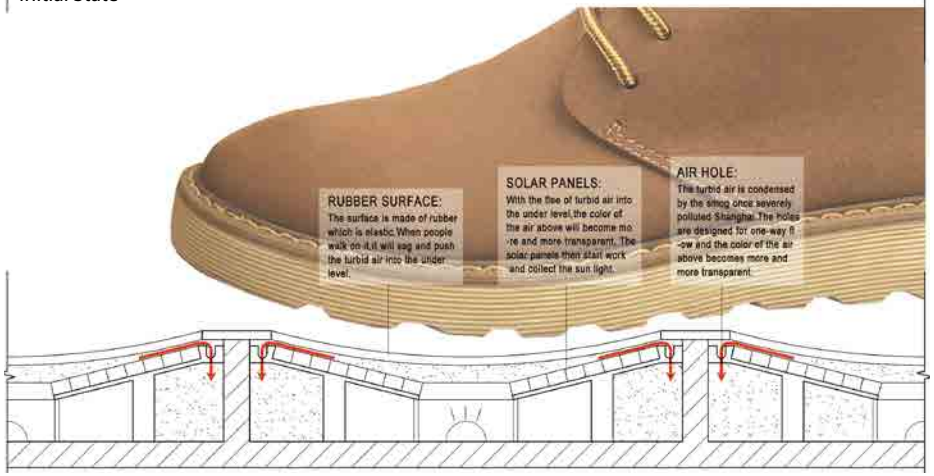
Solar Panel: with the flee of turbid air above, the solar panels will start collecting the sunlight.

Air hole: designed for one-way flow of turbid air.





Initial State

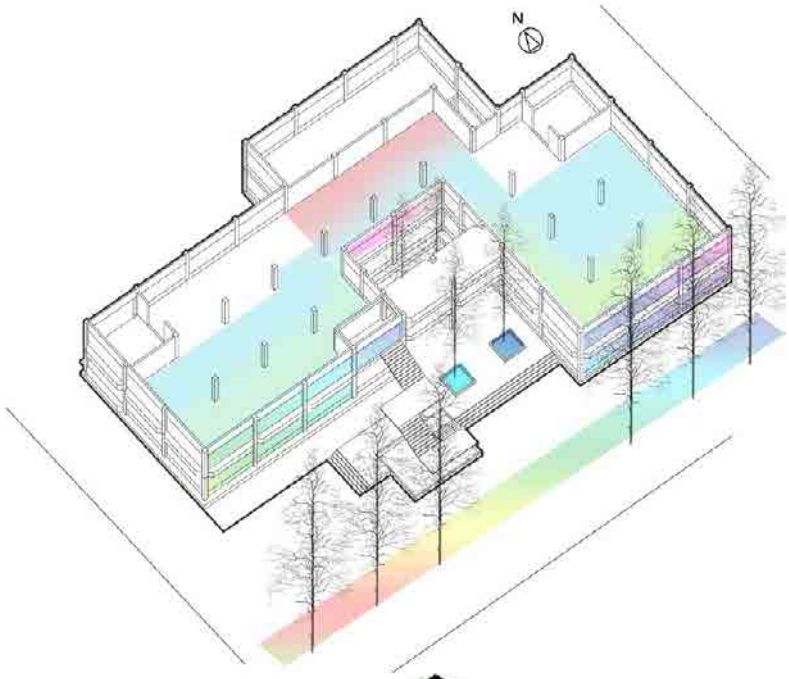


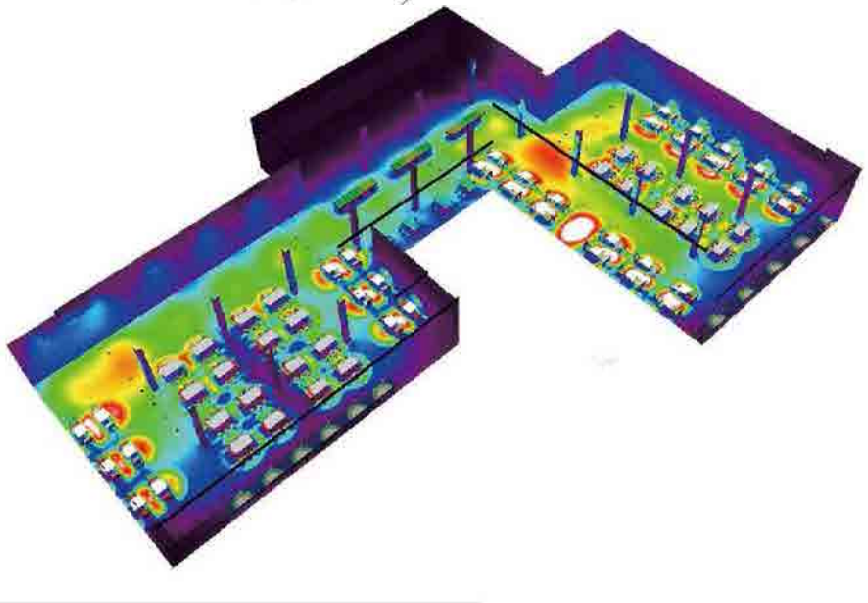
After Being Stepped On (for many times)

Effect Drawing

DAYTIME

NIGHTTIME





03 Changeable Canteen

[experiments oriented]

Luminous Environment Design, Tongji University, Shanghai
8-Week Studio, Team Work, Winter 2014
Tutor: Luoxi HAO
Contribution: Concept 50%, Analysis70%, Model 50%, Drawing 40%

Tongji University's canteen is complained a lot by students, mainly about the quality of food and the whole environment. In this program, we try to use different lamps to recreate the canteen. By studying people's visual cognition through all kinds of experiments, we can finally make a much better eating atmosphere. The keyword is lighting.

Social Problem

After a basic observation, we find the whole place can be divided into three parts. The first one is where students order dishes. Ultraviolet disinfection lamps and normal fluorescent lamps make food seems not fresh despite the fact that all food are totally newly made. The second place is dining area. Regularly arranged lamps along with the cold white light, making the canteen look like a hospital. The third place is the entrance which is surrounded by big tall trees. During dinner time, entrance area is quite dim and cannot attract students.

Besides, because the canteen is located near the dormitory, students take this place as a convenient working and discussing area. So there's a demand to develop the canteen into a multi-functional center.


Ordering Area


Dining Area


Entrance Area

Keypoint

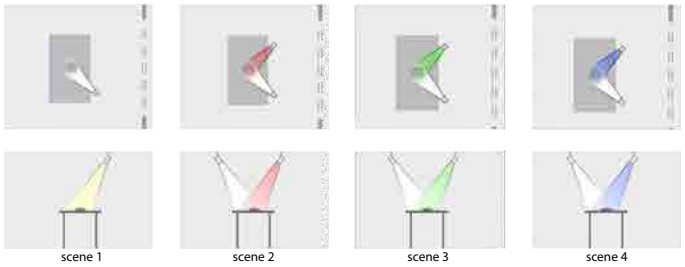
- How to make food look delicious?
- How to make the dull space into a vivid one?
- How to make full use of plants around?

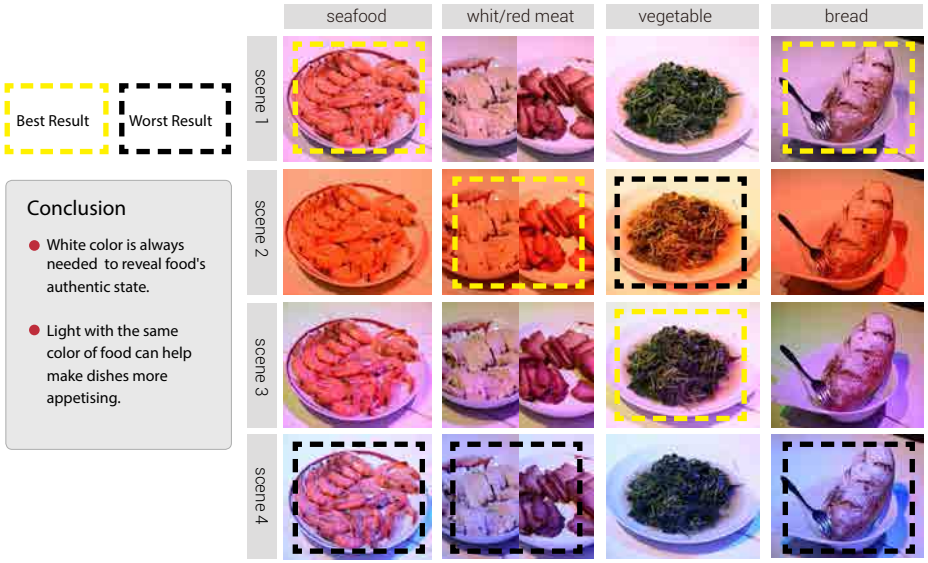
Research

We experimented on effects of lighting on food and plant. Factors like color, illuminance, direction all play important roles in the final visual results.

Food Lighting

Food in canteen mainly includes seafood, white meat, red meat, vegetable and bread. So we tested them under different lighting conditions to see



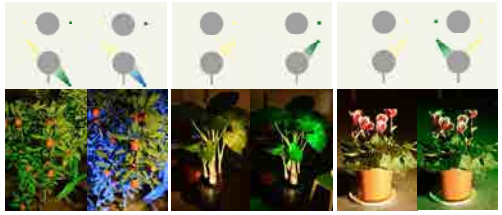


Conclusion

- White color is always needed to reveal food's authentic state.
- Light with the same color of food can help make dishes more appetising.

Plant Lighting

Indoor plant lighting
We choose plants with different shape of leaves, different type of flowers to experiment on. Lights here have various colours and directions.



Conclusion

- Contrast colour on plants give people a dramatic feeling.
- Direction of light is not quite important, but the shadow of plant can be very beautiful.

Outdoor plant lignting
We mainly focus on shadows of trees.

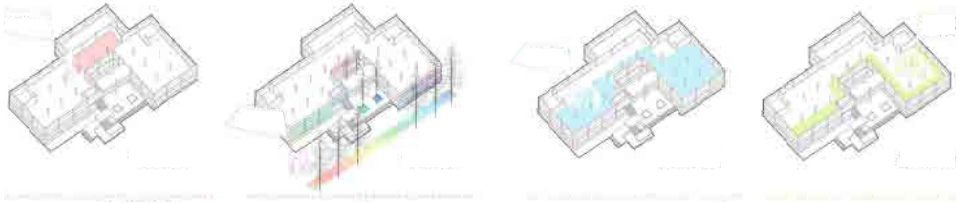
Conclusion

- White colour is always the most basic colour to get a good visual
- Lights need to be placed both in and out of trees to create multi-level

Design

Several kinds of lights are used to create a new vivid canteen environment. The canteen now is more than a place for eating with changable luminous environment.

Multiple Usage



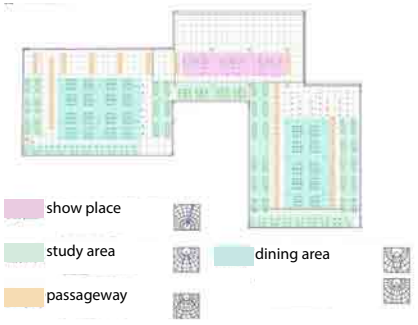
- dining place
- showing place for cooks

- ordinary trees
- avenue for performing

- dining place
- arena for dancing and other activities

- dining place
- place for studying and discussing

Function Distribution




Study Mode


Show Mode

04 Air in Motion

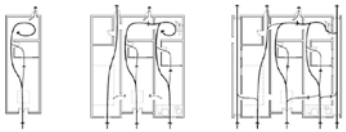
[architectural prototype design]

Thermodynamical Architecture Design, Tongji University, Shanghai
8-Week Studio, Individual Work, Spring 2015
Tutor: Linxue LI, Jianjia ZHOU

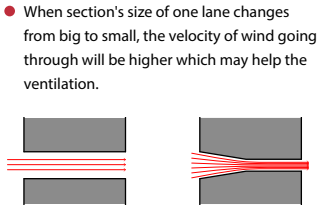
This studio tries to apply topic of thermodynamics into architecture, aiming to build a passive ventilation system by creating new architectural prototypes. I studied traditional residence in south China, especially the Zhu Tong House in Guang Zhou. From it, I summarize three principles of natural ventilation and abstract two typical spaces. Each type of space is further developed into two new forms according to the three principles. Finally I get four prototypes which will help my later building design.

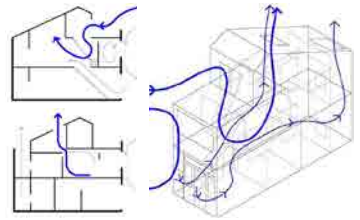
Three Principles

- Air with high velocity tends to attract air with low velocity. This kind of ventilation is caused by different wind pressure.

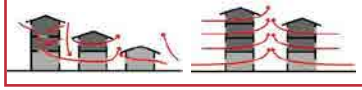


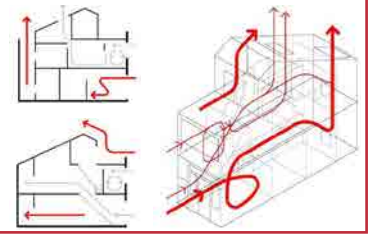
- When section's size of one lane changes from big to small, the velocity of wind going through will be higher which may help the ventilation.





- Sunshine conditions of patios are different according to their sizes and heights. Wind is generated under thermal presssure. It is called "chimney effect".

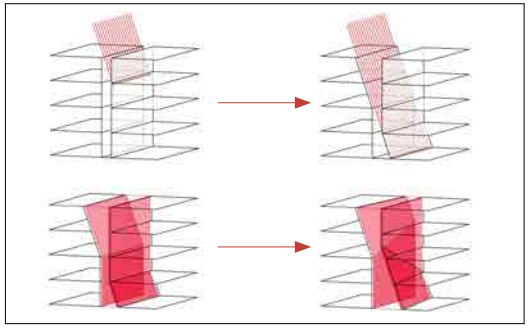


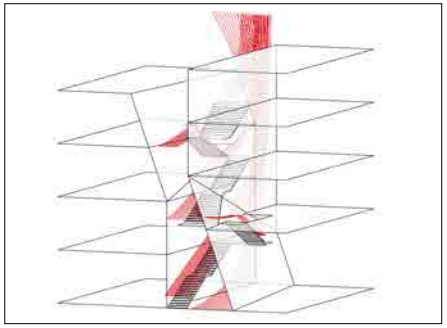


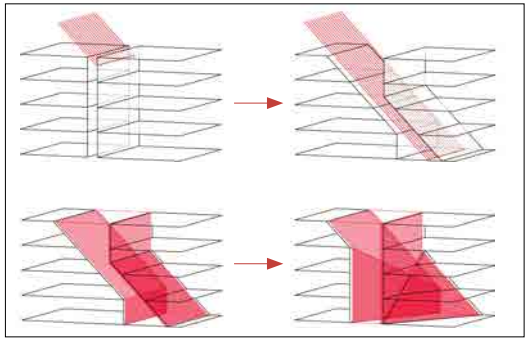
Two Basic Spaces

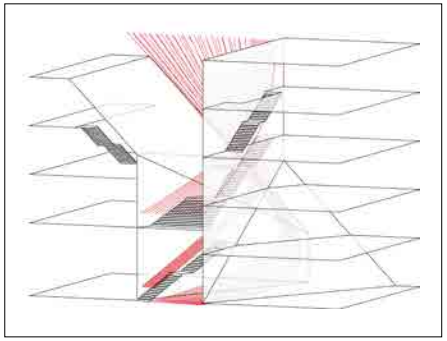
Patio

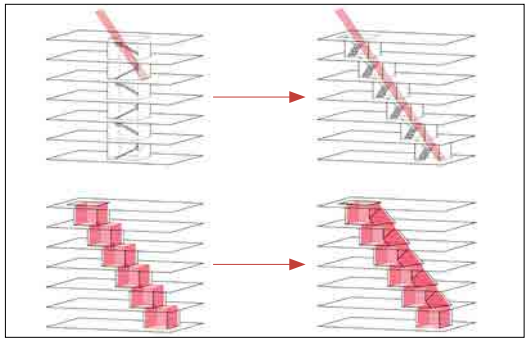
Cold Lane

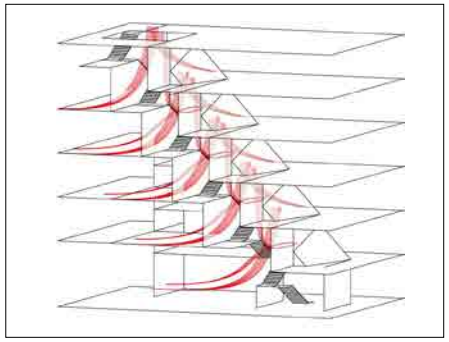


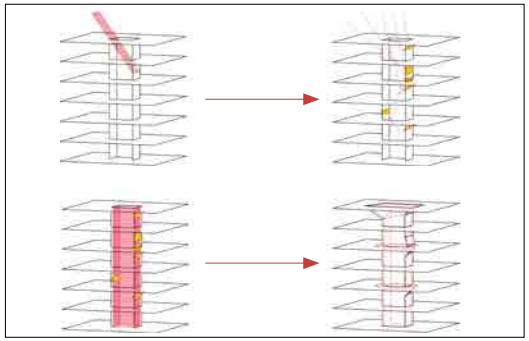


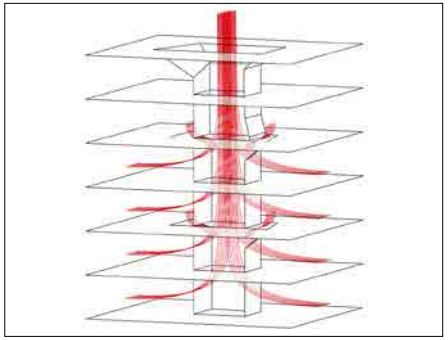


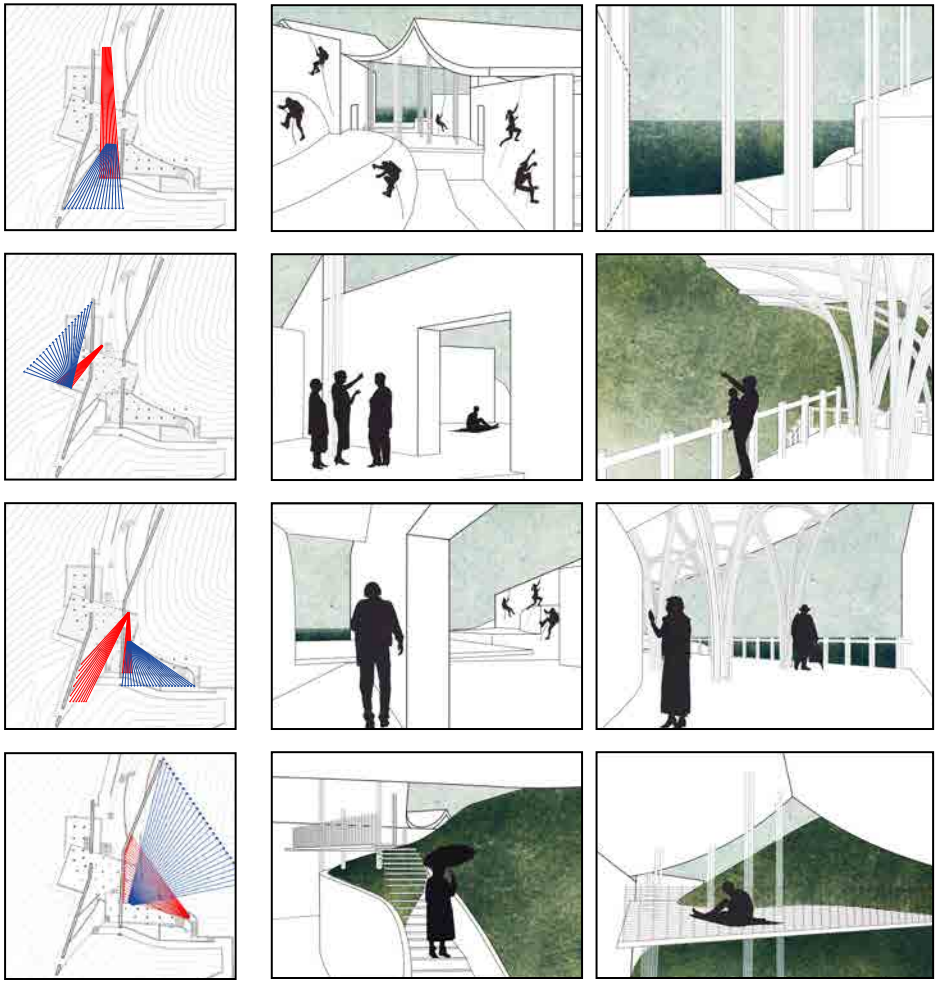










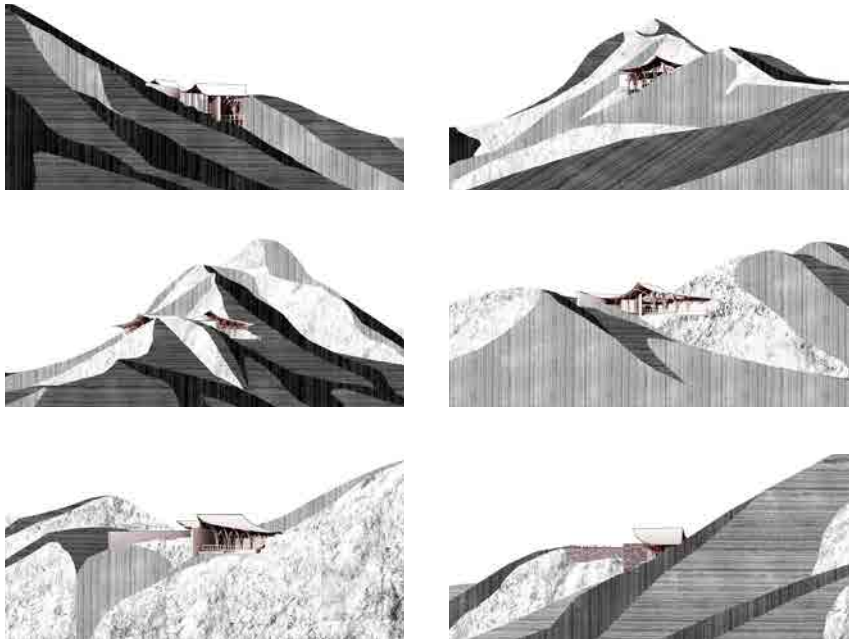


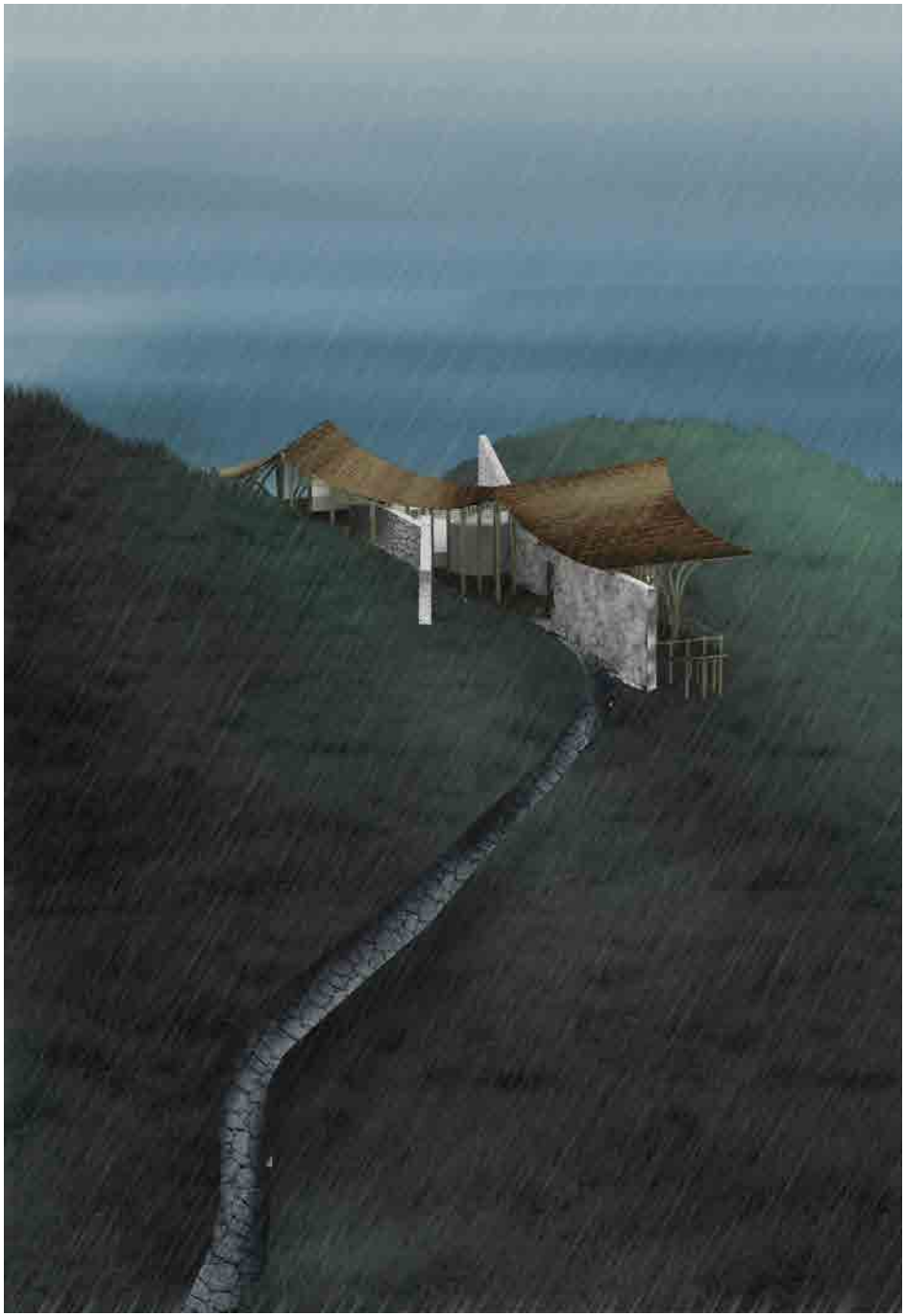
05 Pavilion in Hill

[sight line and space]

Moutain Club Design, Tongji University, Shanghai
8-Week Studio, Individual Work, Winter 2013
Tutor: Zhenyu XIE

This design emphasizes on creating a series of feelings for people by controlling their line of sight. How to control? First step is using the mountain to create a similar image of Chinese ancient paintings. From every angle, people cannot see the whole pavilion but a little part of it, which will attract their interests. The plan and roof of this pavilion are carefully designed. Second step is using walls and columns to restrict visibility. People will experience a much more open scenery after the initial sight obstruction.





Thank You for Reviewing :)