



● HYPER BAMBOO

AAU Design + Built International Workshop 2017



ARABBAH UNIVERSITY CAMPUS, BANDUNG, INDONESIA  
TEL: 022-2512-0222 Fax: 022-2512-0226 WEB: <http://www.arabba.ac.id>

HYPER BAMBOO

# HYPER BAMBOO

Hyper bamboo  
AAU international workshop 2017  
Monfort del rosario school of architecture and design



Montfort del Rosario School of Architecture and Design, Assumption University (AAU) hosts the international workshop in 2017 topic “Hyper Bamboo| Kinetic Façade” in cooperation with German’s universities from the Federal Republic of Germany.

The international workshop aims to deliver subject-related knowledge in bamboo facade design with an integration of vertical plantation to respond to the environmental context issues by arranging workshop, corresponding visits, tours and information meetings respectively by organizing subject-related seminars in the field of higher education in cooperation with our academic partners from:

Faculty of Architecture and Design, Wismar University of Applied Sciences;

Faculty of Landscape Sciences and Geomatics, Neubrandenburg University of Applied Sciences.



The activities are also responsible for arranging the lecturers, a seminar and workshops, which includes:

- block seminars in bamboo architecture and design, construction technique, detail design and assembly,
- special lectures from the experts in bamboo design and construction, kinetic architectural design, bamboo design application in Thailand and Europe, timber construction joinery detail;
- a design project “Hyper Bamboo| Kinetic Façade design”;
- bamboo site visits to Marb Eueng Natural Agricultural Center, and Bamboo Animal Farm, Chonburi, Thailand;
- and excursion to Historic City of Ayutthaya - UNESCO World Heritage Centre



# CONTENTS

<b>Opening day</b>	<b>04</b>	<b>Hyper Bamboo 01</b>	<b>66</b>
<b>Preface</b>	<b>06</b>	Morphogenetic Design	
<b>Introduction Workshop</b>	<b>08</b>		
<b>Lecture</b>	<b>10</b>	<b>Excursion</b>	<b>89</b>
<b>Introduction Materials</b>	<b>16</b>	<b>Group member</b>	<b>93</b>
<b>Hyper Bamboo 01</b>	<b>18</b>		
Wind responsive			
<b>Hyper Bamboo 02</b>	<b>34</b>		
Musical Facade			
<b>Hyper Bamboo 03</b>	<b>50</b>		
Growing the Living Facade			

# OPENING DAY

7 JULY 2017

Montfort del Rosario School of Architecture and Design



“It was great to see the collaboration and the team work between Thai and German students and teachers. Learning and sharing both knowledge and experience together are the good opportunity for student, faculty, and all the participations. Hand on project for this assignment “Hyper Bamboo” is quite fun and challenge for the all of them to come up with the great outcome in the limited period of time, however, every studio can produce the exquisite, beautiful, and successful works.  
Great job everyone.”



Mr.Suparath valaisathien  
( Dean )

“The annual international workshop project between AAU and our German partners has been continued for the fourth consecutive year. This year, Montfort del Rosario School of Architecture and Design, Assumption University (AAU) have conducted the workshop under the name “AAU Design + Build International Workshop” with the topic “Kinetic Bamboo”. AAU has hosted the workshop in the year 2017 in Thailand and it is the first time that we have included a hands on teaching and learning strategy with the design and construct of bamboo material. As the workshop coordinator, I believe that this workshop can be the beginning to more hands on learning experience workshops in the future.”



Mr.Jaturont Boonla-or  
( Course director )

“It was delightful and excited welcoming our academic partnerships Wismar University and Neubrandenburg University for AAU’s hosting “Hyper Bamboo”. We appreciated your passion and enthusiasm joining workshop and explore Thai culture. Wishing and looking forward for great workshop and excursion at Germany in 2018.”



Dr.Sanphawat Jatupatwarangkul  
( Workshop director )

“This collaborative workshop has been achieved the goal of delivering subjected-relevant knowledge in bamboo facade design which respond to the context issue, as well as prolonging relationship among international academic institutions- professors and students, and professional architects and designers. Meanwhile, has provided good social and cultural learning experiences to all participants.”



Ms.Phimpakanit Parisanyutanon  
( Course instructor )



Prof. Dr.Marcus Hackel  
( Co.Host and Group Mentor )

“Hands on Projects” like the joint German Thai “Hyper Bamboo Workshop” in 2017 at the Assumption University in Bangkok are a one-of-a-kind, eventful and successful teaching method for architectural design. The best results and broadest findings come out of international and interdisciplinary cooperation and of projects with participants coming from diverse cultural background. Lecturers and students get in touch with different philosophies, attitudes, values and approaches. They learn about intercultural communication and develop unique solutions. We are glad to be part of the successful long term cooperation between the Assumption University, Neubrandenburg University and Wismar University and look forward for the projects to come.”



Mr.Karan Paibullert  
( Group mentor )

“Sharing of creative thoughts between east and west is a powerful learning experience. Building on the idea of such cross-culture and hands-on with real material, we can bring out endless creative design solutions that benefits all.  
I hope you learnt as much as I did.”



Mr.Karan Paibullert  
( Group mentor )

“This bamboo workshop is a great opportunity for students, Thais and Germans, coming to work, live, eat, laugh, and share their life experience together. This friendship is greatly important. Even though the overall outcome is highly applauding, the experience along the way is even greater memorable for them.”



Ms.Runda Aduldejcharaas  
( Group mentor )

“In relation to working together as part of a team, two countries have great cooperation with one another in terms of creating works, brainstorming ideas, and revising works for achieving the goals. They also exchange their interpretation and attitudes with each other for the best outcome of the work.

Additionally, their learned the advantages and disadvantages of tests, experiments and design work of bamboo structure, as well as production innovation. Able to understand the ability to apply technology to design production for creating potential work.”



Mr.Benjarit Nimboonchaj  
( Group mentor )

“This ongoing annual workshop put focuses back on the local materials which is regaining popularity over the years.”

# HYPER BAMBOO

## Kinetic Façade

Façade is the outermost layer of a building which receives, responds and interacts with the external force of the environment and users perception. What are the functions and requirements of a building façade? What is a good façade design? What are different ways a façade can interact with its environment? Should there be a design to integrate local sustainable materials? Should the design be flexible, movable, and easy to install or dispend? - they are key words that are becoming increasingly important in contemporary architectural concepts. How the face of buildings of the future should look and perform? Sustainable and energy-efficient building concepts cannot be developed through simple, recurring identical planning instructions. What if we adopt the concept of sustainable local materials to our local and climatic conditions? Together we want to discuss challenges, positive examples and ideas.



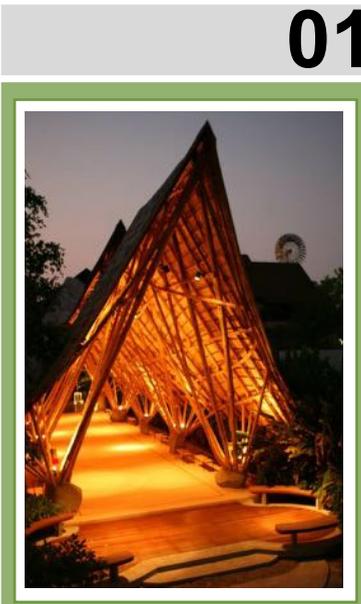
**Workshop content** includes a session focusing on movable architectural elements/flexible space concept. Discussions and impulses during the workshop will include the integration of local material (bamboo) to create a economical, flexible, and sustainable architecture. Students will get the opportunity to experiment, develop and prototype their own design and learn to solve all unforeseen problem in actual constructions.

AAU Design + Build International Workshop 2017  
 4 July - 14 July 2017  
**Hyper Bamboo I**  
**Kinetic Facade**




**LECTURE**

Hyper bamboo  
 AAU international workshop 2017  
 Monfort del rosario school of  
 architecture and design



**01**

**ARSON** SILP  
 Mr. Thana Uthaiattrakoon  
 Arsom Silp Institute of the Arts  
**"Bamboo Architectural  
 Design"**

**02**



**Pimtha** Co., Ltd.  
 Mr. Thana Tipcharoen (Thai-  
 land Bamboo) Pimtha Co., Ltd.  
**"Bamboo Construction:  
 Material Durability, Man-  
 ufacturing, and Detail  
 Assembly"**



**03**

**Wismar** University  
 Professor from Wismar Uni-  
 versity  
**"Managing International  
 Architectural Projects"**



**04**

**Neubrandenburg**  
 University  
 Professor from Neubranden-  
 burg University  
**"Kinetic Timber Struc-  
 ture and Joinery Detail"**



## “Bamboo Architectural Design ”

Mr. Thana Uthaiattrakoon - Arsom Silp Institute of the Arts

The lecture started with the major significant aspects raised by Mr. Thana Uthaiattrakoon on the ways to use bamboos for the building construction and the reason to use it. It started with the simple phrase of “know how” and “know why”. The lecturer demonstrated the issues of poverty and the needs of basic and cheap building constructing way to achieve the basic need of shelter. Some examples of mud house mixed with some recycle materials and local natural materials such as Jak leaves (Nypoideae) were presented to demonstrate how Mr. Thana has started to get involved in the low cost sustainable architecture. The key significant aspect was about how the local community and the local technical experts has got involved in the project, and it was mentioned that the key to the success is the integration between the design and the local knowledge. Various design examples of bamboo architecture have been demonstrated in this lecture by Mr. Thana, started with his first bamboo architecture project at Arsom Silp Institute of the Arts, including the main pavilion and the workshop building for Roong Aroon School. Several other bamboo construction examples from other countries were also presented to demonstrate the variety of design techniques in relations to the different bamboo types, the topographies, the geographies, and the climates.

The main aspects in the lecture are including the knowledge in the different types of bamboo around the world, with a specific focus on Thailand’s bamboo species, the nature of bamboo material in term of strength and weakness in according to the specific types that are commonly used for bamboo construction, and the construction techniques. Mr. Thana also presented the bamboo treatment process to properly protect the material from the insects.



## “Bamboo Construction: Material Durability, Manufacturing, and Detail Assembly”

Mr.Thana Tipcharoen  
(Thailand Bamboo) Pimtha Co., Ltd.

Mr. Thana Tipcharoen focused his lecture in term of technical knowledge of bamboo material and how to build bamboo construction. He began the lecture with his own background on how he get involved and how he has developed the knowledge in the bamboo construction. He explained that bamboo is a common native material in many countries except for Europe and Middle East. People in Southeast Asia and Africa are familiar with bamboos and use them for many purposes such as food, making tools, furniture making, or even building construction.

Asian use bamboos to construct their houses for thousands of years because they are easy to find, easy to construct, and cheap. However, people usually think that bamboos are not durable materials compare to the other construction materials such as steel or concrete or even compare to hardwood because bamboos are fast growing plants, hollow core trunk (not solid), softwood, easy to break, and they are not weather resistance materials, particularly to the hot and humid climate condition. They are also food to some insects such as moths, termites, and ants because bamboos’ trunk consist of flour and sugar substances which are food to those insects. Another weakness of bamboos is moisture and fungal. Water and moisture will decadent or decay the bamboos. If bamboos are installed on ground, berried underground, or soaking in the water for long time, it will generate fungal, which will destroy bamboos within one year. Even though, bamboos are not capable to resist moisture and insects but there are ways to treat the material and protect them from those weaknesses. If we know how to treat bamboo, it can be a very strong material for building structure as well as steel or timber. Bamboo is a softwood that has its unique character and ability, it has its unique long straight wall cell line or fiber line, running in the same direction which generate ability to carry heavy load. This has made bamboo the most durable load carrying softwood, according to the engineering researches.

In Thailand, we mostly used Tong Bamboo (Giant Bamboo – *Dendrocalamus Asper*), and *Bambusa Nana* or *Bambusa Multiplex*. Mostly, Tong Bamboos are used in the main structure because of their large diameter size and their strength to carry heavy loads but we can also use *Bambusa Multiplexes* for the main structure and structure members by tying them together. *Bambusa* is a smaller size bamboo which make it easier to bend and generate curve structure such as dome or arc shapes that allow the design flexibility and creativity. Most of the curvy shape bamboo architectures are seen in Southeast Asia like Thailand, Vietnam, Malaysia, and Indonesia because of the availability of smaller diameter bamboos.

Bamboos are used in all sorts of manufacturing products such as flooring, roofing, ceiling, and wall panels through material transformation manufacturing. The processes are depending on the end products functions and production techniques. Pimtha company has manufactured bamboo floor panels, roof sheets, and wall panels by using variety of techniques such as compressing, weaving, or even sewing.

In term of joinery and assembly detail, there are number of ways to assembly bamboo structure in relation to the individual design and the joinery detail which related to the individual local cultures and knowledge. Mixture of other materials such as concrete and steel are integrated in the building construction, mostly for foundation construction, to protect bamboos from underground water and moisture that can generate fungal in bamboos. Several joinery details for structural members such as the connection between columns, beams, rafters, purlins, or the other support members are used in according to the appropriateness in the different situations, or for the design aspects, or from the local knowledge and techniques.

## “Managing International Architectural Projects”

Professor Dr.-Ing. Marcus Hackel - Dean of Studies at the Faculty of Architecture and Design at Wismar University.



Traditionally architects focused on their home country and culture. The global new technologic possibilities and global economic changes offer and demand new approaches on architecture and management. We will have to change our mindset. But why should we go international? The market in our home country might force us to get into new markets. Sometimes we might have to follow our clients, sometimes architects will just look for different, rewarding and demanding projects. Even if you stay in your home market cooperation with foreign architects or projects financed or developed by foreign clients will bring globalization to our front door.

Competition will come in many ways, in foreign countries as well as in your home country. Architects will have to develop strategies for international competitive advantages. We will have to answer general questions of strategic management like

- what type of services can be offered
- how and where do we get the contracts
- how and where will we provide the services
- how will we get competitive advantage

Learning from economic research we can use the concepts of

- global efficiency

- multinational flexibility
- worldwide learning

International branding and the concept of “Starcitecture” are other important strategic tools.

But the ultimate prerequisites for international success are partnerships, strategic alliances and networks.

International projects normally don't fail because of technologic shortcomings but caused by lack of understanding of foreign customers and markets, lack of “international talent” and lack of foreign partners. Different attitudes in different cultures will influence our architectural practice in many ways:

- emotional sensitivity and emotions
- power plays, loyalty and team work
- decision making and face saving
- style of argumentation
- documents and contracts
- decision making process as group and individual
- atmosphere and decision making
- culture and symbols

It is vital to understand the host culture – communication, values, attitudes and social structure. International architectural management is always intercultural management as well.

## “Kinetic Timber Structure and Joinery Detail”

Prof. Philip S. C. Caston, Phd, Architect, Neubrandenburg University of Applied Sciences

The design of timber structures is all about rigid body dynamics or in more simpler terms, about the movement of systems of interconnected bodies under the action of external forces. The designer's main goal is to construct a structural system that is statically stable, rigid and where necessary flexible, that is able to support itself and applied loads, be practical and economically viable.

In heavily forested countries such as Germany, timber is an obvious building material and has been used traditionally for different applications for many centuries. However, timber and its simple use has its limitations, based on its natural size, type, durability, workability and availability. To achieve a useful and practical function as a building material timber needs to be converted into a structure by combining smaller parts into a greater whole.

A good example of this is the truss, whose individual components (chords, posts, struts and braces) have in themselves a considerably reduced capacity to transmit forces compared to the final assembly working as a whole. The history of timber structures is all about the design of trusses and truss like structures able to exceed, sometimes far exceed, the natural load bearing capacities of its single components. In addition, other factors such erection and assembly realities/problems contribute to the final design.

Making these individual components work together is the key to building a successful truss. Joining the individual pieces together is paramount – joints have to function properly or the truss will collapse. The size and position of each member is similarly important. All these factors have to be balanced correctly to achieve the desired goal and this has been the subject of much thought and development over the previous centuries.

A look at the design and construction of selected examples of historic roof trusses, bridges and surveyor's towers, all made from timber, and incorporating complex trusses can show what has been achieved so far with kinetic timber structures and joinery details.

# MATERIAL

## INTRODUCTION



### INTRODUCTION MATERIAL BAMBOO

**Bamboo**  
Our beloved fast-growing grass and the focused building material of the workshop. Known for its exceptional physical strength, application versatility and ecological excellency.



**PVC pipes**  
An upcycled material widely used in various systems. Lightweight, uniform and cost-efficient, like an artificial cousin of bamboo



**3 Rubber tube**  
A common household material with outstanding flexibility and durability. Available in various grades, diameters and colours.



**Thatch**  
Traditional natural building material in palm family. Commonly used in roofing. Abundant in mangrove area throughout Thailand



**Spandex**  
A manufacturing waste generated from Thailand's prosperous garment industry. Light and elastic, the colour, thickness and pattern depend on the source.



**Rope**  
An ancient material available in various colours, materials and thicknesses. Best know and utilized for its tensile strength.



# WIND RESPONSIVE

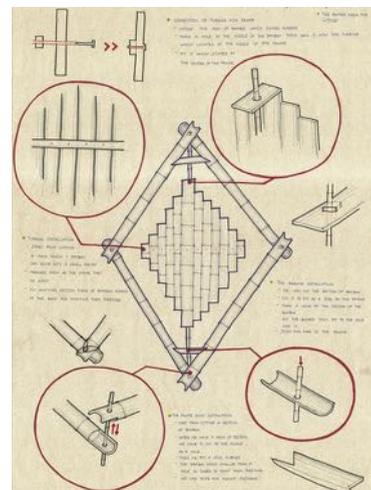
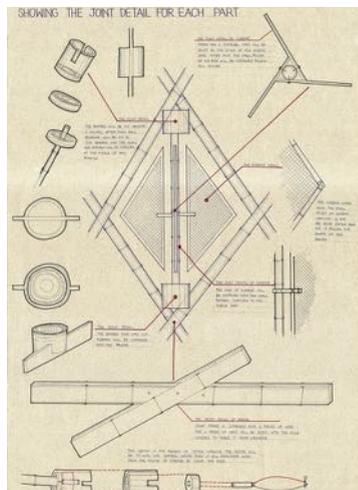
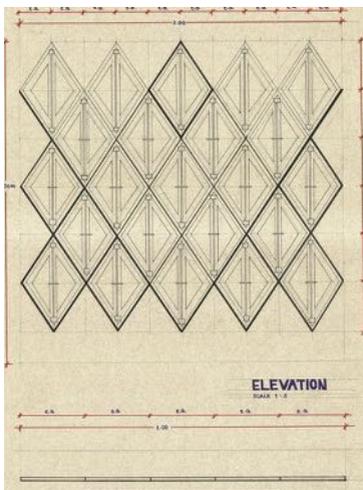
To inspire by breathing building skins, the studio seeks participants to explore, rethink and design a façade that reacts to wind forces using bamboo and other material. Its intentions are to generate a prototype for a building skin that benefits in building environmental control as well as an esthetic that reflects Asian cultures. Through applying bamboo joint techniques, participants are to develop modular unit prototypes by integrating available reused/recycled material.

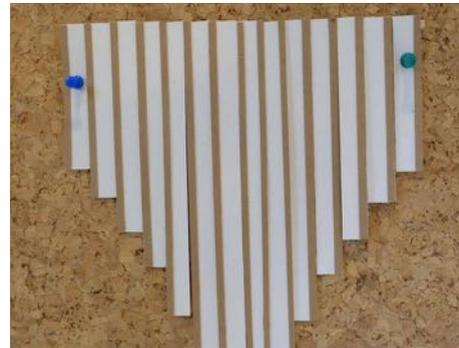
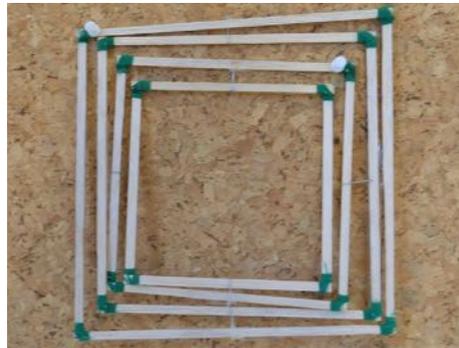
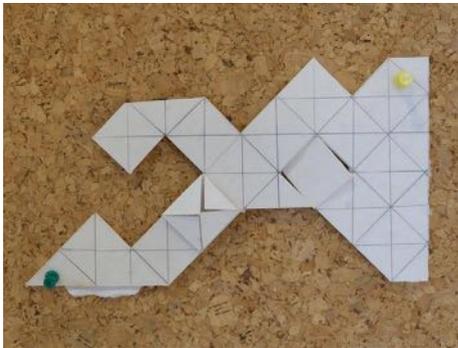


## WIND RESPONSIVE

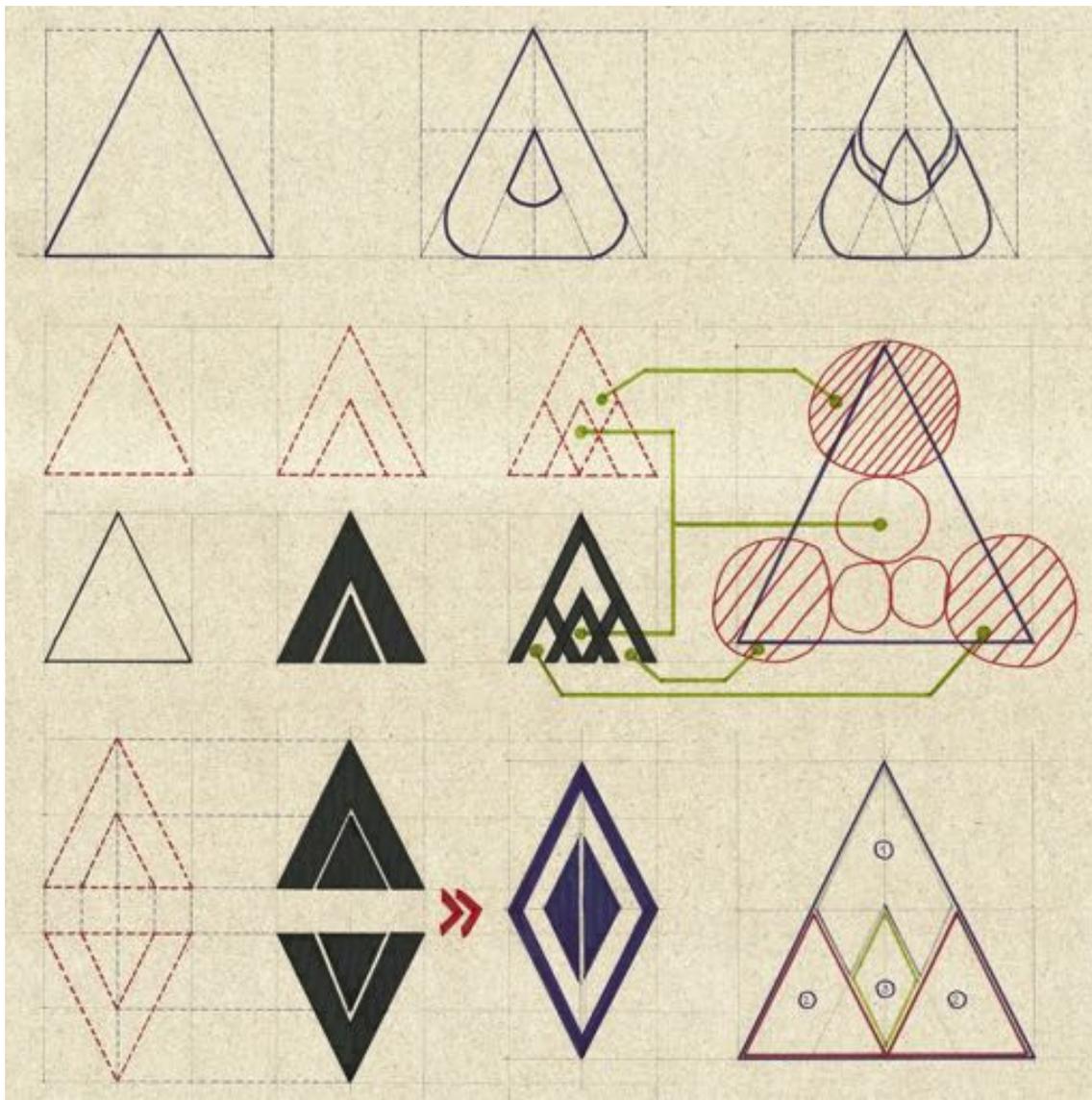
Thai drawing show the transformation of Benjarong pattern into the facade design and structure.

With the combine knowledge of material bamboo, our group was assigned to develop a facade that would respond to the wind. So we created a prototype of a façade for a building that benefit in building environment control and also reflect Thai culture using locally available and renewable material such as jute ropes and bamboo.





1.First scheme describes the essence of Benjarong (five colors). 2.Second scheme shows the combination of geometry and pivot movement for further wind interaction. 3.Third scheme shows the layering study and composition arrangement. 4.Forth scheme demonstrates the wind responsive prototype.



The diagram showing transformation of benjarong pattern to bamboo structure.



The main design of our façade is based on Benjarong pattern that is famous pattern in traditional Thai fabric and other traditional Thai products. Benjarong patterns are related to multiple repetition of triangle in proportion.





We constructed our first 2\*2 meters model with split bamboo pieces that were flat and easy to use. These flat pieces were diagonally connected in a web pattern to achieve diamond shape to place the turbines. For the turbines thin bamboos were used for the axel that connected to a soft wooden fan. To connect the turbine to the frame we used short pieces of bamboo that were cylindrical. We then put the ball bearings in these bamboos to smoothen the spinning movement. We were able to achieved the pattern but the structure was unstable and weak.



The experiment of movement on the bamboo structure.

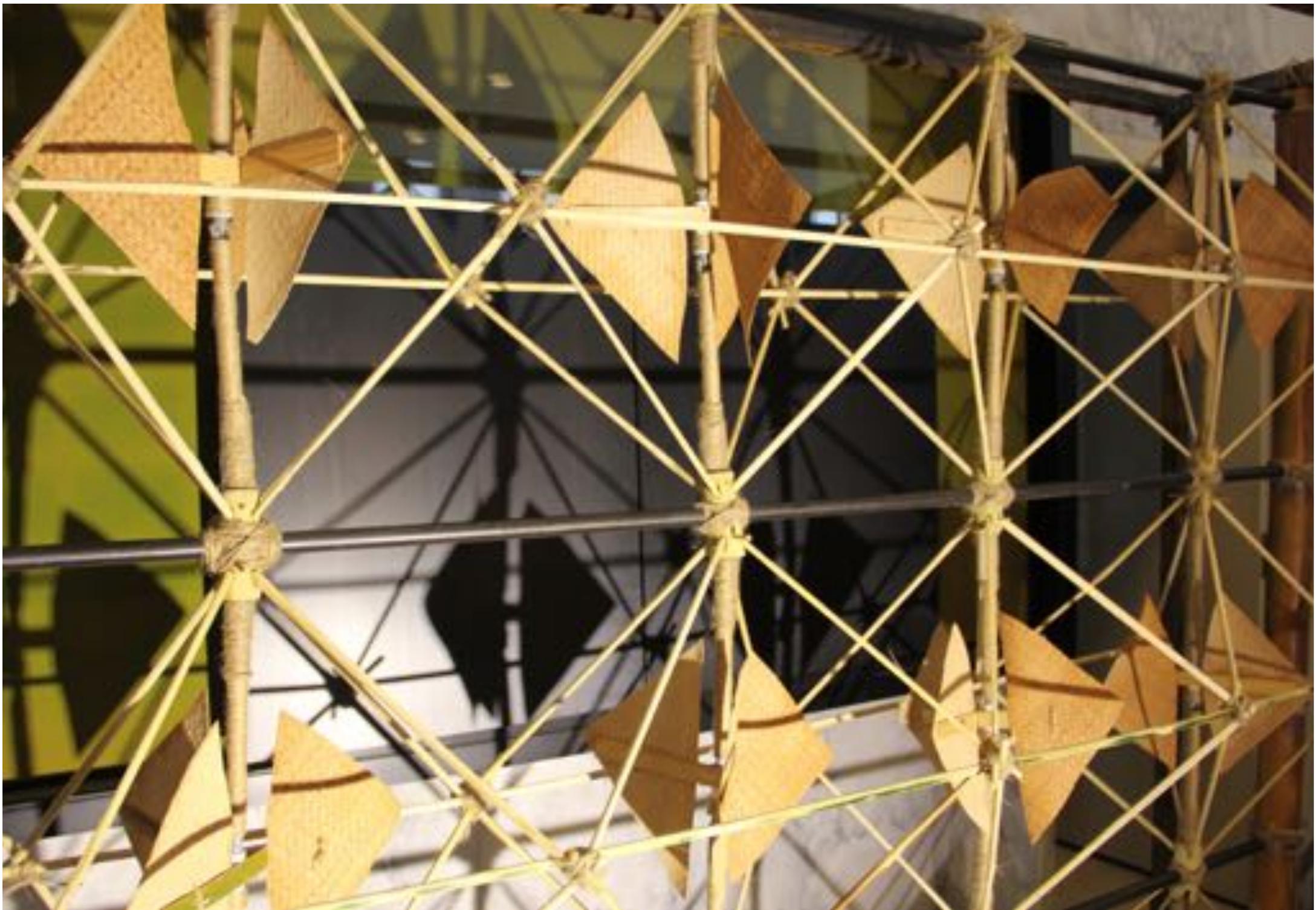




Due to the weakness of structure we changed the frame to be whole bamboo instead of split bamboo. This gave the structure more strength and volume. To add a purpose to the vertical turbine we added a reverse motor to produce electricity like the windmill .we installed these motors inside the short cylindrical bamboos that connected the turbine with the frame. we needed to develop the fan for the turbines so that it would work more efficiently. It needed to catch more wind and be lighter at the same time. To solve this problem we used thin strips of bamboo that were sued for weaving .this can be seen in many Thai handicrafts, we also added one extra fan to the turbine. The only problem with this structure was that it was wobbling while it faced the wind. And the joints needed to be strengthened.



This is how we came up with our final product. We used the steel bars for the extra strength .the design of our façade changed slightly. We developed the layer of our façade to be a single layer and the framing to be three dimensional. This gave the façade more volume and the strength. The axel of the turbines was replaced to P.V.C pipes that gave smoother and straighter support .these pipes were rapped with the rope to maintain the natural bamboo theme. We added L.E.D lights to the turbine that would light up when the turbines were spinning.



The final  
presentation day  
14 July 2017



# MUSICAL FACADE

To explore different methods a façade can also perform as musical instruments and create prototypes using only handcraft skills and common tools with bamboo as the primary material and recycle waste materials as supplementary fitting. The design is intended for elementary schools in rural area in Thailand as a wall for the classroom to encourage group learning and creative social interaction in early childhood through music. A successful design will be proposed to the Student Committee charity camp to be constructed in their next trip.



## MUSIC BAMBOO FACADE

Our goal in this project is to create a façade by using kinetic energy with a sound. We would like this façade work for children in the rural area that we do not have much technology to use for themselves. We aim that we will focus on our main material “bamboo” and create the façade that can easily build on the rural area. For our first step we try to analyzed the music instrument and see the mechanic and technic how to make a sound in that instrument for we can adapt their mechanic to our façade. After we analyzed we make a model for each instrument and work on create sound with the main material bamboo and recycle material that we can normally found around our daily life. For our second step we concern more about the opportunity of the bamboo façade that they must protect the user from the sun, wind and rain also they must have a good ventilation. So we make a model in 1:1 scale to see how it work and try to find problem when we work on installation. We think about the passive and active façade that we want to make a façade with 2 systems with a user and without a user. We create that mechanic but we did not success on making sound. So we think more about how to make sound for children and think more about safety.



The first presentation of bamboo musical façade with conceptual models. We were experimenting on creating sound from bamboo's movement.



Getting a comment from special guest to develop further on the next stage. We try to install mechanical movement to the façade with only bamboo.

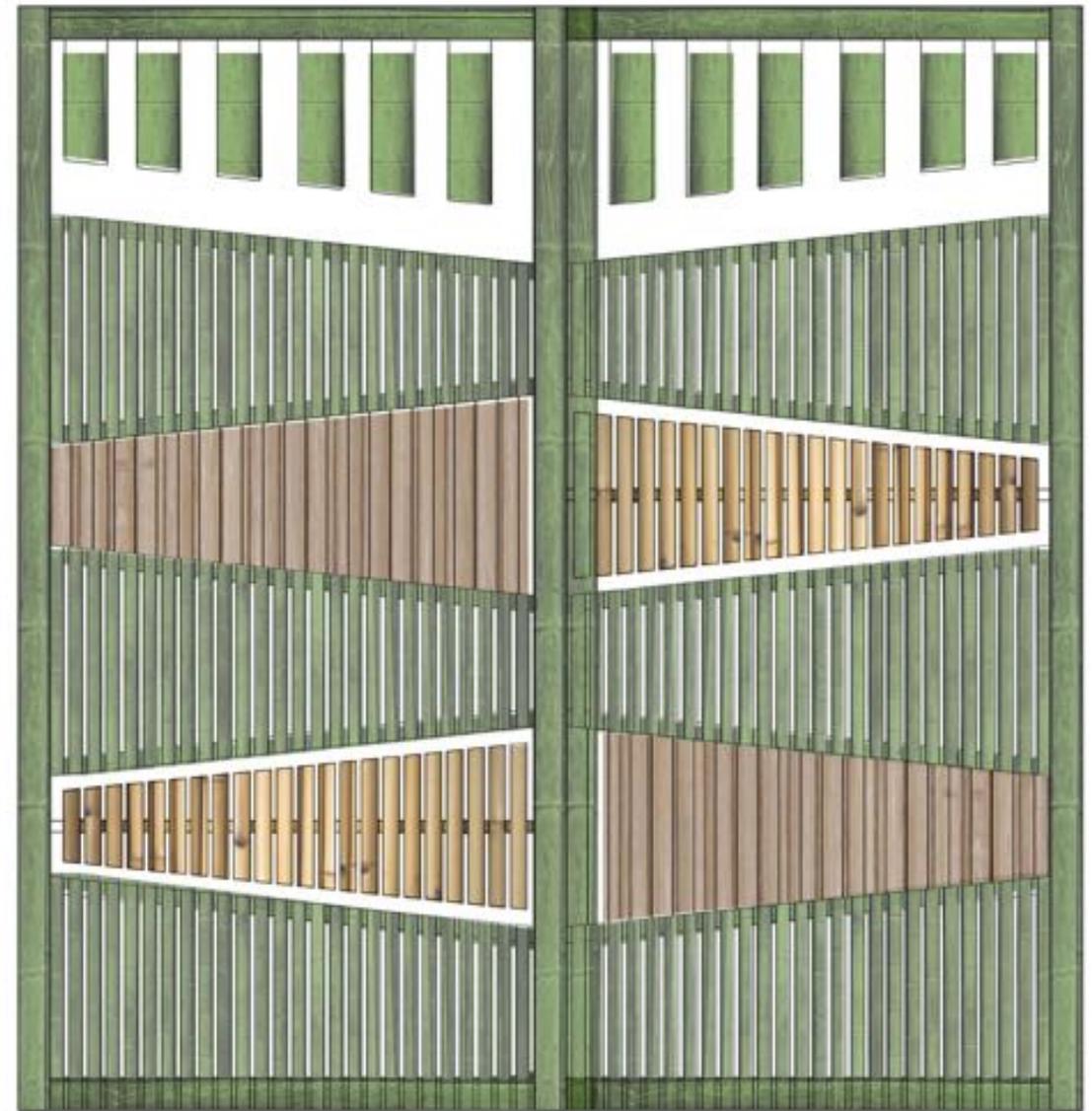




The final presentation day  
14 July 2017



A series of images showing the production process of developed facade

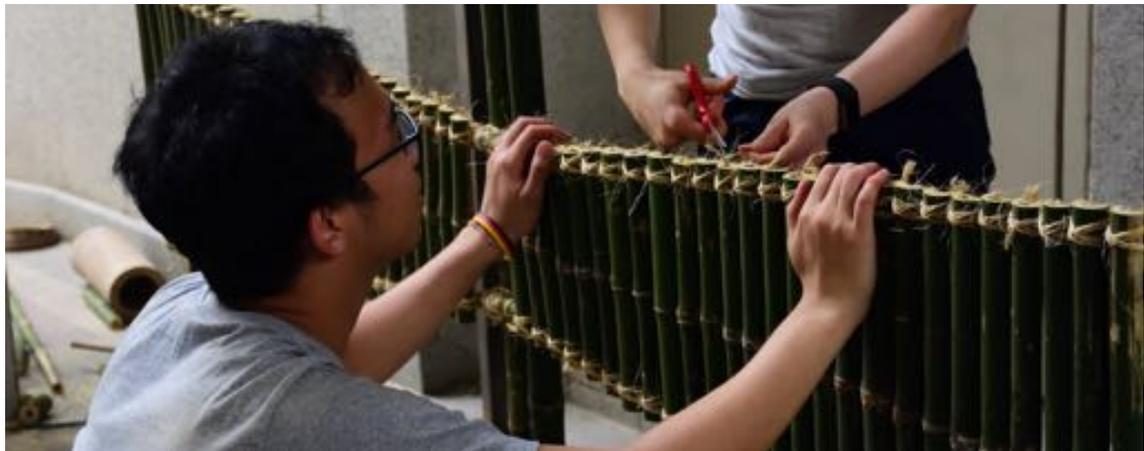


The elevation of the final facade showing the arrangement of three type's musical instruments which consists of xylophones, rainmakers, and the bells.



For the second stage of workshop Wismar University and Neubrandenburg University from Germany help us to develop our façade by keep our goal an objective. We try to think the possibility instrument that can make the sound and we come up with Xylophone, Rainmaker and the bell that make from bamboo. We spilt in 3 groups to test the instruments and make the pattern for out façade we put the bell on the top of our façade for the passive function and Xylophone, Rainmaker on the active functions that where our main user can do activity with the façade. Also our pattern can protect the user from the sun and have a good ventilation and the important part it can create a beautiful sound with bamboo material.







The final presentation day  
14 July 2017



# GROWING THE LIVING FACADE

To encourage participants to explore, rethink and design the Living Façade that could allow the plants to grow while still also enhance more interactions not only ventilation, sunlight, and rainfall but also inside-outside architectural and social relationships as well as enhance the experiential perception thru this Living Façade. The Kinetic Living Façade should allow the user to control, manipulate and change how it performs such as prevent the rain, reducing the heat while allowing the sunlight to shine inside, & etc.



## LIVING GROWING FACADE

For begins the project objective of the project was leading our group to make and build a kinetic green facade which was settled to build with the traditional material of most of south East Asian countries (Thailand) in architecture which is bamboo. more over our group discussions decided to start the project with getting idea from name of it in a simple way that the word of (facade) led us to think about elevation view of building where mostly is the area that all openings are located so these openings are the connections of interior and exterior of building which obviously we can see the connection of users who are humans with their surrounding environments .on the other hand these openings mostly are windows so our team decided to design different kinds of windows and just mix them with idea of green plants and then adding the idea of kinetic and movements to this green window. Next we think about a new phase of project in terms of how we make our window move? So we tried to deal with different ideas which are in process of our design for example using wind power or water movements or even moving the window manually.





Since plants need daily watering so the idea of water movements in terms of kinetic issues is very suit to the project on the other hand the function of the sliding window would give ability to users to control the percentage of the light that could come through interior areas and mix of these 2 type of movements can help for cooling down the building and creating different shades on balcony part.



Midterm presentation

As you can see in our design processes in first phase of our project we mostly worked on smoothness of water movements which is our first kinetic issue and we tried it with different type of materials such as rope and chains but in the second phase we worked in second kinetic issue which is sliding part of the window and we work on smoothness of panel movements and we tried it in different ways and different materials such as making bamboo railings or using different type of wheels and finally in the last phase we worked on location of plants and think about which area is the best spot to watering them and keep them alive and also type of plants to be more suit with the weather and Thailand situation. All these phases were include of detail designing different type of joints and work with bamboo material





The Experiment of the joints 1  
To connect two bamboos which have the function of hanging and carrying the weight of the structure. we put another small T shape of bamboo to join those two stalk of bamboo.



The Experiment of the joints 2  
Using one longer bamboo to join other 2 bamboo for the racking experiment.



The Experiment of the joints 3  
We put small piece of bamboo which work as a nail to make the joint stronger



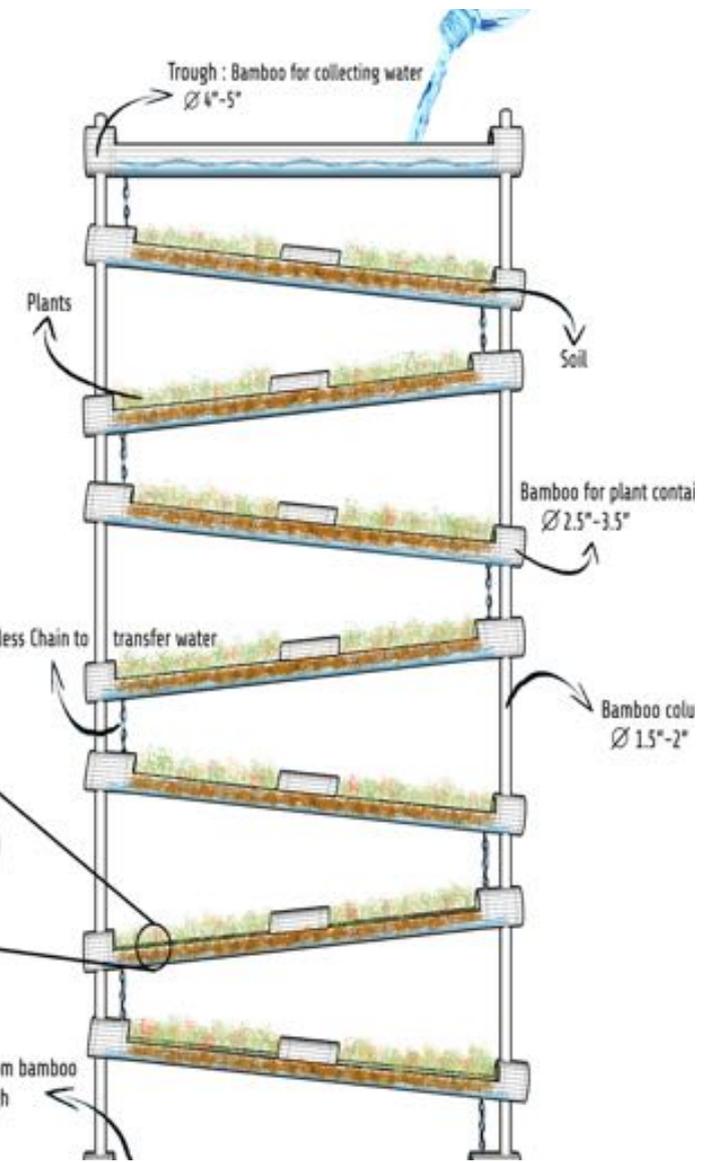
#### The railing part

To make the whole structure move smoother ,We decide to use bearing wheels. Bearing wheels connected with the steel structure to make it strong enough for caring the weight of the whole panel. We use this set of structure in both end of the panel to make it moving with balance. Also the wheel loader had stick with the bamboo trunk which make it look harmonious.

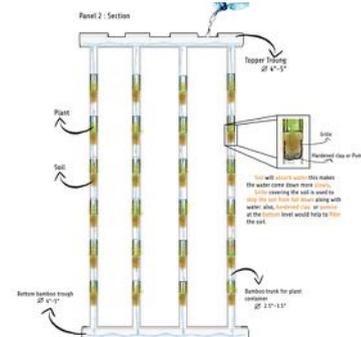




Panel 1 :Section



Soil will absorb water from the chain trunk. This process repeats till the last bamboo trunk. Since soil absorbs the water, it makes water come down more slowly.



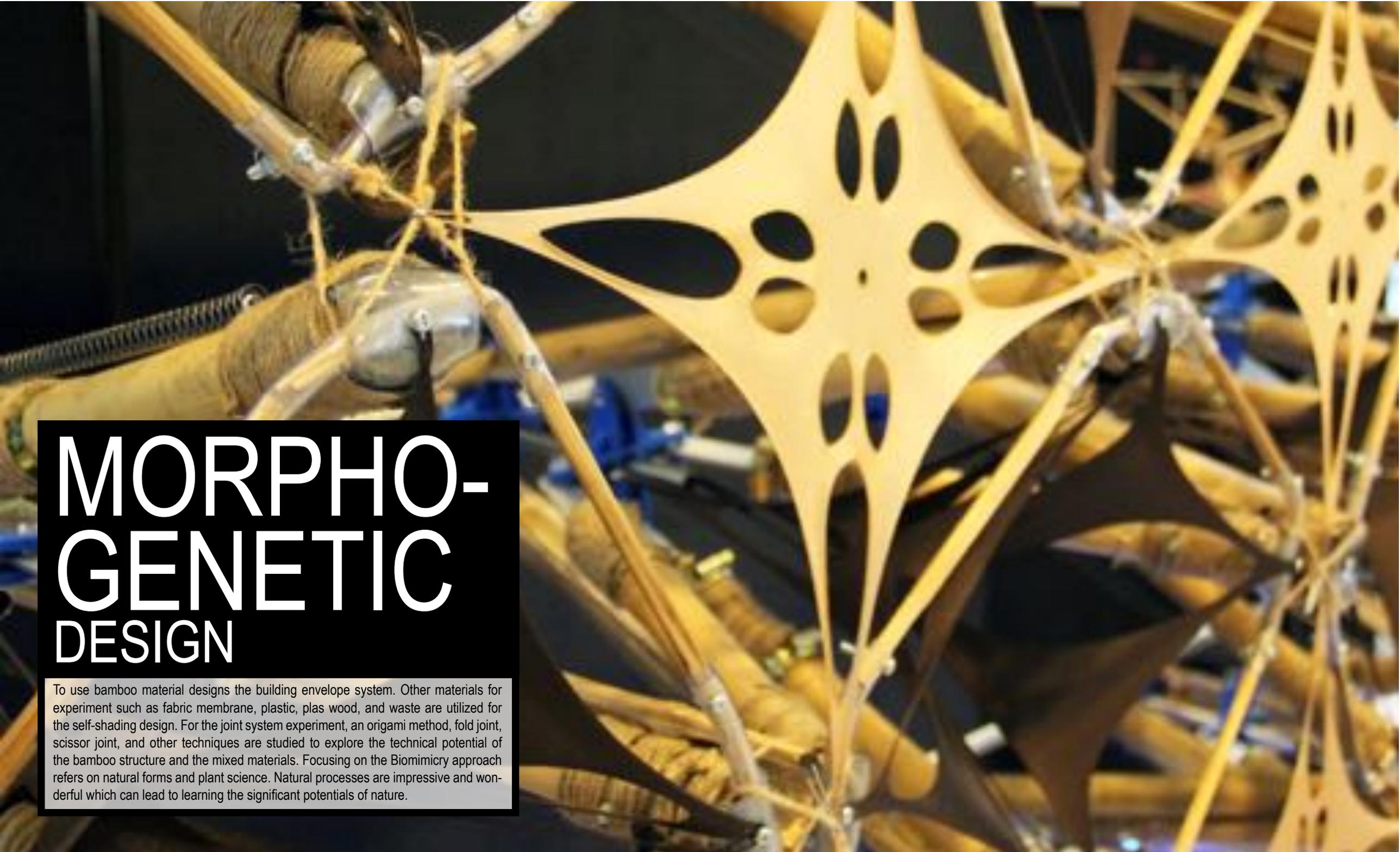
As you see the green panel is located in outdoor part of building where is balcony part and it will move through the long of balcony, the panel itself is combination of bamboo structure which connected and made by bamboo joints and whole panel is connected to the main railing structure from top and bottom and it's moving with help of the metal wheels.



The structures and connections of both panels are totally the same but as you see the floor plants are designed in 2 different styles which are horizontal and vertical and it's just showing different performance of water movements and it can use in different side of building according to sun directions and shades that is needed. In reality the panels will be install between 2 concrete floor from top and down by using the strong joints which can hold the panel.

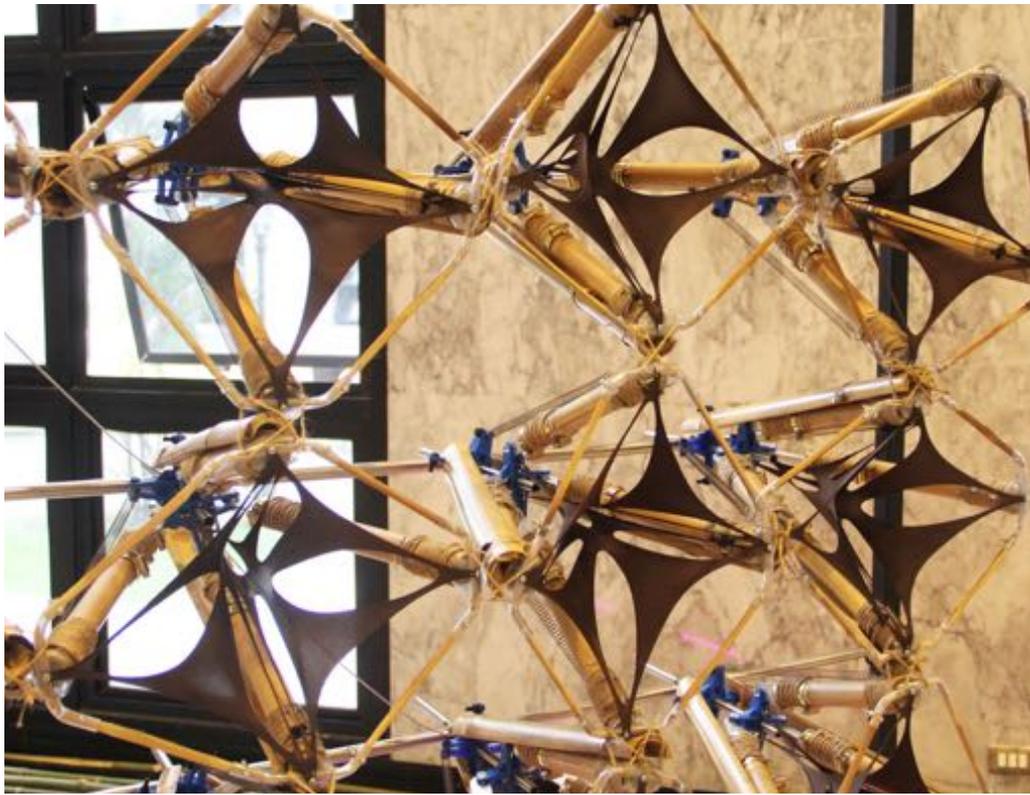


The final presentation day  
14 July 2017



# MORPHO- GENETIC DESIGN

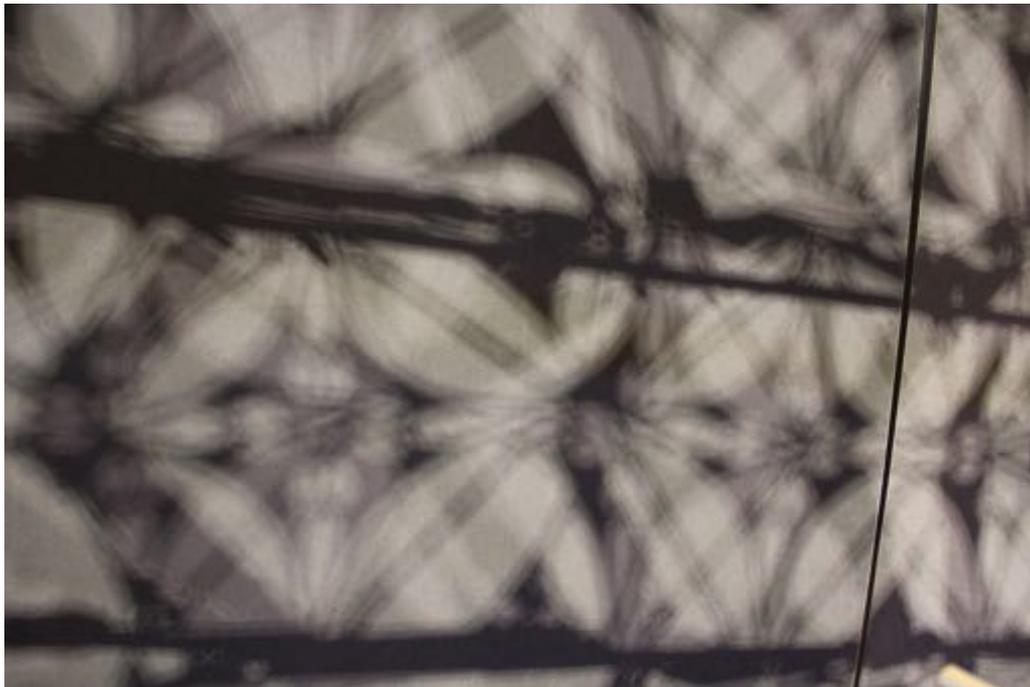
To use bamboo material designs the building envelope system. Other materials for experiment such as fabric membrane, plastic, plas wood, and waste are utilized for the self-shading design. For the joint system experiment, an origami method, fold joint, scissor joint, and other techniques are studied to explore the technical potential of the bamboo structure and the mixed materials. Focusing on the Biomimicry approach refers on natural forms and plant science. Natural processes are impressive and wonderful which can lead to learning the significant potentials of nature.

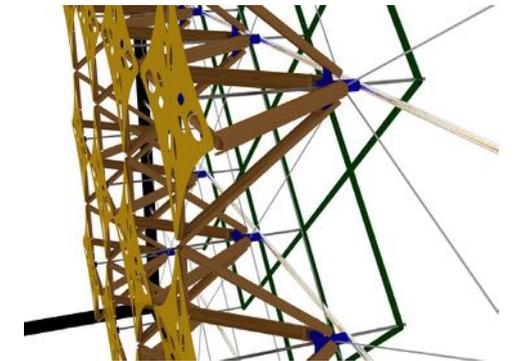


## KENETIC FACADE

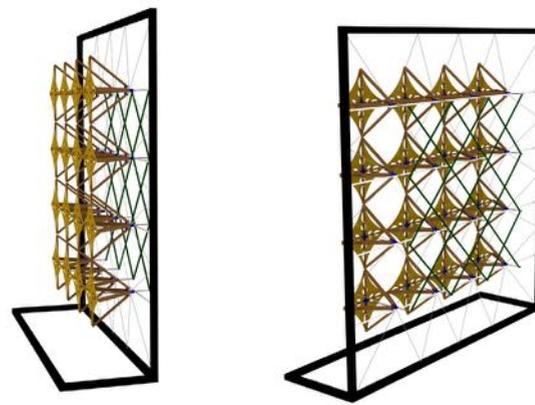
Portulaca Grandiflora

The group had inspired from the movement of the Portulaca Grandiflora as the present of the sunlight the flower would slowly bloom and opposite with the absent of the sunlight. Applying the core idea from the flower movement to be the kinetic façade is our main intention. With the present of sunlight, the façade will respond accordingly to block the unused sunlight entering the building and allow only the ambient light.



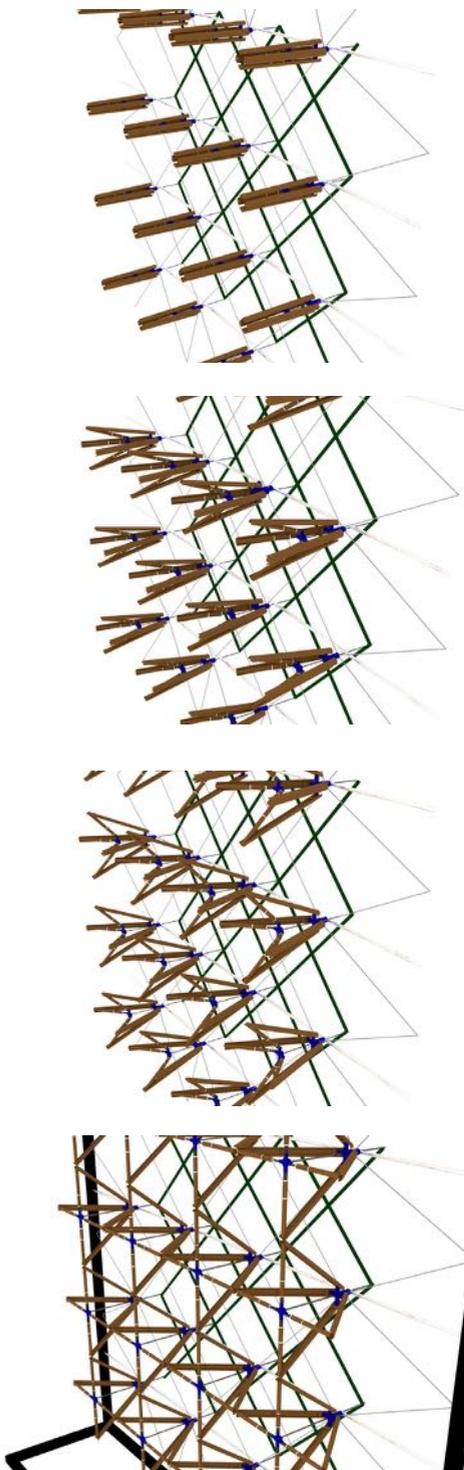


The group had developed many model to make it movable by researching and developing by using different materials such as PVC as it had the same size with the Bamboo. The Bamboo had been treated to protect against the insect due to the present of the sugar and starch present inside the bamboo. The traditional treatment of the bamboo would take around 5-6 months to treated the bamboo. With the help of the chemical which is known as Boron, it would shorten the time of the treatment process to be 5 to 7 days only. The Bamboo that were used in this project was carefully selected due to it flexibility and their commonly found in



#### Midterm Presentation

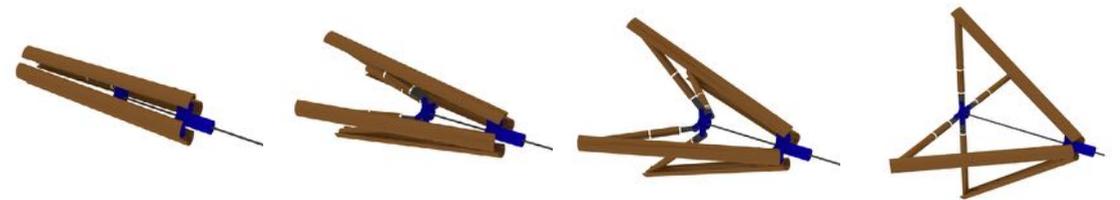
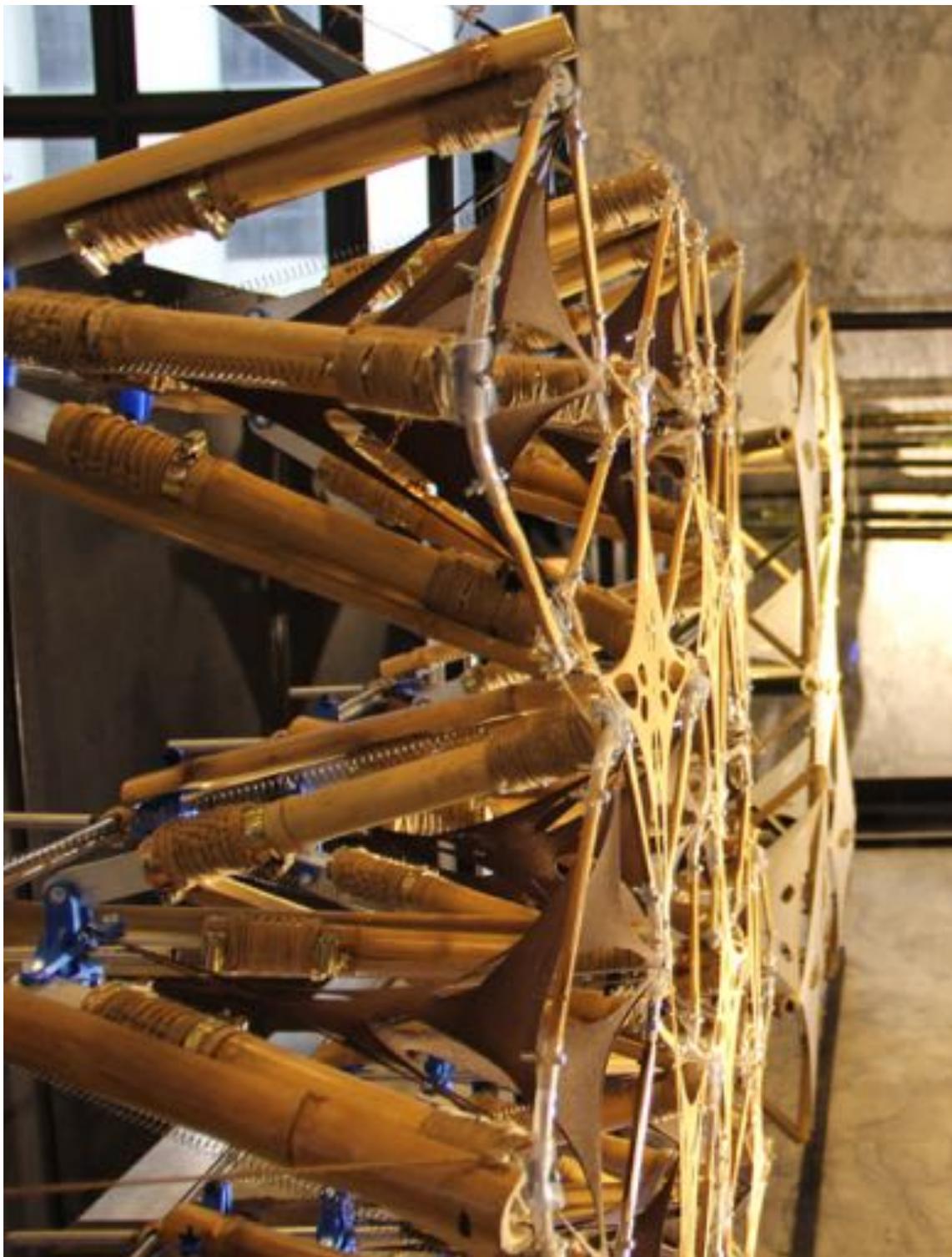
The technology these day helps our work to be easier. The group has used the 3D printing to make the joint as the bamboo when make for smaller joint it could be break easily. The joint used for controlling the main movement of the façade movement. We had develop the model to the certain point before German join up with the group to help further more development, to make it more efficiently.



We had built it in the modular for easier for the installation on the building façade. There would be the sensor to sensor the light entering on the façade of modular which is controlling by the gears to turn the surface On and off at the present of the sunlight.

We developing the size of the material as it used to be very heavy in the earlier state to make it lighter as in would reduce both live load and death load.

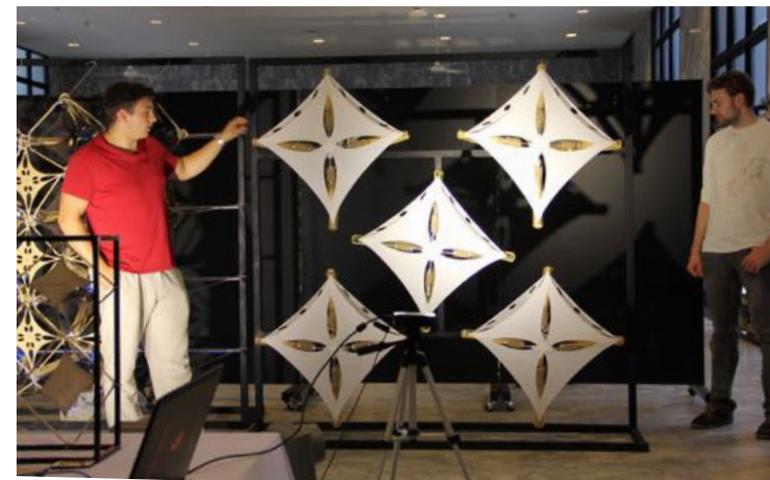


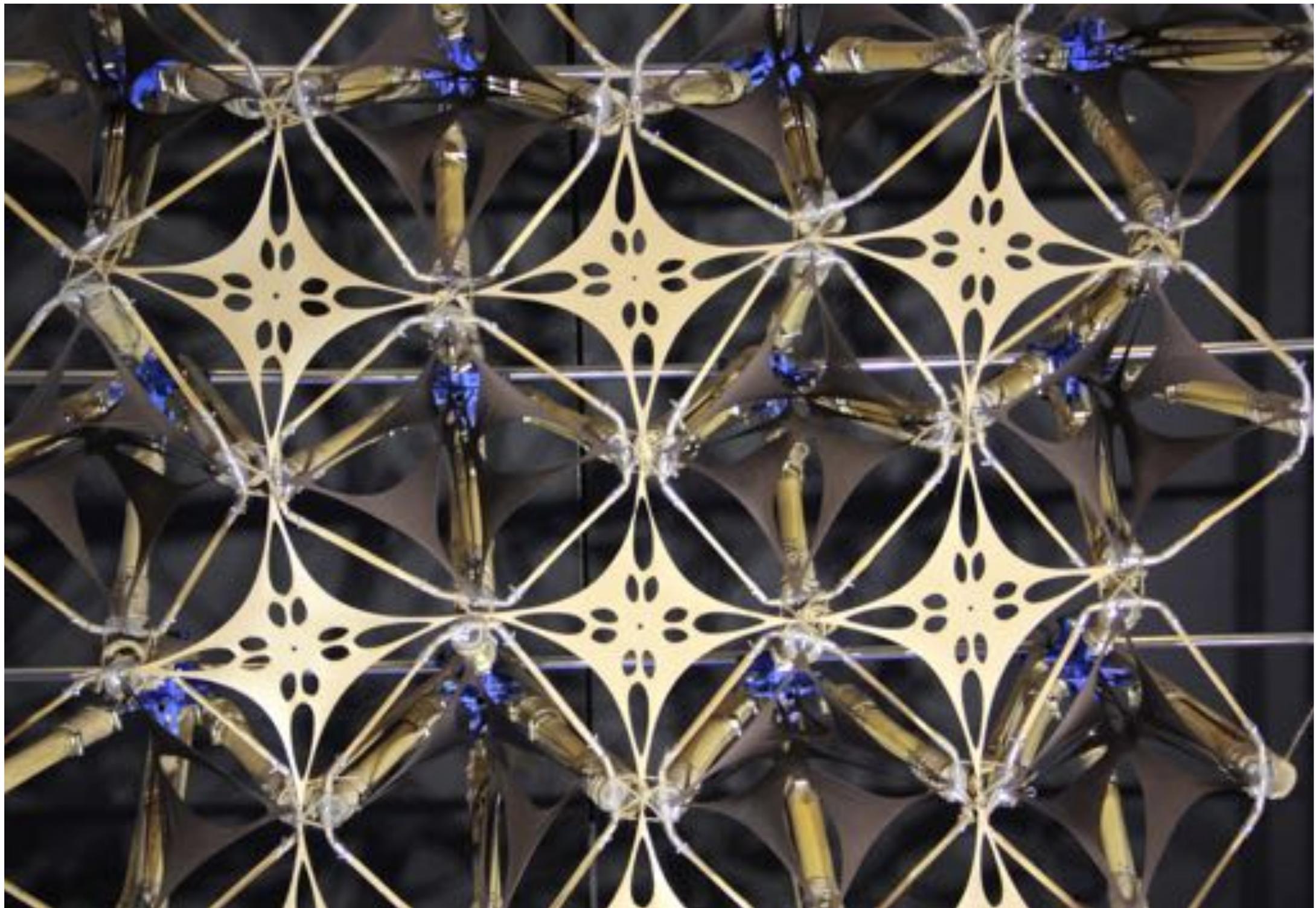


The team had developing with the fabric on the facade as it would be an effect on both live load as the wind on would attack the facade and the movement that stand out and pushing on.



We had help each other out until the end. The model could be effectively. However, the further more development could be carry out for the more advance facade design. It was a good time shering an experience with each others. Knowing new friends, working with them.





The final  
presentation day  
14 July 2017









## “ Bamboo Technology ”

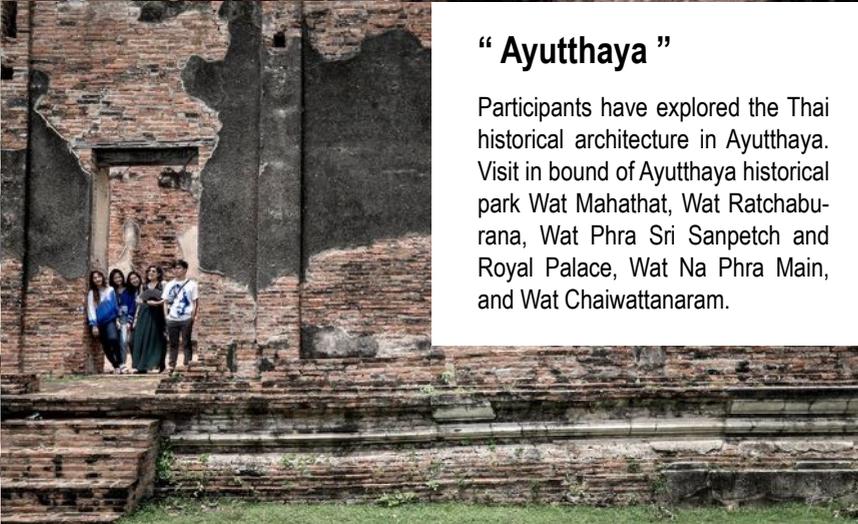
◀ Mr. Kolakot Aromdee’s bamboo workshop at Phetchaburi Province

There were lectures about Korakot International LTD’s vision and demonstrated the success story of bamboo craft invention. Participants have been observed bamboo craft manufacture and process.

Arsom Silp Institute of the Arts and Roong Aroon Primary School, Bang Khun Thian, Bangkok ▶

Participants have experienced in the bamboo construction and technology. On the other hand participants were gaining the philosophy and concept of behind the institution architectural design and built environment approach.





**“ Ayutthaya ”**  
Participants have explored the Thai historical architecture in Ayutthaya. Visit in bound of Ayutthaya historical park Wat Mahathat, Wat Ratchaburana, Wat Phra Sri Sanpetch and Royal Palace, Wat Na Phra Main, and Wat Chaiwattanaram.



GROUP 1  
: WIND RESPONSIVE



**MENTOR**

Mr. Karan Paibullert  
Prof. Dr.-Ing. Marcus Hackel



Korrakot Khuengpo



Nareekan Watanyu



Vasinee Mayazes



Teofilo F.S. Pereira



Shashank Shrestha



Christian Grätsch



Lennard Kaufmann



Ariane Bamberg



Jasmin Krause



Julia Nowaczek



Hannah Winkelmann

GROUP 3  
: GROWING THE LIVING FACADE



**MENTOR**

Mr. Veera Leelapattanaputi  
Prof. Dr.-Ing. Thomas Oyen  
Prof. Dr.-Ing. Bärbel Zander



Pimrampha Saenyakorn



Erfan Shoja



Phusit Boonrod



Anantaya Thungtong



Markus Jansky



Mike Horn



Dajana Lieser



Asli Ersan



Alex Krugenberg

**GROUP MEMBER**

GROUP 2  
: MUSICAL FACADE



**MENTOR**

Mr. Benjarit Nimboonchaj  
Prof. Dipl.-Ing. Martin Wollensak



Patricia Fuangrabil



Natcha Neeranatphuvadon



Sib Chainukusila



Promrasta Siripatt



Morten Fuchs



Guowei Zheng



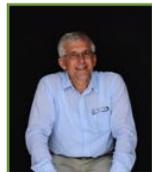
Miriam Haase



Elena Gross



Konrad Saß



Gerhard Tokarski

GROUP 4  
: MOPHORENETIC DESIGN



**MENTOR**

Ms. Runda Aduldejcharas  
Prof. Dr. Phillip Caston



Manlika Arong



Kerati Reecharoen



Kanjiran Lerdkompradit



Suchanat In-ampai



Wutthikrai Sanoh



Nayanika Bahia



Sarah Streng



Tim Dietrich



Patrick Spichal



Julia Seewald



Emmanouela Mygiaki



Hochschule Neubrandenburg  
University of Applied Sciences



Monfort del Rosario School of Architecture and Design, Assumption University (AAU) hosts the international workshop 2017 in topic “Hyper Bamboo | Kinetic Façade” in cooperation with Faculty of Architecture and Design, Hochschule Wismar University of Applied Sciences: Technology, Business and Design, Germany and Faculty of Landscape Sciences and Geomatics, Neubrandenburg University of Applied Sciences, Germany with an aim to deliver subject-related knowledge in creative bamboo facade design with an integration of vertical plantation to respond to the actual context.

The project successfully achieves all goals and on behalf of School of Architecture and Design, it is our honor and privilege to have you all presence in our international workshop. We highly appreciate for your participation and look forward to our solid future cooperation and prolonging relationship.

This book is published in conjunction international workshop 2017

**“Hyper Bamboo| Kinetic Façade”**

Copyright 2017 international study. All right Reserved.

<http://www.arch.au.edu/aau/internationalstudy>

publisher by Montfort del Rosario school of architecture and design. Assumption University

Author 1: Darasawin Chumee, Nithinan Krungkarnchana, Pantaree Kasampatanasuk,  
Tachat Wuthitananun

Author 2: Benjarit Nimboonchaj, Karan Paibullert, Runda Aduldejcharas, Veera Leelapattanaputi

Editor: Jaturont Boonla-or, Sanphawat Jatupatwarangkul

Organizes by Montfort del Rosario School of Architecture and Design,

Assumption University Suvamabhumi Campus

88 Moo 8 Bang Na-Trad Km. 26

Bangsaothong, Samuthprakarn

Thailand 10540

Tel +662-7232822

Fax +662-7232823

E-mail : [arch@au.edu](mailto:arch@au.edu)

Published by

E.T. Publishing Co.Ltd.

51/612 soi Ladprao 128/1

ladprao Rd.Klongchan,

Bangkapi,Bangkok,Thailand

10240

ISBN : 978-616-76953-1-0



100 pages