PORTFOLIO

NAWAPAN SUNTORACHAI
Computational and Architectural designer

Nawapan Suntorachai

Architectural & Computational Designer

(+66)918721399 nawapan.suntorachai@gmail.com jokesunt

119 Inthamara 43, Sutthisan Rd.,Dindaeng, Bangkok 10400 Thailand

Graduated from International Program in Design and Architecture in 2018. Nawapan freshly started his early experience at Site-Specific Architectural research in Bangkok before pursuing his passion in Architecture at Bjarke Ingels Group in Copenhagen. Subsequent works have included diverse directions such as urban housing, educational institutes, cultural and arts center, shopping mall, and mixed-use building. Also, he has been practicing and researching on biomimetic and computational parametric design which he has been developing and experimenting on natural, geometrical, and mathemetic forms and designing as pavilions. Also, during pandamic situation, he was joining the master program of computation in design and architecture at IaaC, Barcelona where he gain practical knowledge in parametric tools and programing for computational design as well as developing an artificial intelligence for his study projects.

Educational

2008-2014 **Bangkok Christian College, Thailand**
Highschool Class of 2013

2012-2013 **Ankeny Hawk Highschool**
Abroad Exchange Study
Class of 2012

2017 **Haute Ecole D'Ingenierie et D'Architecture**
Architecture Program Exchange

2014-2018 **Faculty of Architecture, Chulalongkorn University, Thailand**
Bsc. in Design and Architecture, Second Class Honor

2020-ongoing until July 2021 **Institute of Advanced Architecture Catalonia**
Master in Advanced Computation for Architecture and Design

Experience

MAY-JULY 2016 **IGNITION Festival, Portugal**
Design Build Assistant with Nuno Sousa
- Installation for the music festival
- Collaborate with carpenter in timber construction
- Online and printed publication for advertisement

MAR-MAY 2017 **100 Years Exhibition of Chulalongkorn University, Thailand**
Design Construction with Thomas Lozada
- Researched and Materialized in prefabrication
- Prefabricated modules including cnc and lasercutting

JAN 2018 **Design and Experiment / My Virtual Home, Thailand**
Architectural Film and Documentary with Taller De Casqueria
- Document and produce interior atmosphere of AirBnb

JUN-JUL 2018 **Research and Conceptual Design / Building Trust International**
Internship at Site-Specific architecural research
- Reseacrch on materials focusing on Bamboo and tropical resources
- Design produce visualizing images in graphic representation

MAR 2019-JUL 2020 **Bjarke Ingels Group A/S (BIG), Denmark**
Architectural Design assistant
- Participate in 2 completed competition projects and 1 ongoing
- Producing diagrams, renderings, drawings, modelings at high quality
- Work in diverse programs including commercial, cultural, educational, etc.

Software

Proficient in Architectural programs including Rhinoceros / Grasshopper + Parametric Plugins / Vray / Abobe Suites / Enscape / Revit / Shapediver / Speckle / VisualStudio / Python / HTML / Java / #C / Rhino.Inside / Proving Ground / Dynamo

Design Projects

01 ***Bangkok Residential Project***
The Passive Cooling and Environmental Optimization

Bangkok is one of the most dense cities in the world with high temperature and humidity. Almost 30 percentage of the housing energy consumption cost from air condition operation. In order to reduce the household cost and carbon emission, the project is proposed to design a passive cooling system with carbon-neutral based materials. The local Thai vernacular architecture will play a special role in the design as principals for passive design strategy.

02 ***Festival Design and Local materials***
Wonderfruit

Our proposal is to design a pavilion that integrate arts, cultures, and functions. People can have their own private area, but also visually open to publicity with the central of communal area for bars, small band stage, or garden. The atmosphere vibe will be under the shading of natural materials, bamboos, to enhance the soft and environmental feeling to the people.

03 ***Learning from natures and mathematical geometries***
The Worse Pav

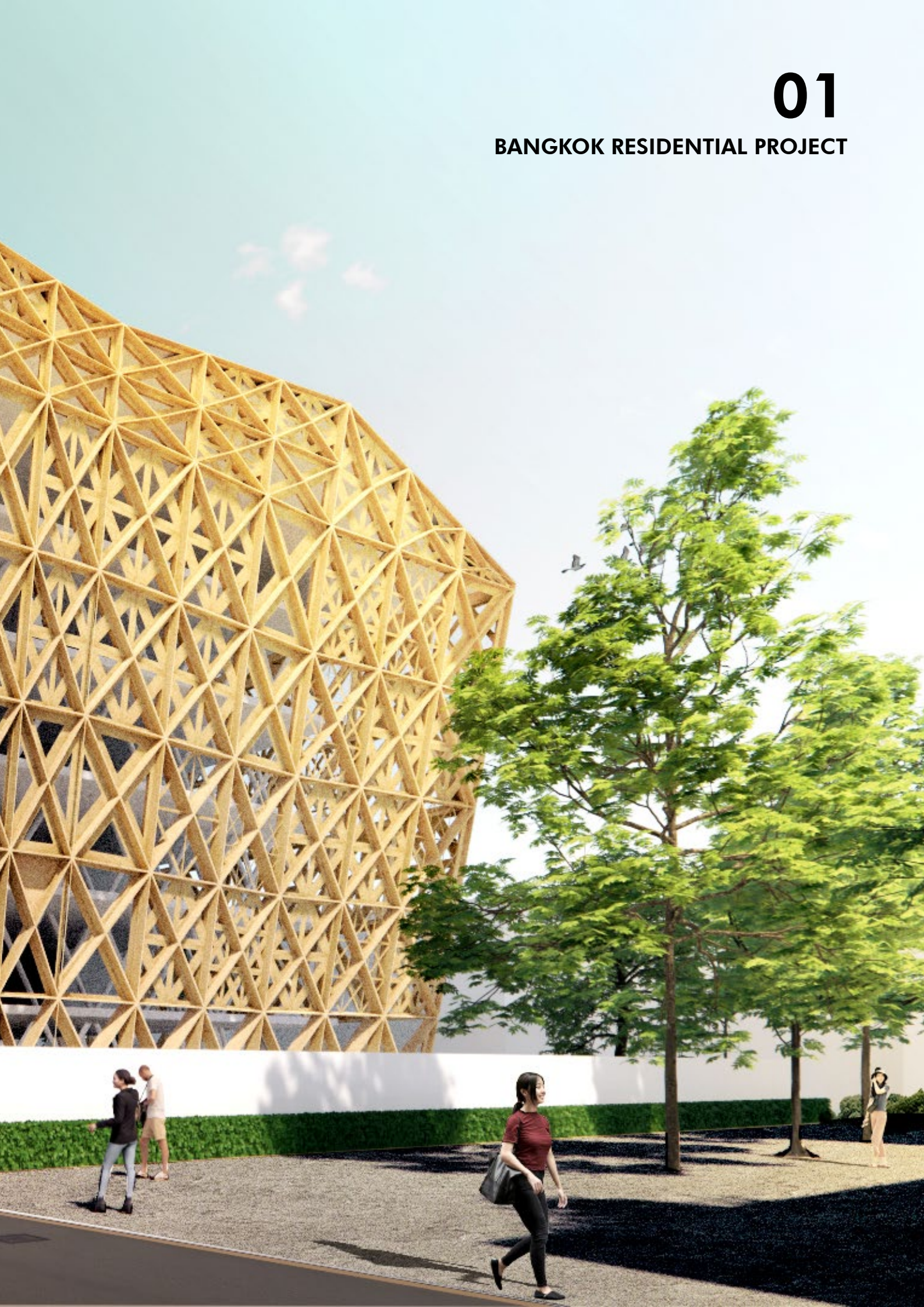
The Worse Pavilions project is a personal experiment form-finding for Nawapan. He has analyze the geometries based on nature, then translate into design algorithm languages using grasshopper and design tools to create 3 dimentional form.With the parametric design, bio form could be explored and the design could help the project to achieve some answer to the truth of nature in term of mathematics, environmental interactions, sizes, patterns, and other complexity of living creatures.

04 ***BIM Smart Construction and Collaborative Workflows***
LEAF - Luna Enhancement and Agricultural Farming

Our design aims to contribute food production for 100 astronauts and possible to grow more on the Moon. The farm consists of 3 major groups of food including plants, insects, and animal meats products where smart farm system will be integrated to the monitoring that can be optimized by the algorithm.The cultivation system is based on closed aspect of the system that the resources including air, nutrient, water, and energy will be regulated within the facility itself. Therefore, our project needed to be developed as a modular system and that can be connected and disconnected, and also have some future growth area for expansion.

01

BANGKOK RESIDENTIAL PROJECT



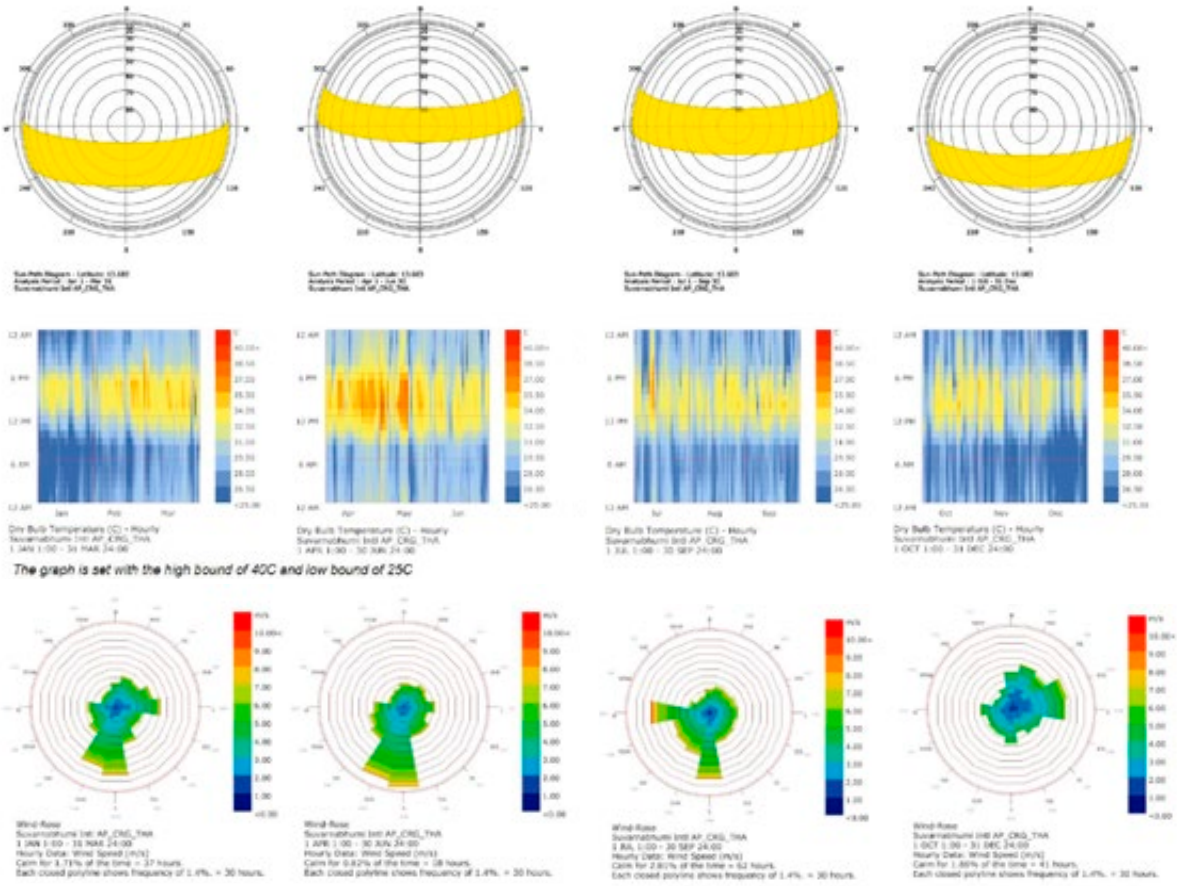
01

BANGKOK RESIDENTIAL PROJECT
The Passive Cooling and Environmental Optimization

Bangkok is one of the most dense cities in the world with high temperature and humidity. Almost 30 percentage of the housing energy consumption cost from air condition operation. In order to reduce the household cost and carbon emission, the project is proposed to design a passive cooling system with carbon-neutral based materials.

The local Thai vernacular architecture will play a special role in the design as principals for passive design strategy.

ENVIRONMENTAL ANALYSIS : BANGKOK

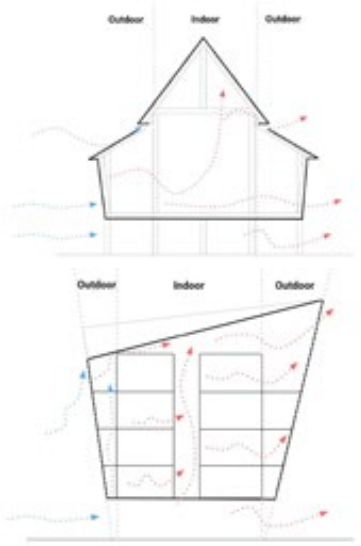


First, The Sun path of Bangkok showing the angle that directly from Southern upto perpendicular angle in Summer correspondes to the dry bulb temperature of Bangkok where the hottest period happening during April to Jun.

Second, the wind direction that flow mostly from South and West(Oceanic) happening during Jan - Sep. While in Winter, Oct - Dec, the wind mostly flow from the North (China and Vietnam). The wind that come from the South mostly brought warm temperature from ocean and it also brought humidity where the wind that come from the North is colder because it came from the moutain side.

From this analysis, the design will be continued develop to achieve the goal of reducing temperature by passive cooling in which the wind direction and velocity will be significantly impact on optimizing process.

PASSIVE COOLING STRATEGY - PRINCIPLE&ACTION



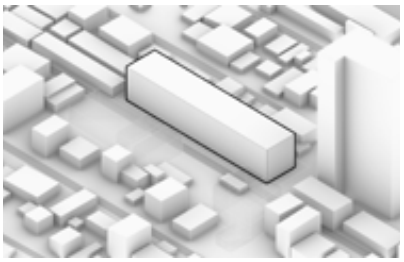
BASE IDEA : THAI VERNACULAR PRINCIPLES

Thai vernacular architecture is one of the good case study for passive cooling research. Historically speaking, the building has no air condition, however, in term of cooling down the interior heat, several elements are designed according to natural flows of the wind that can be known as a cross ventilation.

NEW IDEA : PROJECT STRATEGY FROM THAI VERNACULAR

In relation to Thai vernacular architecture, as a role model for passive cooling, the elements of the project will be optimized according to the principle extracted from this system including open ground floor, high slope roof, self-shading, and most importantly Carbon-neutral based materials will be implement for the structure in order to raise the topic of Carbon emission issues.

OPTIMIZATION AND DESIGN PROCESS



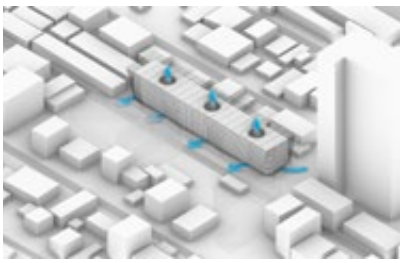
0 - Base geometry

1 - Offset 3m

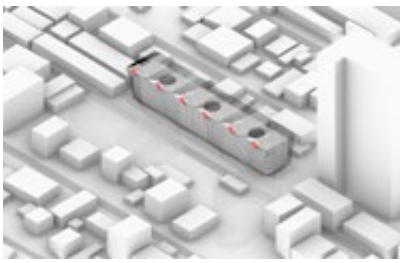
2 - Box-in-Box = Buffer zone

3 - Incline facade for solar radiation reduction

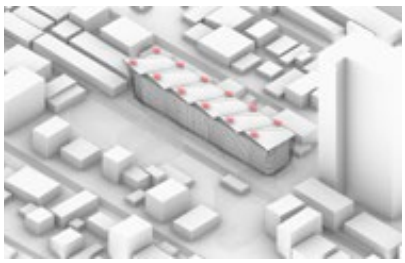
4 - Uplifing ground floor for cross ventilation



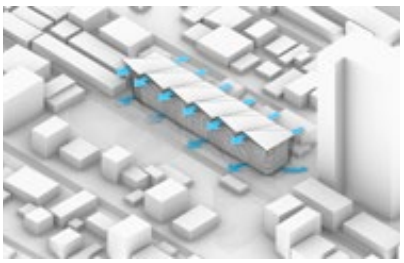
5 - Core atrium for ventilation



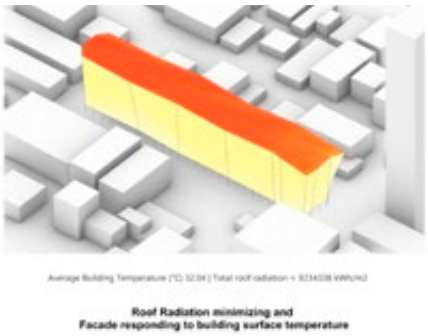
6 - Lifting up roof and open for air ventilation



7 - Rotate the roof direction according to wind

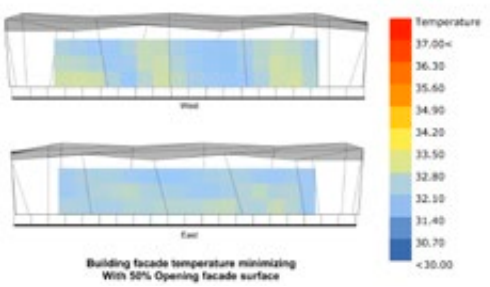


8 - Simulate the results



Roof Radiation minimizing and
Facade responding to building surface temperature

Final result and Analysis on Inside temperature



Building facade temperature minimizing
With 50% Opening facade surface

Result

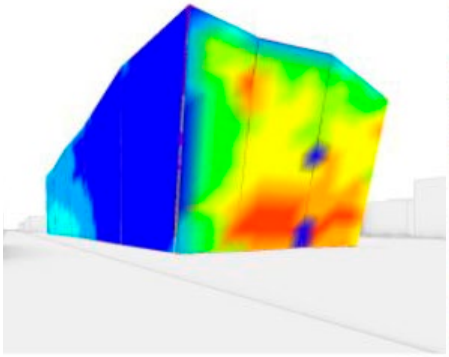
the average indoor temperature according to the optimized form could help reduce temperature from 35.72 Celsius to 31.97 Celsius.

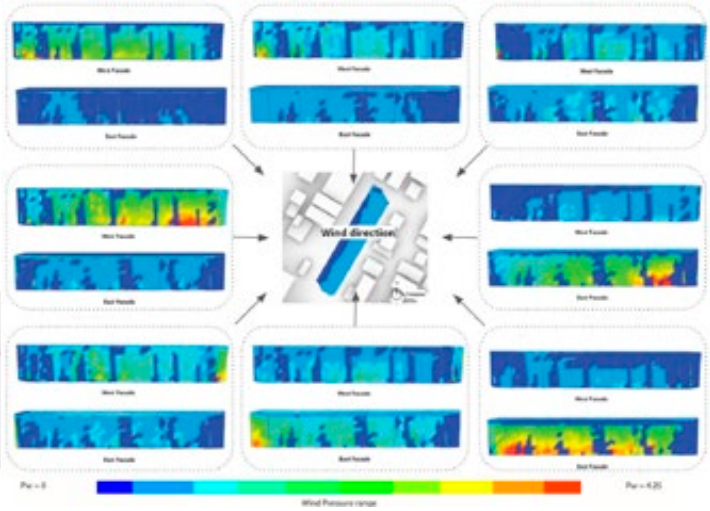
CROSS VENTILATION AND DESIGN DEVELOPMENT

WIND PRESSURE

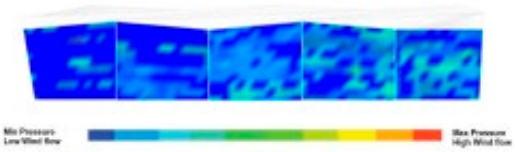
In this stage, finding the strategy to achieve cross ventilation in terms of openings will be our topic for design. The wind pressure seems to be related to the velocity and indicable to locate the position on the building facade in order to bring the wind in.

Therefore, the wind pressure mapping below showing West and East facade being simulated from 8 directions of wind in order to averagely optimized location for facade openings strategy.



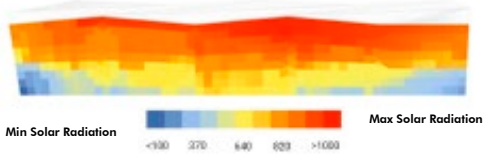


FACADE OPENINGS DESIGN STRATEGIES



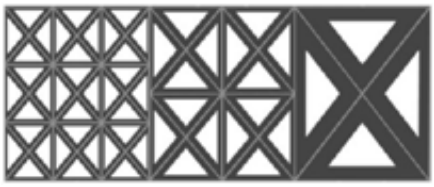
WIND PRESSURE

FACADE OPTIMIZATION



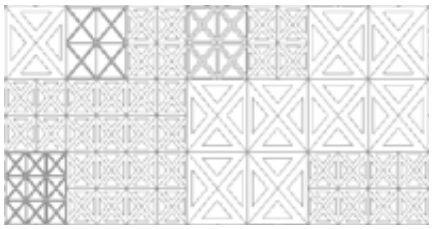
SOLAR RADIATION

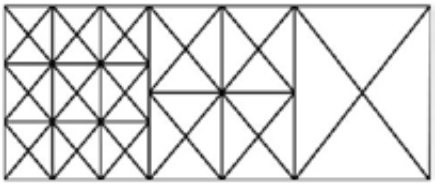
OPTIMIZATION ALGORITHM



WIND PRESSURE

Opening by Wind Pressure
Parameter: Domain from 40% to 90%

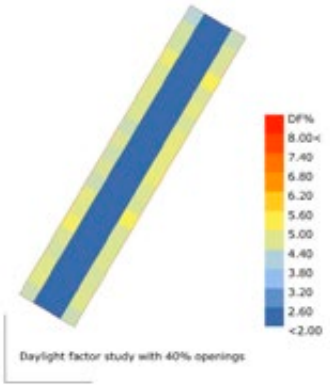


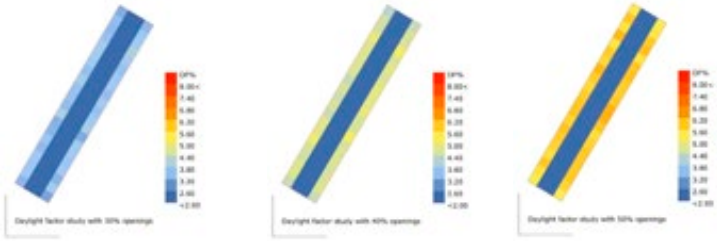


SOLAR RADIATION

Subdivided by Solar Radiation
Parameter: UV division by 1x1,2x2, and 3x3

DAYLIGHT FACTOR RELATIONSHIP TO OPENINGS

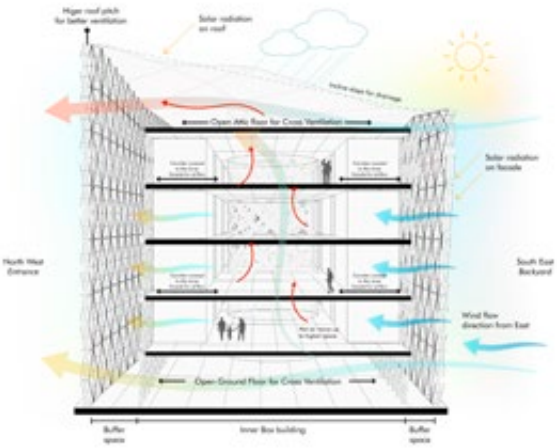




DAYLIGHT FACTOR RELATED TO OPENINGS STRATEGY

With the minimum opening set at 40%, it allows daylight to access with the Optimal Daylight Factor between 4 to 5 that beneficially help reduce cost of electricity.

OPENINGS AND CROSS VENTILATION



VENTILATION

As a result, we found out that with 40% openings, the interior space will have the daylight factor between 4 and 5 which during the day, the indoor space doesn't need to use artificial light.

In parallel, the section diagram show the cross ventilation from South East to North West where the indoor hot air can flow upto the roof through the porosity of atrium structure before moving out of the building.

CONCLUSION OF BUILDING OPERATION TO ENVIRONMENTAL DATA:

- According to the optimization this optimized form can reduce building surface temperature from 35.27 to 31.97 Celsius = 3.3 Degree Celsius.
- Facade create not only openings for ventilation but also self shading for reduce direct solar radiation and provide enough daylight factor.
- Materials from 1F to 5F are all replaced with Carbon-neutral based.

02

WONDER FRUIT THAILAND

02

WONDERFRUIT
Festival Pavilion and Local Materials

Our proposal is to design a pavilion that integrate arts, cultures, and functions. People can have their own private area, but also visually open to publicity with the central of communal area for bars, small band stage, or garden. The atmosphere vibe will be under the shading of natural materials, bamboos, to enhance the soft and environmental feeling to the people.

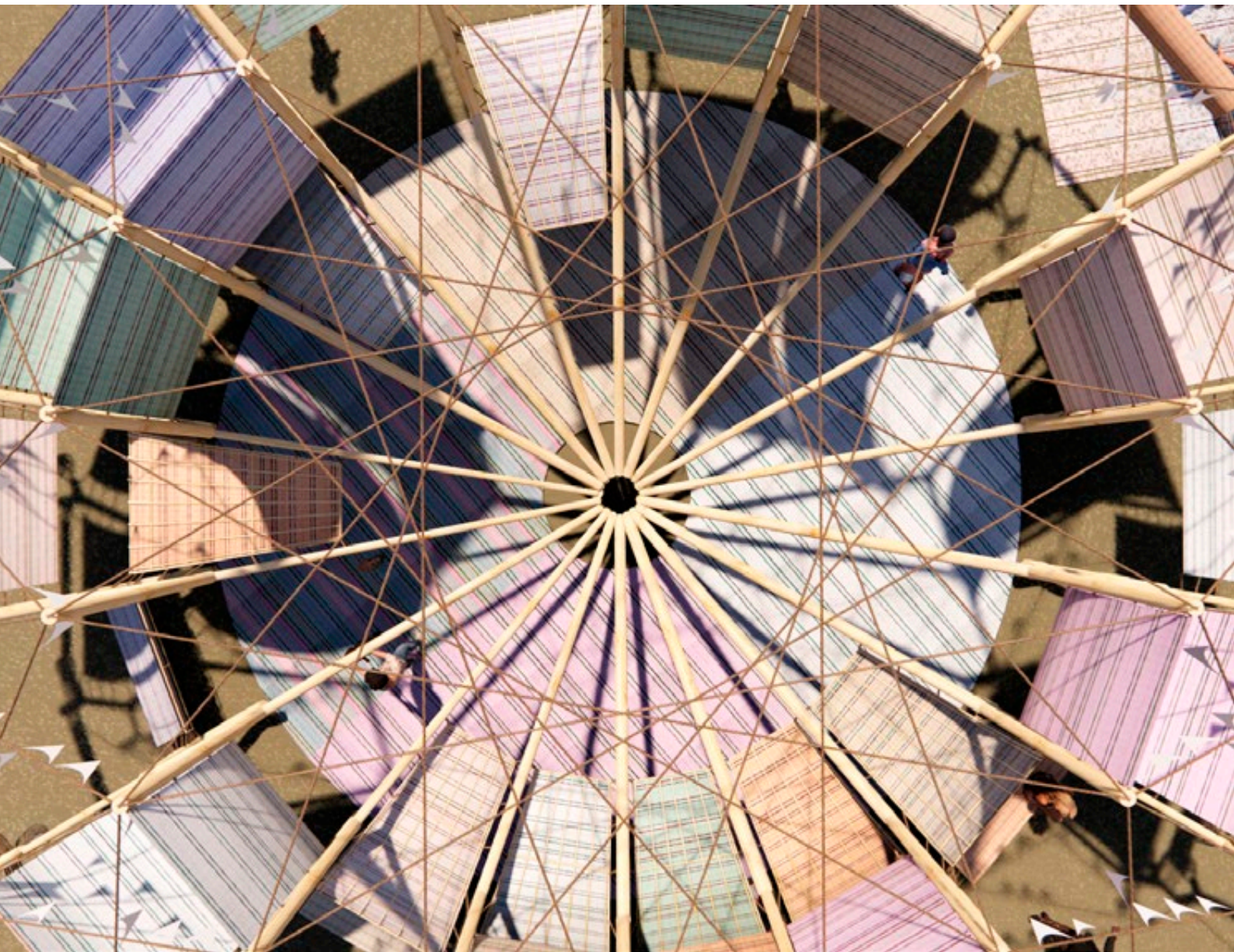
Wonder Fruit | Tri-Pavilion

Tri-Pavilion, combination from 3 characters of nature forms including tree, star anise, and cactus, has been designed based on Bamboo that implemented on both structure and skin surfaces. The pavilions were aggregated with 3 rings creating a communal area in between. There are hanging seats both indoor and outdoor.

With the use of shading optimization, during the day the roof surfaces could provide shading to the beneath seating spaces.

Meanwhile, the combination of different colors, patterns, and arrangement of surfaces within structural frames allowing the pavilion to have artistic vibes for those who come for a visit.


WONDERFRUIT



WONDER FRUIT DESIGN FESTIVAL

WONDERFRUIT MUSIC FESTIVAL

Wonderfruit is a celebration festival for music, arts, foods and collective area of sustainable ideas of living. The festival was located in Moo Ban Wonder, Pattaya, Thailand happening annually during mid December until mid January.

Structure

Bamboo size will be optimized in different size according to support and load values in Karamba.

Diameters were set with 6 cm, 12 cm, 18 cm

Protection

Shading surfaces will be optimized according to the sun direction to achieve the maximum shading.

Surface numbers will be optimized at 60% Openings

Function

Seating numbers will set between 40% to 60% for privacy, access, and openings.

Surface numbers will be optimized between 40% to 60 % Openings

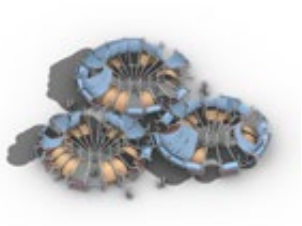
BAMBOO AS A STRUCTURAL AND SURFACE

STRUCTURE : WHY BAMBOO

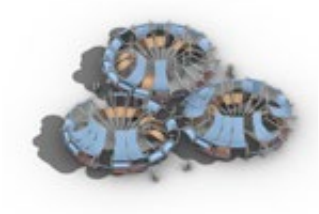
The reasons why Bamboo are good for being a structure because of its strength, beauty, and flexibility, and also because the short growth production cycle and carbon embodied capacity. It is the most environmental and economic option for building materials. Not only it is good for environment, but also helps people feel connecting to natures which enhances quality of life

OPTIMIZATION AND DESIGN PROCESS

0 - Base geometry

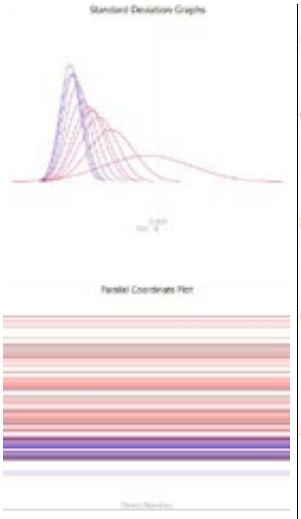


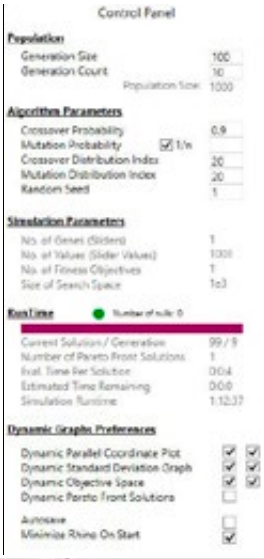
0 - Base geometry

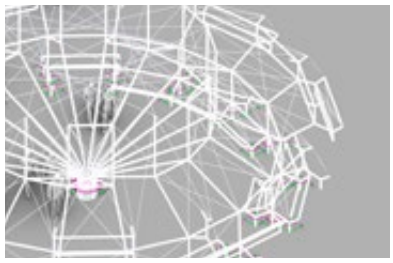


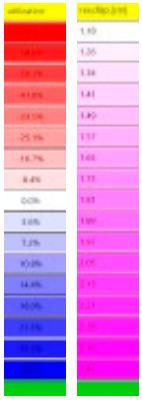
0 - Base geometry

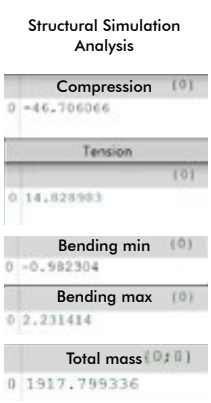
0 - Base geometry

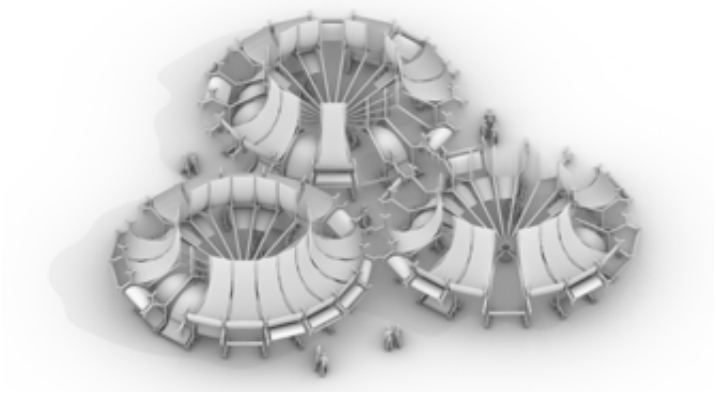












Result

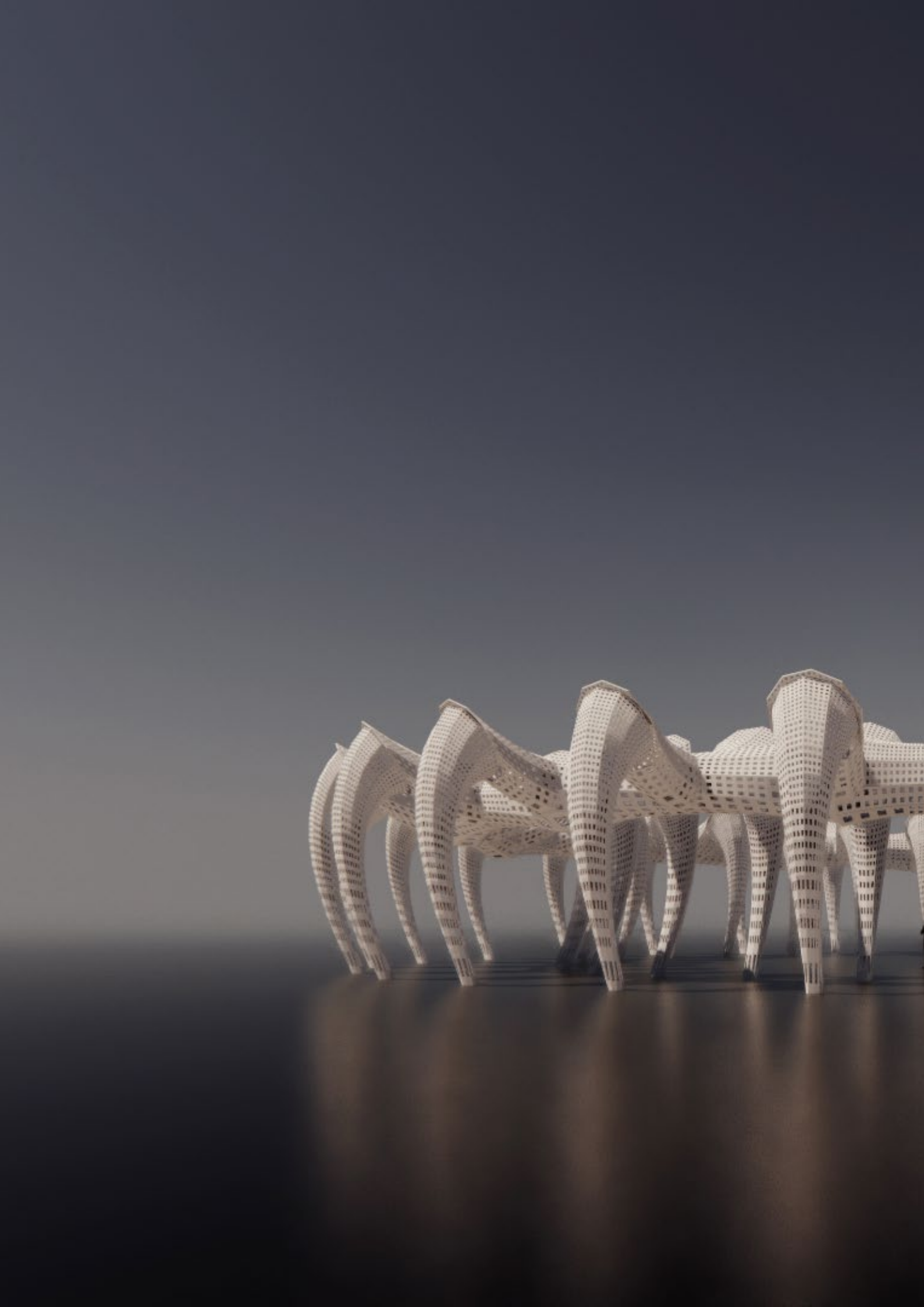
The optimization process is to find the optimal size of the bamboo pipes that will be used in the construction for structure.

Aggregation

The modular models are aggregated by 3 pavilions with the tree growth strategy. By connecting between different variations let us have diverse results in between spaces

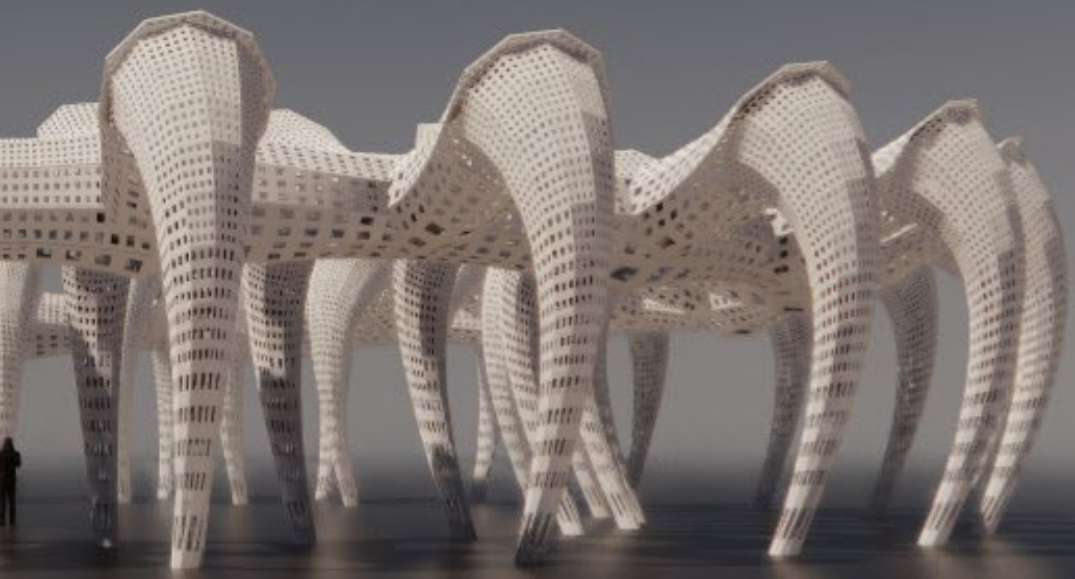
Comparison

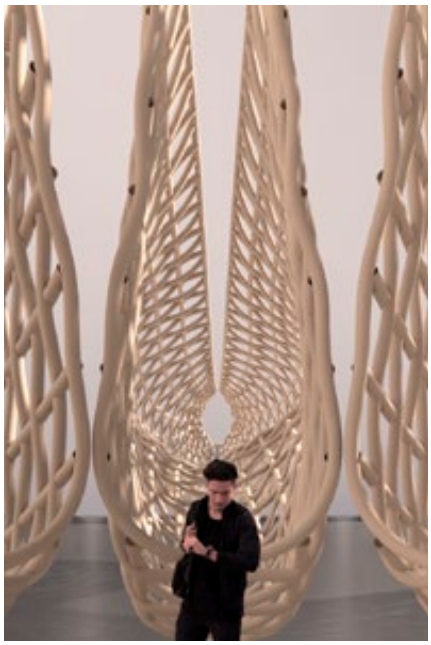
The goal of this pavilion optimization is to have the maximum shading value with the maximum roof openings.



03

BIOMIMICRY DESIGN FORM-FINDING





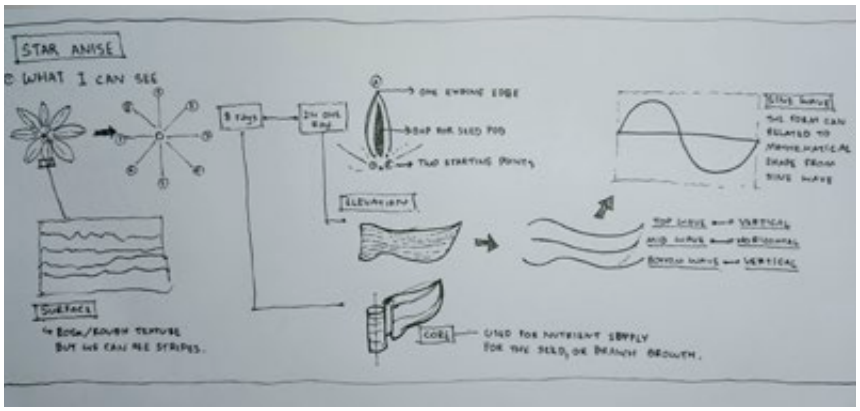
03

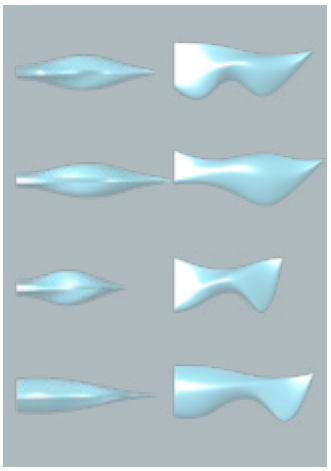
WORSE PAVILIONS
Learning From Natures
And Mathematical Geometries

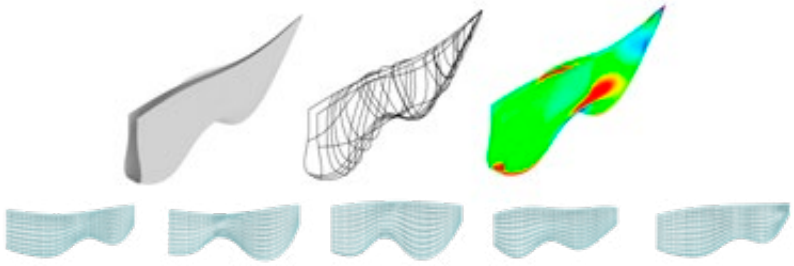
The Worse Pavilions project is a personal experiment form-finding for Nawapan. He has analyze the geometries based on nature, then translate into design algorithm languages using grasshopper and design tools to create 3 dimentional form.

With the parametric design, bio form could be explored and the design could help the project to achieve some answer to the truth of nature in term of mathematics, environmental interactions, sizes, patterns, and other complexity of living creatures.

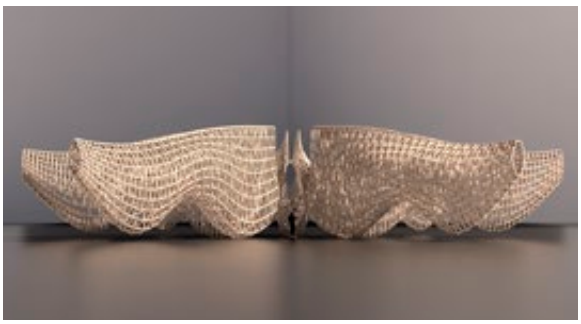
SAMPLE : STAR ANISE / CINNAMON SEEDPOD

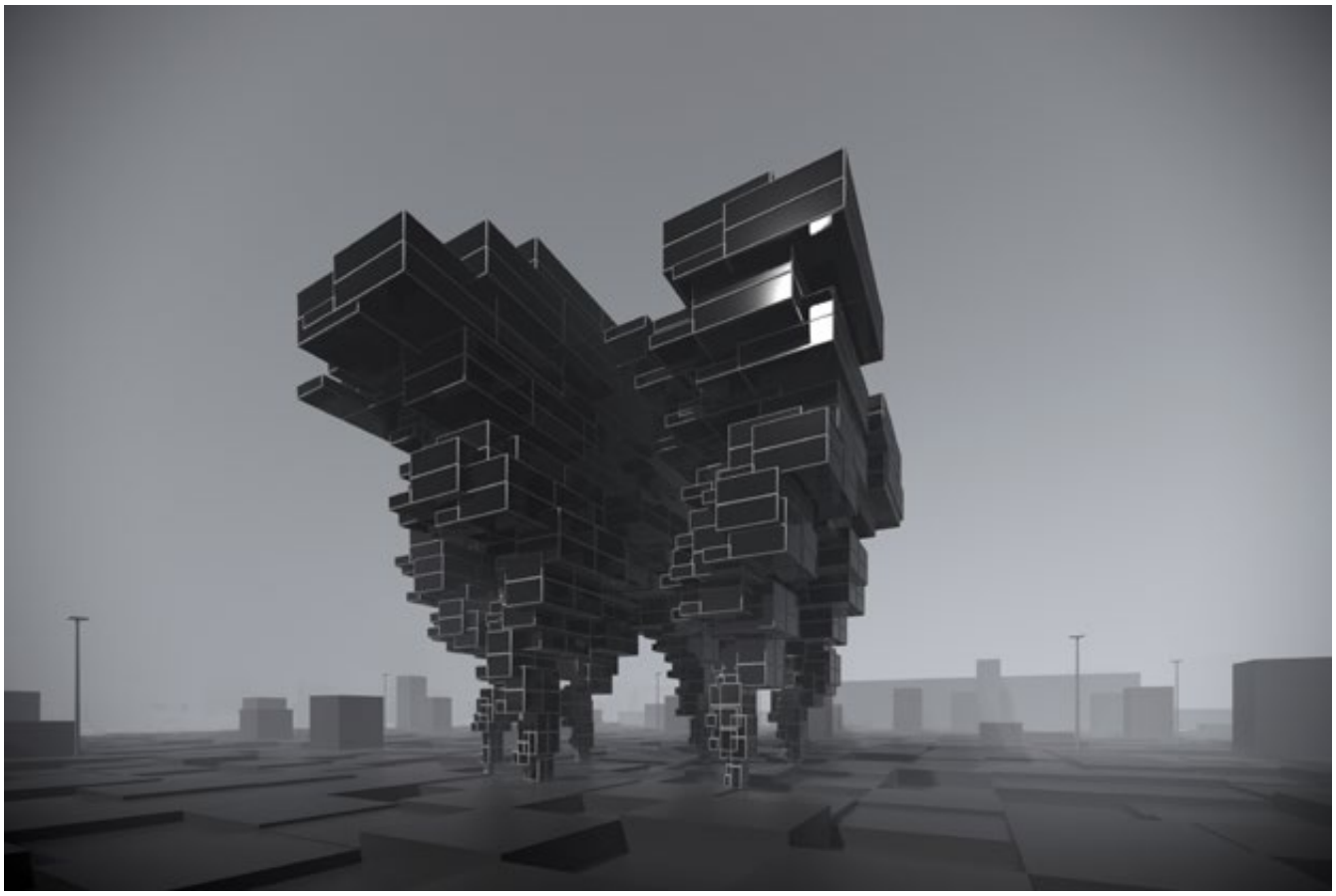






Analyzing the branches of the star anise to find the curvature data and how to construct the form based on the irregular shape. With using the methematics, the project end up using sine waves to variate the different modules and developed further into human scale installation.



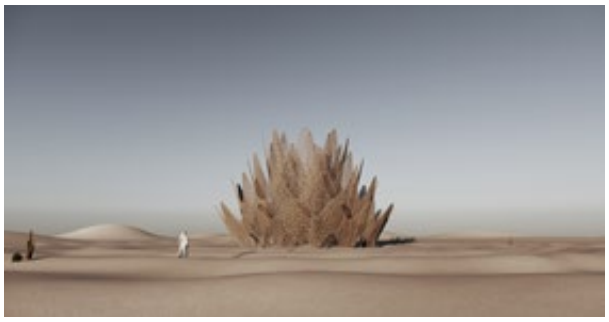


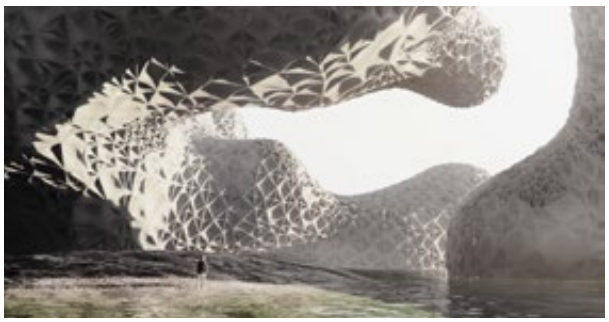
Future Cubic Cloud

Melon Dome

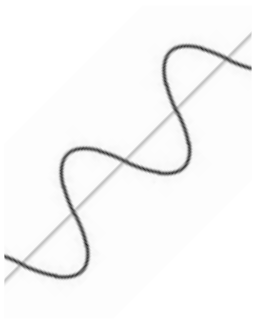


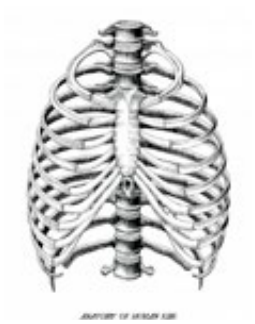
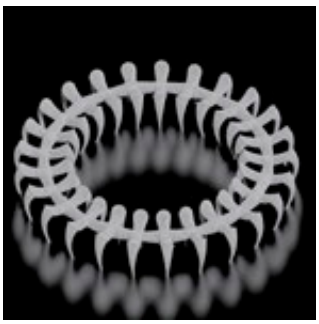
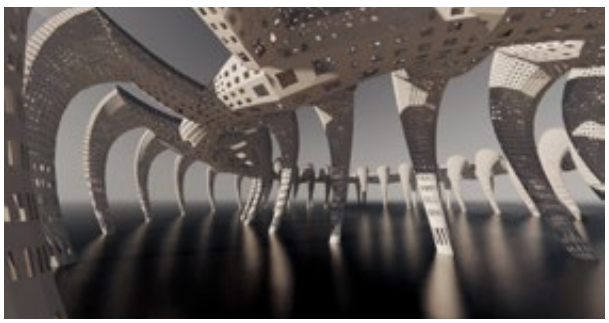


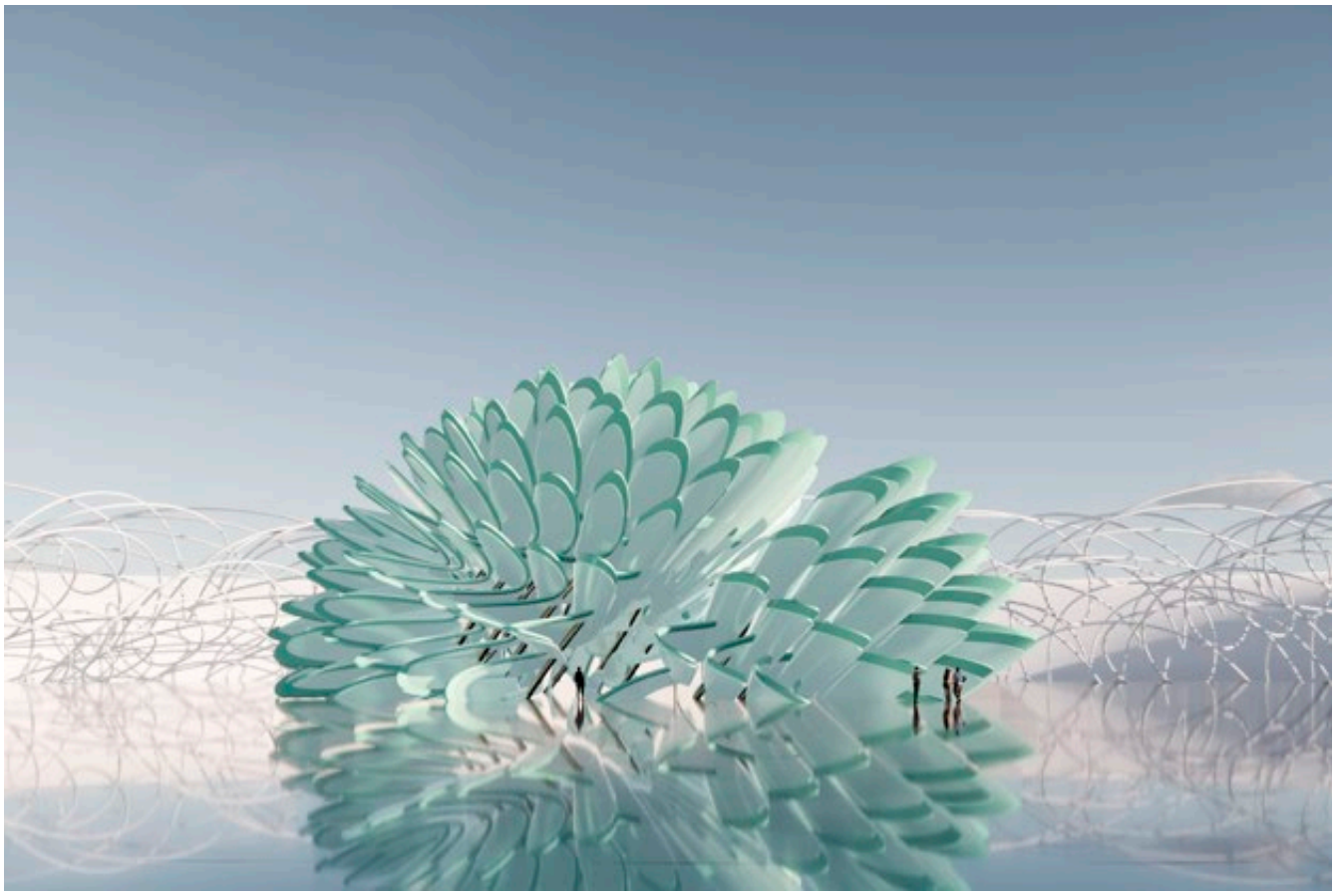





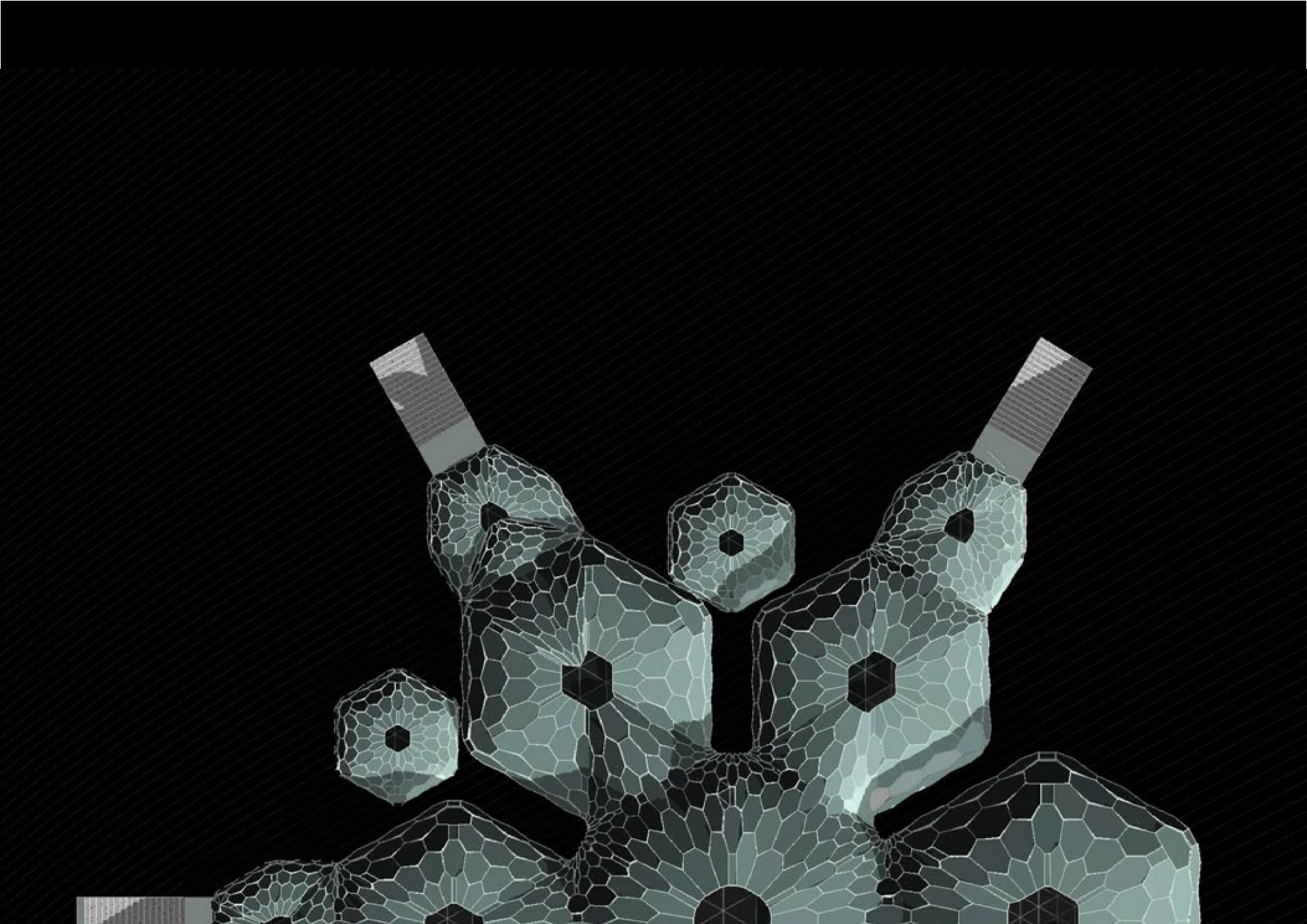




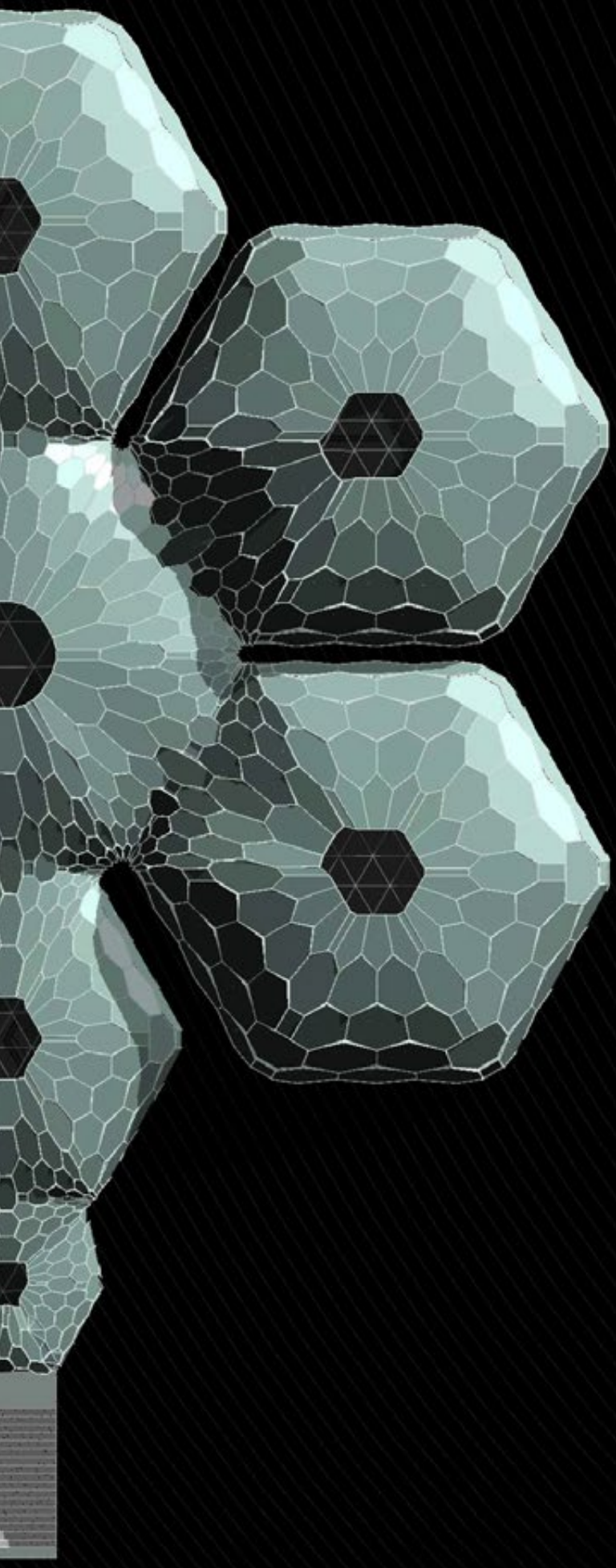
Durian

Waves



04

LUNA ENHANCEMENT AND AGRICULTURAL FARMING



04 LEAF

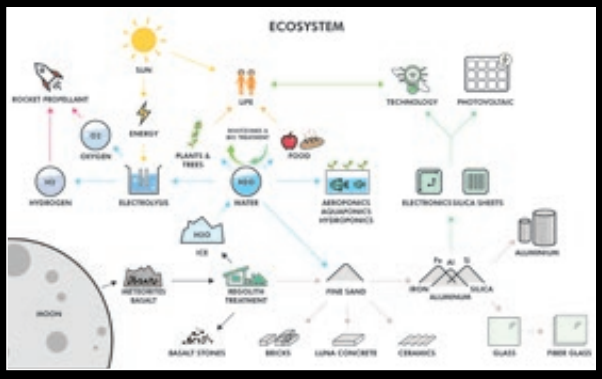
Luna Enhancement and Argricultural Farming

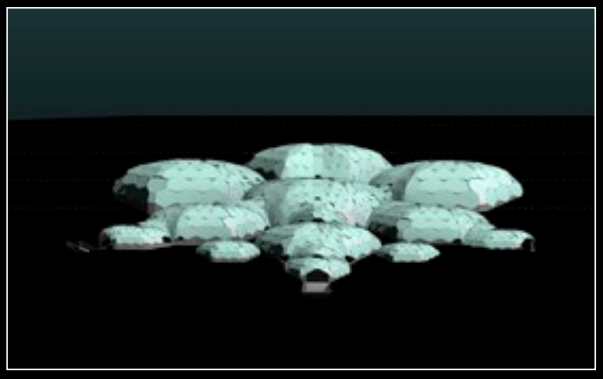
Our design aims to contribute food production for 100 astronauts and possible to grow more on the Moon. The farm consists of 3 major groups of food including plants, insects, and animal meats products where smart farm system will be integrated to the monitoring that can be optimized by the algorithm.

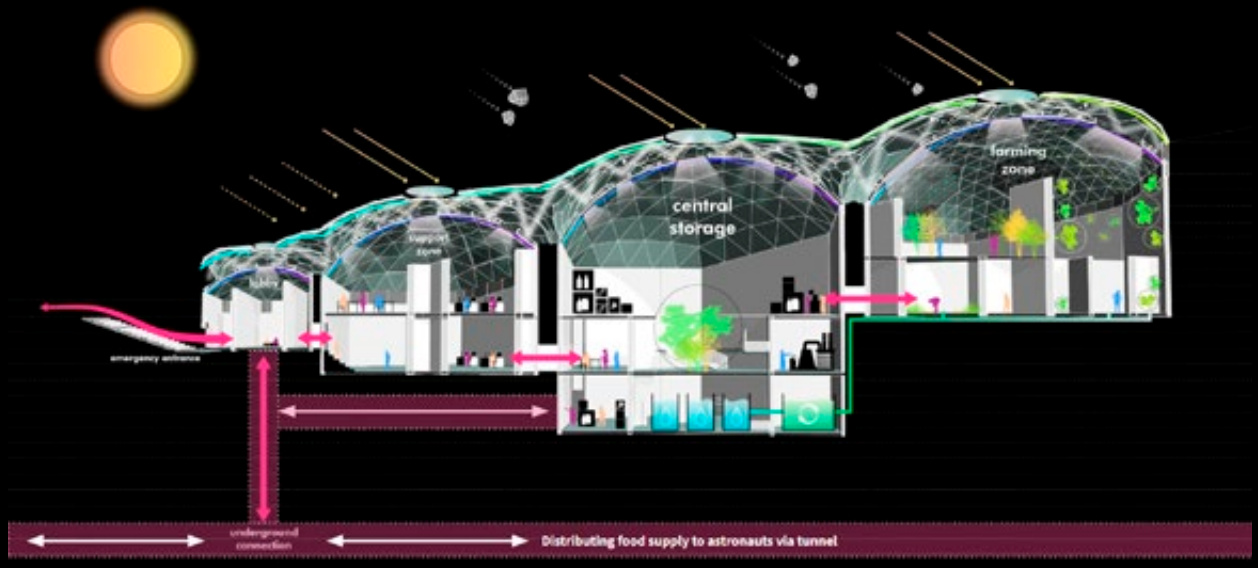
The cultivation system is based on closed aspect of the system that the resources including air, nutrient, water, and energy will be regulated within the facility itself.

Therefore, our project needed to be developed as a modular system and that can be connected and disconnected, and also have some future growth area for expansion.

THE MOON | FUTURE OF FARMING



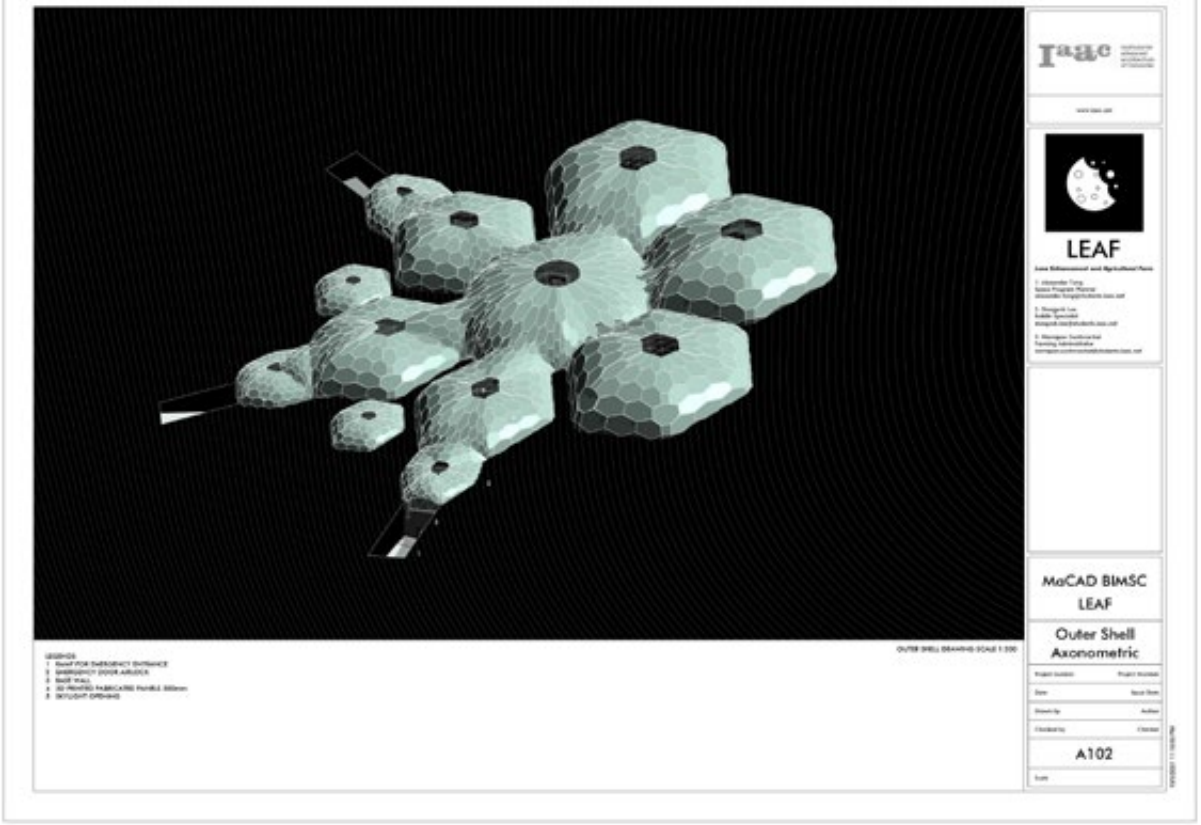


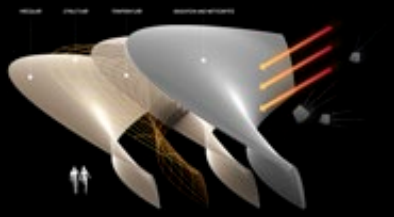


LEAF ECOSYSTEM

The space layout is arrange orderly from entrance, support & administration, central storage, and lastly farming zone. The ecosystem within the building aim to regenerate wastewater and reuse for irrigations and food production system. Also the shell of the building consist of 2 layers including outer shell for space radiation protection, and inner shell for pressuring and temperature control. Meanwhile the cladding surface of both shell is reflective polyethylene or plastic composite that allows direct light to be filtered and reduction of flare before accessing into the interior space

04 : LEAF LUNA ENHANCEMENT AND AGRICULTURAL FARMING

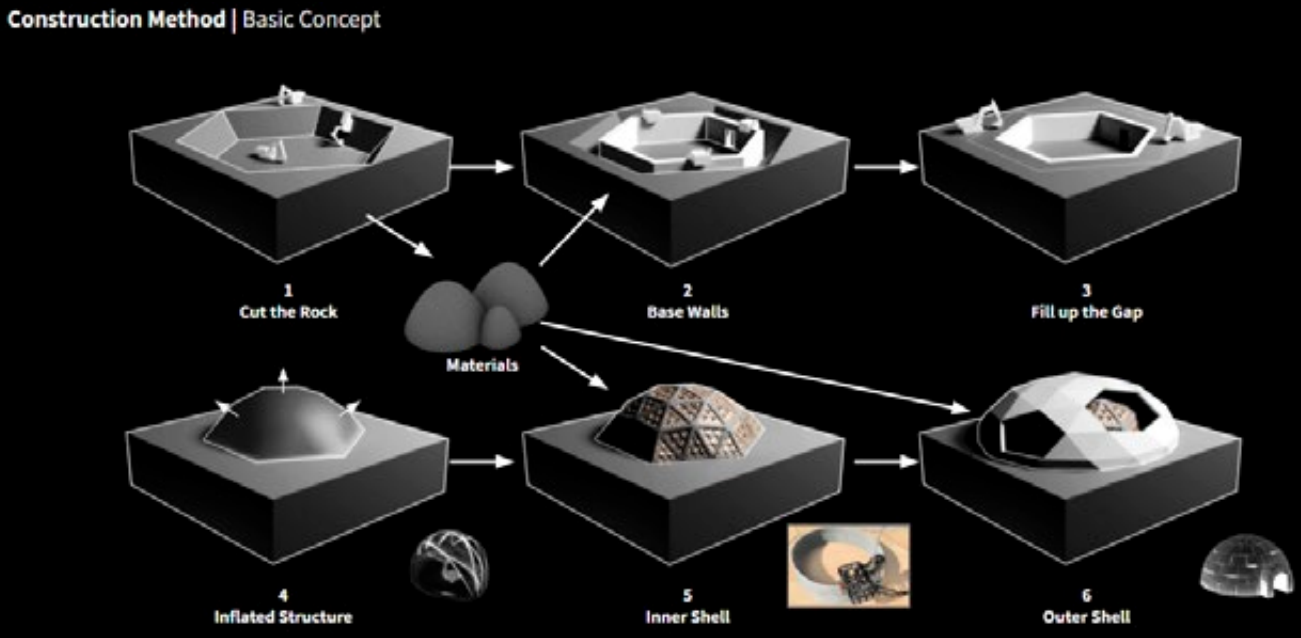




LAYERS OF PROTECTION

With low pressure environment, a pressure membrane must be complemented by radiation shielding to provide long-term habitable environments.Approximately 46 cm thickness of lunar regolith are required to protect against galactic cosmic rays while protection against radiation from solar flares may necessitate upto a 7m thick layer

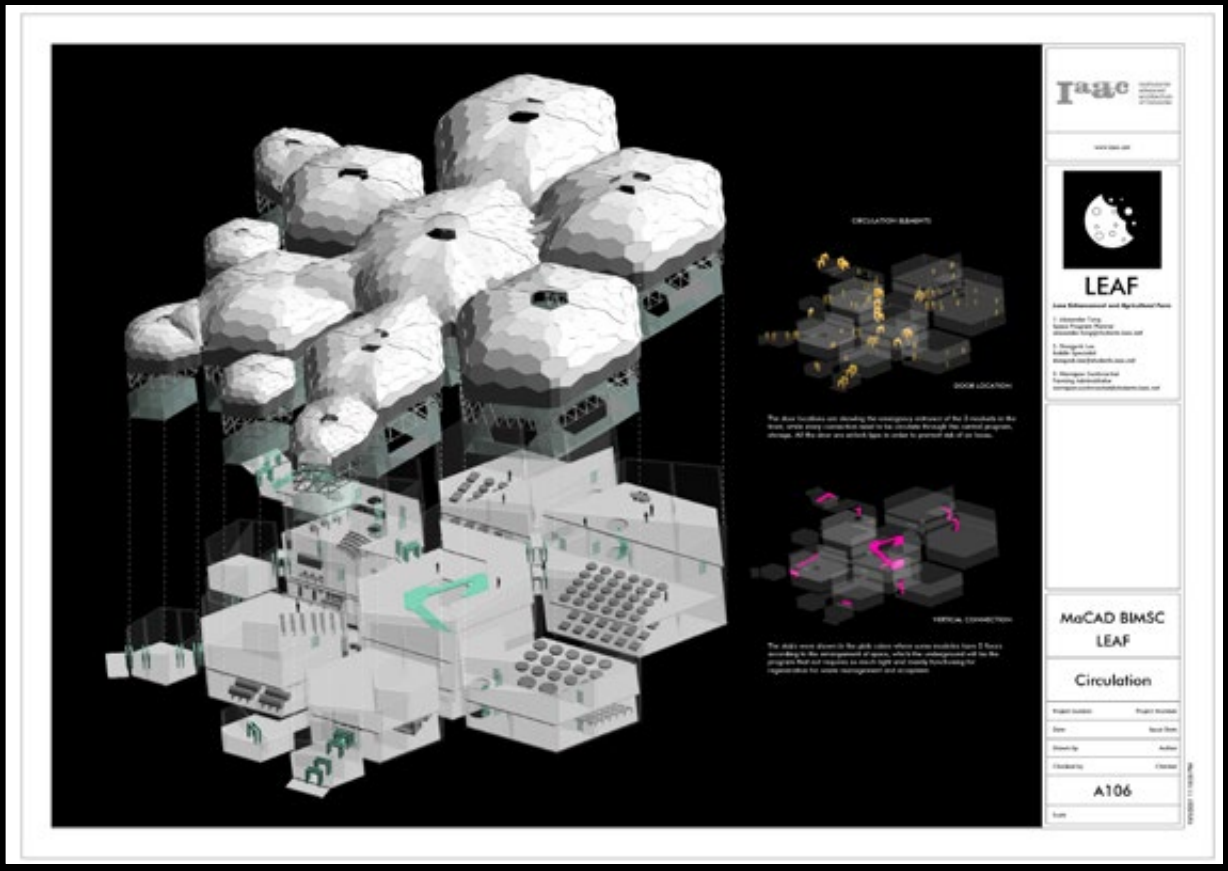
04 : LEAF LUNA ENHANCEMENT AND AGRICULTURAL FARMING

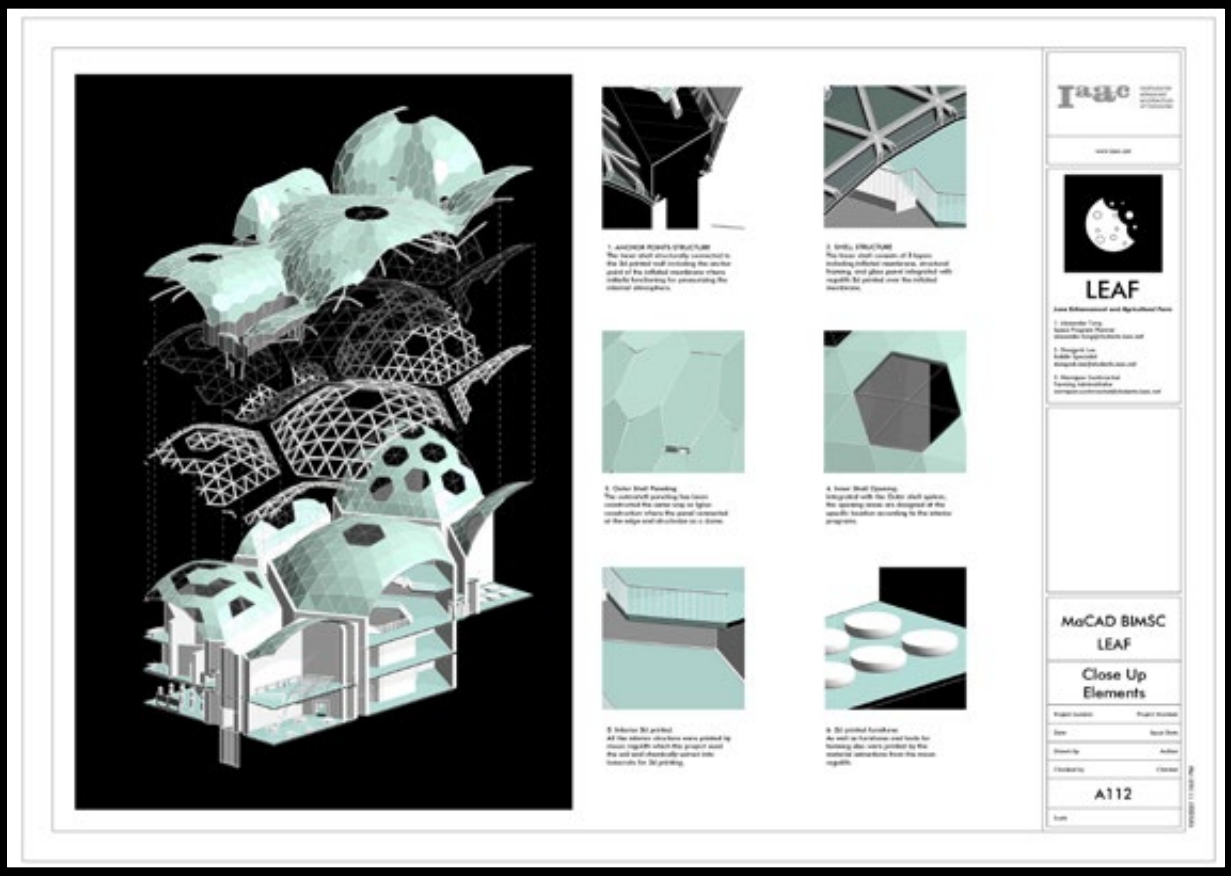


Moon Project : Luna Farm

The project is located on the moon which means all the materials and building construction need to be fabricated by robotic and light weight structure that possibly be brought from the earth. So the projects will be constructed conceptually by swarm robots that AI will play a role for humankinds to create a workflow and build up the initial structure suitable for habitation.

04 : LEAF LUNA ENHANCEMENT AND AGRICULTURAL FARMING

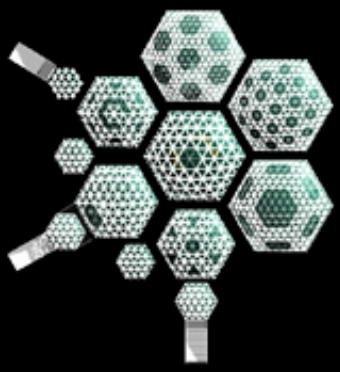




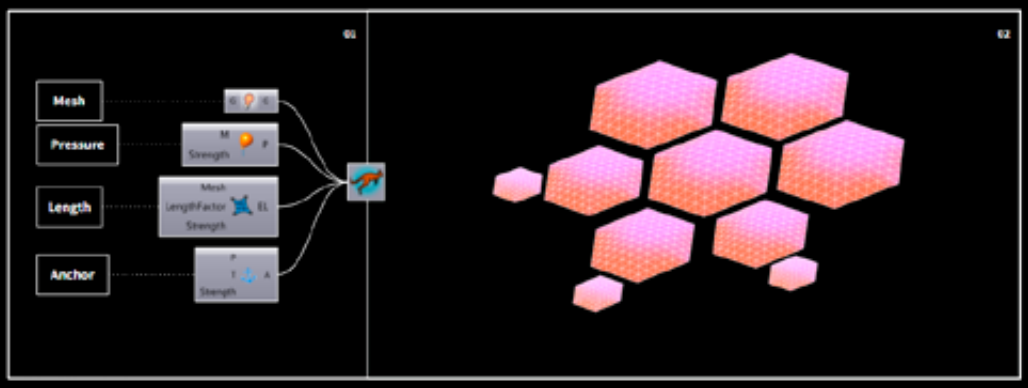
COLLABORATIVE WORKFLOW

The design workflow is consisted of different programs including Rhinoceros3D, Grasshopper and plugins, Revit, Speckle, Rhino.Inside Revit, and some python and c# scripts for data computation. By using parametric tools, we can achive the building information modeling or BIM to assign the elements to the correct parts as known as families or types.

04 : LEAF LUNA ENHANCEMENT AND AGRICULTURAL FARMING

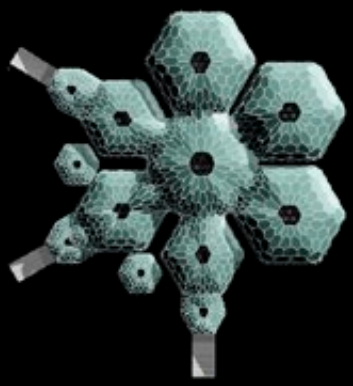


Inflated membrane and structure



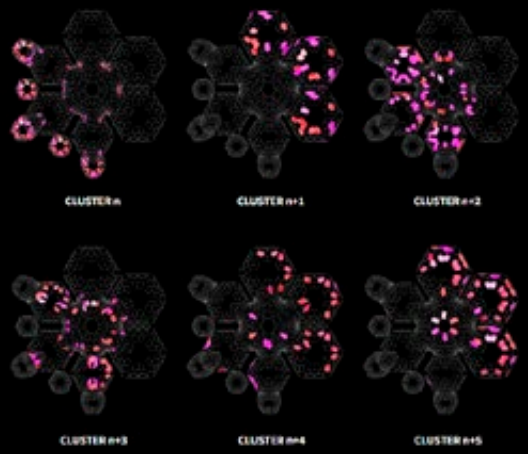
01 Constraints
Using Kangaroo to perform inflated membrane by pressurizing and edge length, where the anchor point is fixed at the edge of the meshes.

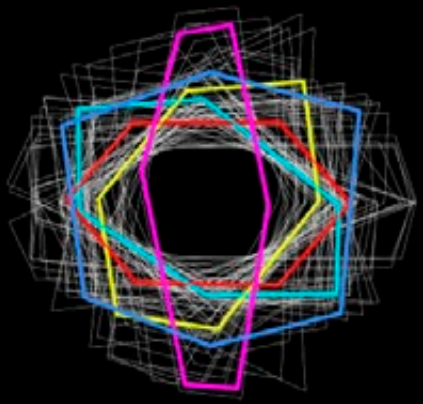
02 Inflatable Simulation by Kangaroo
The results of innershell was brought by the final convergent of inflated geometry.



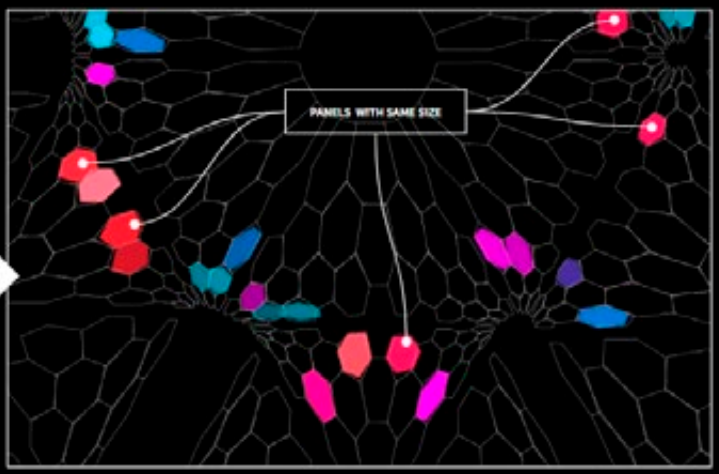
Tessellation Construction and BIM Integration

Using Kangaroo and LunchBoxML (K-Means) to clusterize the group of similar panels related to the area, edge length, orientations, and deviation.





BACK

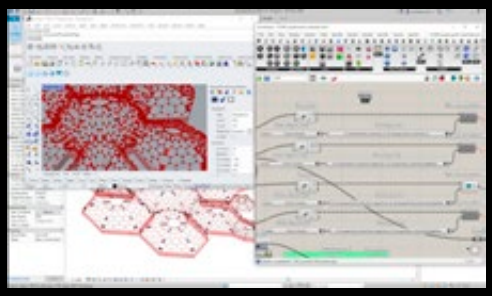


Possibility to create BIM Schedule

AF_HexagonPanel_OuterShell_EdgeHoles	1030
AF_OctagonPanel_OuterShell_EdgeHoles	177
AF_PentagonPanel_OuterShel_AI	182
AF_RectangularPanel_OuterShell_EdgeHoles	264

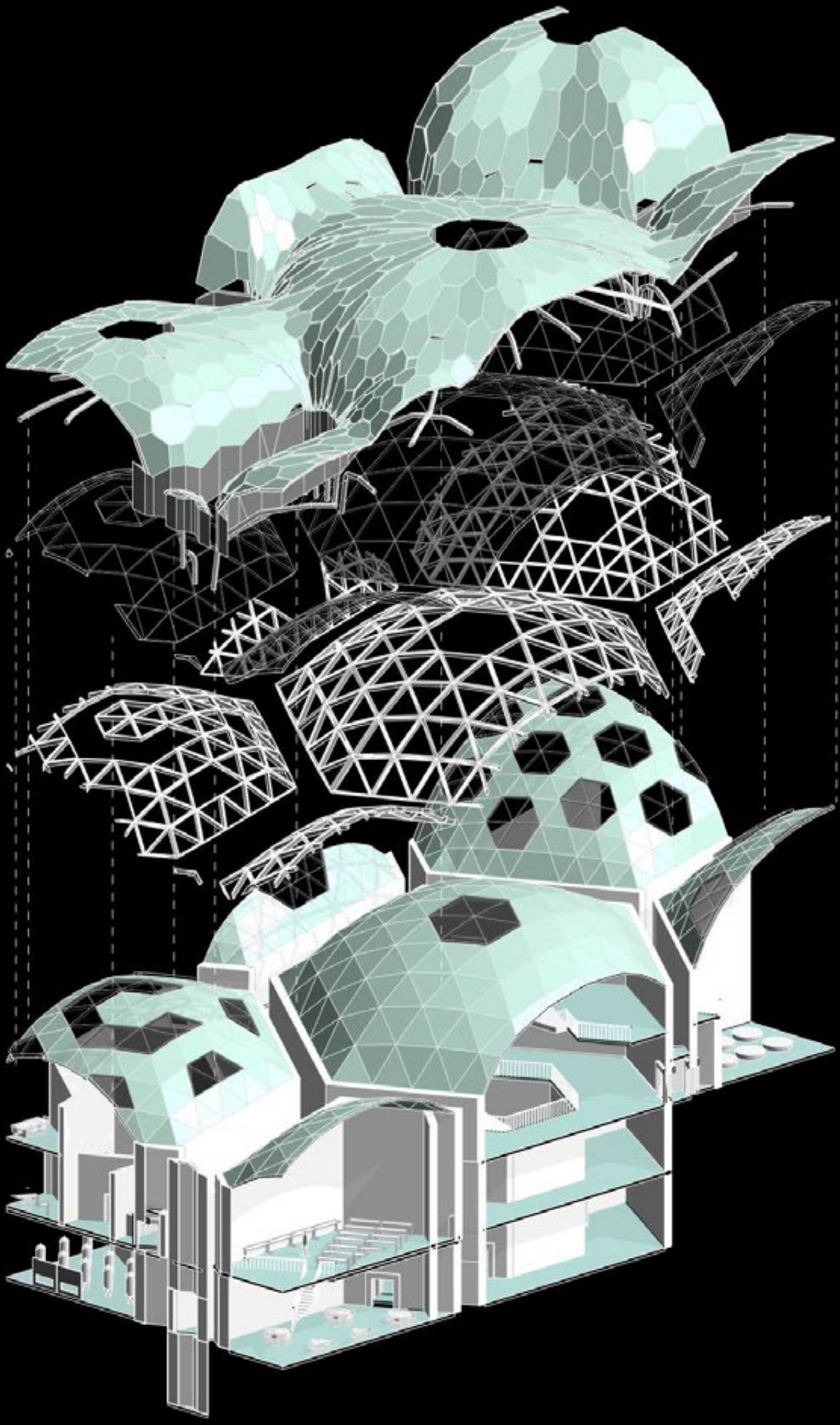
AVERAGE PANEL INTO LESS NUMBER OF GROUP

REPLACE WITH AVERAGE PANELS FOR BIM CONSTRUCTION



BIM and Parametric modeling Integration

Using grasshopper to generate the form and patternization and assign into BIM elements by collaborative software including Speckle, and Rhino.Inside Revit. The panels are unified through mesh relaxation simulation by grasshopper and clusterizing by Machine Learning tools to create clusters of similar shape before averagely optimized again and place back into designated positions on the facade surface.



NAWAPAN'S CONTACT

: 119 Inthamara 43, Sutthisan Rd.,
Dindaeng, Bangkok, Thailand 10400

: nawapan.suntorachai@gmail.com

: (+66)918721399

: /nawapan.sunt

: /nawapan-suntorachai-549729161

: jokesunt