

ANALYSIS OF TRADITIONAL THAI PATTERN

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Abstract

Traditional Thai pattern was developed as an integral part of Thai culture and Thailand as a nation. Essentially it is inspired by nature and Buddhism beliefs and influenced by all major Asian cultures such as Indian and Chinese with some western influences as the country develops. Traditional Thai patterns are used in all aspects of Thai lives from architectural to everyday objects such as fabrics, jewelry, and ornaments. There is a strong relationship between the pattern creation and the proportions of traditional Thai architecture and what we would consider beautiful; the perception is informed and ingrained from the basis of the pattern conception methods.

Although the education of traditional Thai pattern is undocumented and no formal methods of teaching and learning other than through apprenticeship, the pattern itself is a precise art. Drawing traditional Thai pattern comes with explicit hidden rules of acceptable appearances and limitations in which it can be developed without being viewed as disrespectful or considered not authentic. This research explores this unanalyzed field of drawing by utilizing parametric tools and computer modelling to generate scripts to recreate variations of base drawings and creating patterns. Using deconstruction method on the documented drawings discovered in old masters' sketchbooks and temple murals as base for studies and comparative model which enabled different understand of traditional Thai pattern drawing methods which allow reproduction with correctness for preservation values and authenticity but at the same time, also identify rooms for reinterpretations and recreations which can make the drawing and the pattern dynamic and unique to each artist.

New applications are also possible following the new method of drawing production. The generative tools not only can draw correctly but it can also replicate flexibilities of human organic drawings. Making this art more accessible by current generations who might not be able to learn to create the pattern in traditional ways and the outfit of the new ways of production can be used in both architecture and product designs through various new fabrication technologies. The results of multiple applications can bring this ancient art into a new light of understanding and contemporary usage.

Background

Traditional Thai pattern was found in artifacts and architectural ornaments for over 1000 yearsⁱ. Throughout the years of usage, the teaching and learning from one generation to the next was done by copying. With the nature of it being traditional arts, traditional Thai drawing has seen very few morphological transformations and no real new pattern can be introduced. It has strict unspoken rules and perception of beauty which are familiar and identifiable to all Thais.

A formal recording of the drawings in the format of a book had only started in the past 40 yearsⁱⁱ. The book such as *Buddhist Art Architecture* by P.Phrombhichitr was a collection of images taken from sketchbook of masters for their design works. Some were collected by the masters themselves and some were from students who tried to add text descriptions to the methods. These descriptions are rare and are a turning point for this research project because it shows that these drawings and patterns are not random. Because the usage of traditional Thai Patterns is so wide which requires large variations for each specific usage and the nature of these books being a record of drawings, despite attempting to be descriptive in methods, the organization is not easily achieved.

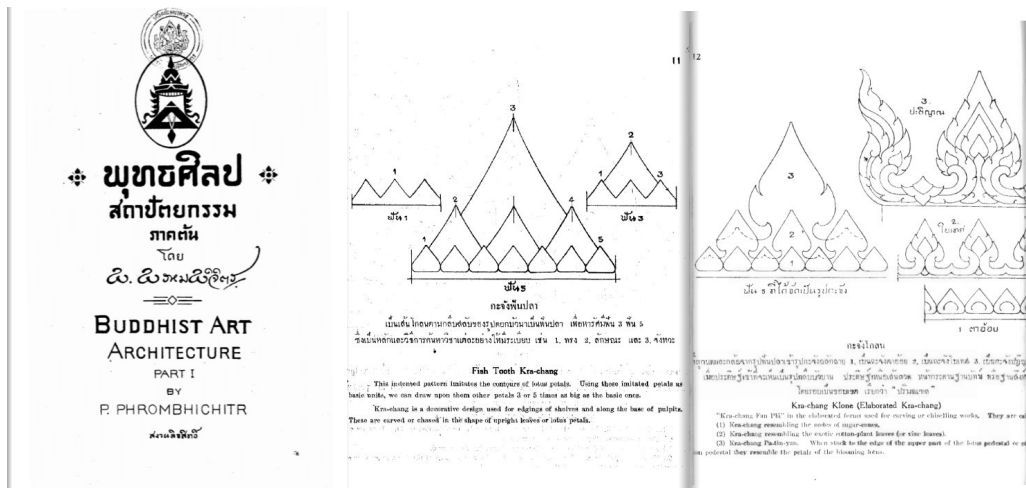


Figure 1. One of the prominent book about Thai drawing published by P.Phrombhichitr.

This lack of fixed and formal production methodology has a positive impact on forming one of the most unique characteristics of the drawing by making them highly organic and dynamic. Following the basics of the drawings such as overall outline shape and proportion, each artist would have the ability to adjust which would make a particular drawing or pattern one of a kind despite having no option for truly new designs. With this understanding in mind, the exploration of this research started first on trying to understand the hierarchy of traditional Thai drawings, the basic drawings and the making of the pattern.

Deconstruction of master's drawings

The identification of the hierarchy of the traditional Thai pattern comes from extracting the information from the masters' books and rearranging them in particular order. The composition of a pattern comes from application of base drawings, which does not have large variation of types. Each type of drawing was given a specific name. The pattern would be given specific names as well. Names can be related to its specific use such as "Bua Kwam (บัวควม)" "which means "Downward lotus" are composed of Krajung (กระจิง) base drawing and to be used at base of Buddha statue or as architectural base trims for stupa. This design is following a Buddhism belief that lotus represents wisdom and the Buddha sits on blossoming lotus as he achieved enlightenment.

There are 5 types of base drawings identified across masters' books which are Krajung (ลายแม่กระจิง), Phomkhaobin (แม่ลายพุ่มข้าวบิณฑ์), Prajumyam (แม่ลายประจายาม), Dao (แม่ลายดาว) and Kranok (แม่ลายกระหนก). The Thai name used to call these base drawings are the word means mother as they are source which give birth to patterns. Within each base drawing, there will be several variations within each type. which overall contributes to the complexity of the traditional Thai pattern.

The usage of computers in the production of architectural drawings, both two and three-dimensional, has transformed the way expressive drawings can be done and understood. With CAD drawing tools and parametric modelling, the process of drawings can be scrutinized and explained in a mathematical format which is objective from its result. Using 2-dimensional CAD drawing tool to produce the base drawings has been done previously because in the masters' books there are sections which describe parts that everyone should utilize such as methods of attaining desirable proportions. This would merely be an interchanging tool which can be used to draw. The research aims to look further into the identifying acceptable tolerance boundaries which makes any drawings considered authentic from its construction of base drawings and the choreography of base drawings to form a pattern by using masters drawings as a comparison basis.

Reconstruction and deconstruction of the Masters' drawings

With the hierarchy identified, to understand traditional Thai pattern is to be able to draw traditional Thai pattern. Each base drawing is being examined following the masters' guideline. One of the unique aspects of Thai drawings comparing to Chinese or Islamic drawings is that there are very few sections of straight line. The common techniques Thai drawing used are layering and carving. Through layering, variations can be created to a particular type of drawing and pattern. The function of carving is to create intricacy. It is a method of adding decoration to the ornament. The more carvings a particular drawing has, the more elaborate the drawing is. This tends to be influenced by the usage of the pattern because it requires higher craftsmanship to manufacture. When combining both techniques together to a drawing, millions of possibilities of drawings can be created without altering the overall structure at all.

The aim for testing is to identify the tolerance limit dimensions and values. This comes from testing the range in numbers of coordinates of each control point and identify less than 5% varies from the masters' drawing lines. The base drawings that are used in the studies are the ones that are meant to be used as decoration which will more likely be used as pattern.

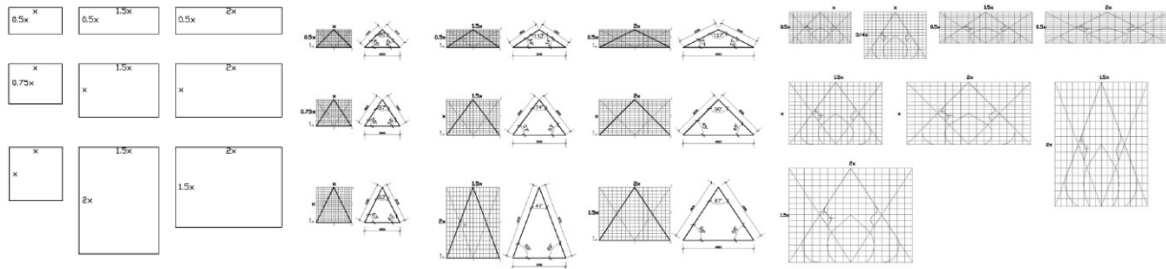


Figure 2: Example of proportional test process of a Krajung (กระจิง) base drawing.

Base Drawing 1 : Krajung (กระจิง) was inspired from a leaf or a lotus. This base drawing has a simple structure of a triangular shape that fits within a square frame which makes the drawing symmetrical on the Y-Axisⁱⁱⁱ. Layering and carving is used to create 3 major different variations of Krajung (กระจิง) drawings. This type of base drawing can be used as a stopper and a joiner when creating pattern.

Base Drawing 2 : Phomkhaobin (พุ่มข้าวบิณฑ์) is believed to be inspired by how a Thai would bring rice to give to monk and shaped it in a cone shaped from its round container or how a Thai pays respect through hand gesture. This drawing comes from triangles within a 1:2 width to length rectangle frame^{iv}. This drawing is only symmetrical on the Y-Axis.

Base Drawing 3 : Prajumyarm (ประจายาม) was inspired by flowers with 4 petals. It comes from a 45-degree rotated squares within a square frame with a round centre^v. It is symmetrical on both X and Y axis. This base drawing is also used as a stopper when creating patterns.

Base Drawing 4 : Dao (ดาว) or star is very similar to the idea of Prajumyarm(ประจายาม) which has circular shape centre. The main difference being the number and length of the triangles which forms the star effect. Dao (ดาว) base drawing has a larger circle centre than Prajumyarm(ประจายาม) and leaves small space for the triangle distributed along the circumferences of the middle circle. It is also symmetrical on X and Y axis.

| Base Drawing | Geometry/Proportion | Symmetry |
|--------------|---------------------|----------|
| | | |
| | | |
| | | |

Table 1. The overall structure of base drawings and pattern relationship

With all the base drawings, the proportions are being tested through series of drawings and the initial remake of base drawings using 2-dimensional CAD tool helped identify the minimum control points in the format of (x,y,z) coordinates. The more detailed and sensitive the numbers tested has direct influence on how the drawings can appear organic. The number of control points are usually related to the symmetrical axis each drawing is functioning on. The coordinates of control points were used to test by given +/-5% variation from the starting point. This established the tolerance limit which is a part of preservation of authenticity.

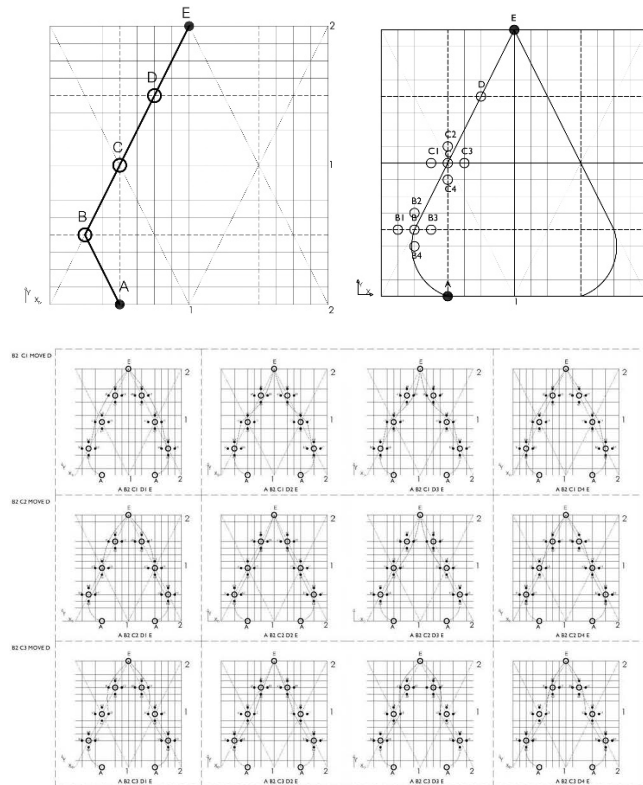


Figure 3. Example of control points testing in Krajung (กระจุ้ง) base drawings.

The interpretation of drawing methods into precise numeric formats made utilizing parametric tools possible. The scripting process is better than 2-dimensional CAD drawing as it is a dynamic model. The scripts were used in a way that it can create millions of variations of drawing. This then requires the carving and layering to be explored too. Layering is simpler as it follows the master's guide. All drawings can be layered, and the number of layering is depending on the drawing type. The act of carving is more complex. Despite the redrawing of the carving not necessarily hard, the real challenge was drawing it in a parametric format.

After testing in 2-dimensional CAD, the carving method was identified as using two of S curves at different angles. The factors in carving are width and depth of a carving. The width would be influenced by the location which the carving would take place and depth of carving had to be considerate to layering as they would occupy the same space within a base drawing. When drawing a base pattern, it is necessary that the artist consider what would be the main method as this would provide first limits. For example, if the number of carvings is considered a priority, the width and depth of carving must be informed.

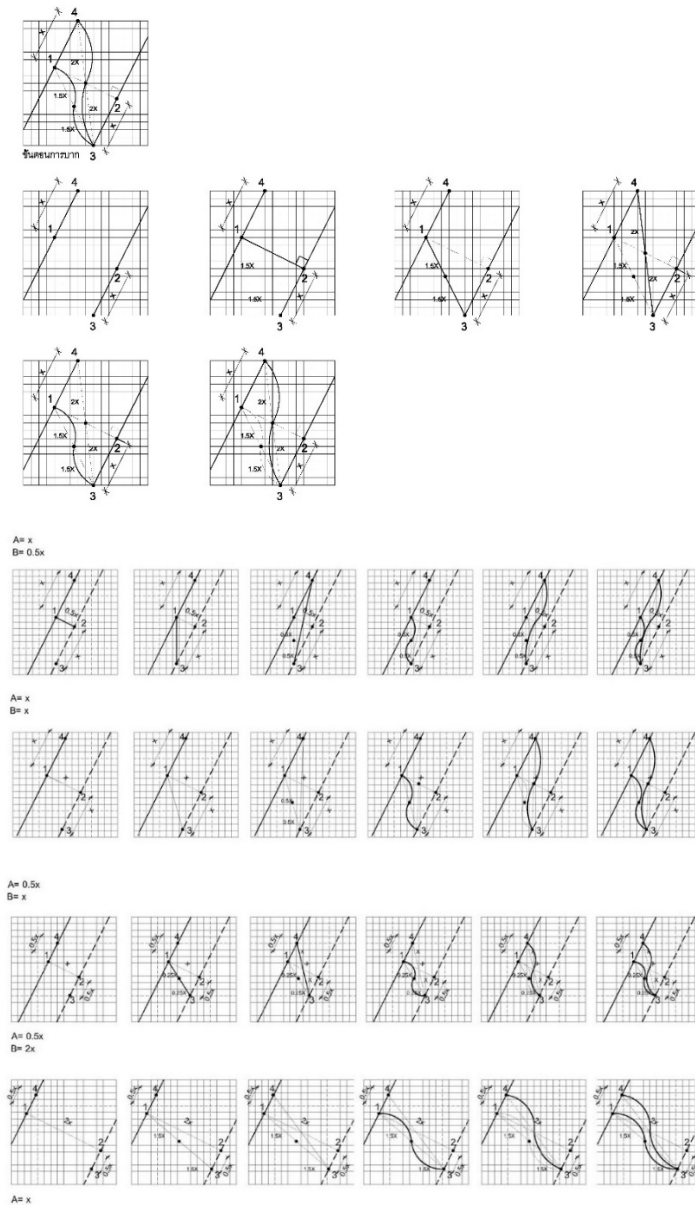


Figure 4. Example of process of carving test drawings

Pattern Making

Patterns can now be created using base drawings that were previously studied. The masters' book has recorded names for some commonly used patterns and given 4 important key consideration when creating traditional Thai pattern. Firstly, the base drawings must be properly drawn. This reflects how traditional Thai pattern has a bottom-up nature. Secondly, the pattern must have enough spacing. For traditional Thai pattern, creating a pattern comes from using combination of base drawings. Spacing is to give positive and negative space between drawings which create a sense of repetition which turns drawings into a pattern. Pattern making is using mostly layering and spacing to create the effect. Thirdly, patterns must have endless variations and possibilities. And lastly, all the base drawings must come from the same drawing category. For example, flower drawings should be used with another flower drawings when creating patterns and not to be mixed with drawings from human or animal category. Patterns which were made using parametric tools are.

Pattern 1 : Rakroi (รักร้อย)

The characteristics of this pattern are that it has a centre point and is symmetrical in both directions on X-Axis. It comprises of Prajumyarm (ประจายาม) base drawing in the centre with Krajung (กระจัดัง) base drawings overlaying on both left and right sides. The Krajung (กระจัดัง) drawings have a small percentage of overlapping each other. No frame manipulation for the base drawings is required to create this pattern.

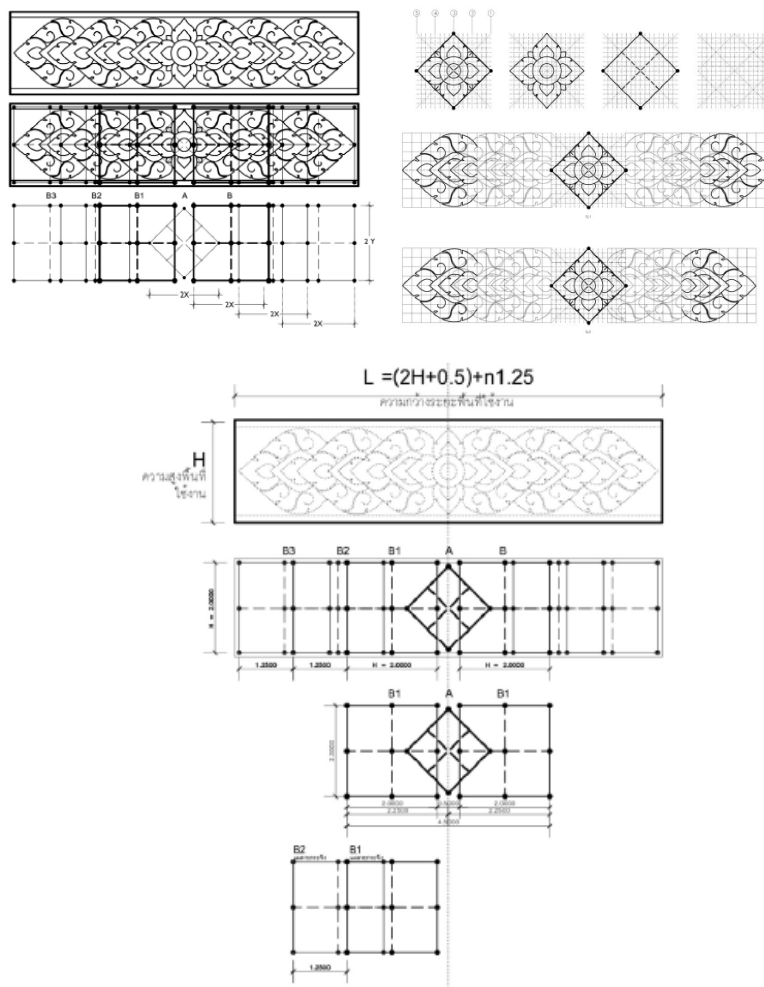


Figure 5. Analysis of structure of Rakroi (รักร้อย) pattern and testing process

Pattern 2 : Bua Kwam (บัวคว่ำ หรือ บัวหงาย)

This pattern is simple but very commonly used. The unique character of this pattern is that it can be used endlessly on X-axis making them convenient option in architectural application. Also, it has half of a drawing as edge which allows the drawing to turn 90 degrees at corner to wrap around an area, making this pattern suitable for using as base of architecture and objects. The structure of this pattern is using only layering technique. The pattern is comprised of using 3 layers of Krajung (กระจุ้ง) base drawings with the 2nd layer starting half the width of the first layer and the 3rd layer starting half the width of the 2nd layer. This is making the first layer have full visibility, the 2nd layer has half the visibility and the 3rd layer only 25% visible.

There are another 2 variations of this pattern which have the same 3 layers overlapping structure, but the base drawing Krajung (กระจุ้ง) can be stretched from 3 to 5 units or more from the typical 2-unit height. This is considered unusual as the base drawings have their own rules, but this is believed to help solve the design application issue mostly in products and fabric patterns. These can provide flexibility which requires a trim pattern to occupy longer space on Y-Axis.

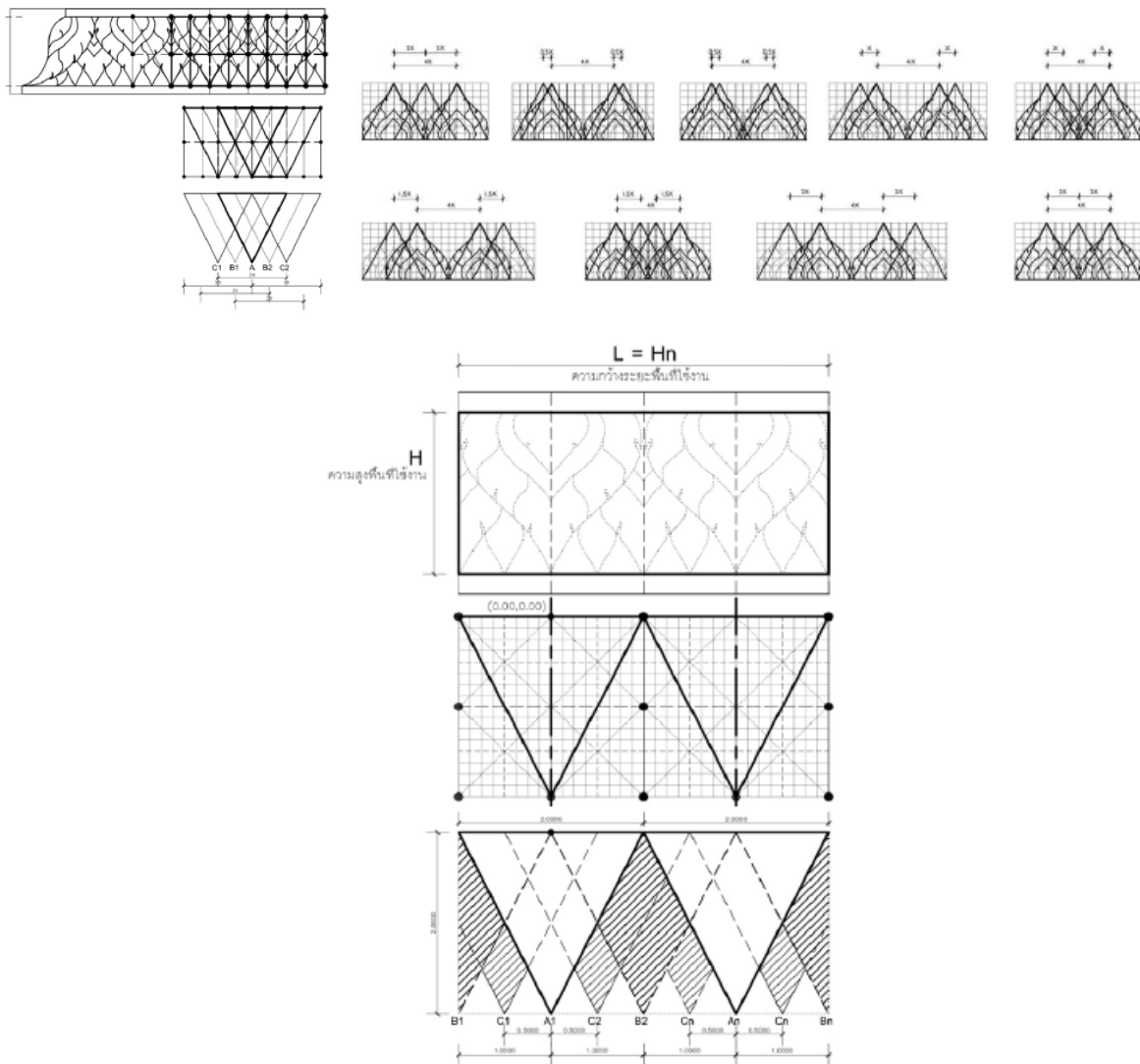


Figure 6. Analysis of structure of Bua Kwam (บัวคว่ำ หรือ บัวหงาย) pattern and testing process

Pattern 3: Na Kra Dan (หน้ากระดาน)

This is another pattern which can be used at any length due to the way it can be expanded on X-Axis. The structure is using Prajumyarm (ประจายาม) base drawing at the centre and adding 4 Kranok (กระหนก) base drawing at the centre of petal edges. This layer does not have any layering. The space between Prajumyarm (ประจายาม) base drawing is used as the structure for Kranok (กระหนก) base drawing sizes. The controlling of this space is the controlling of the pattern. At the end of the desired space, the layer can end with half a Prajumyarm (ประจายาม) flower drawing.

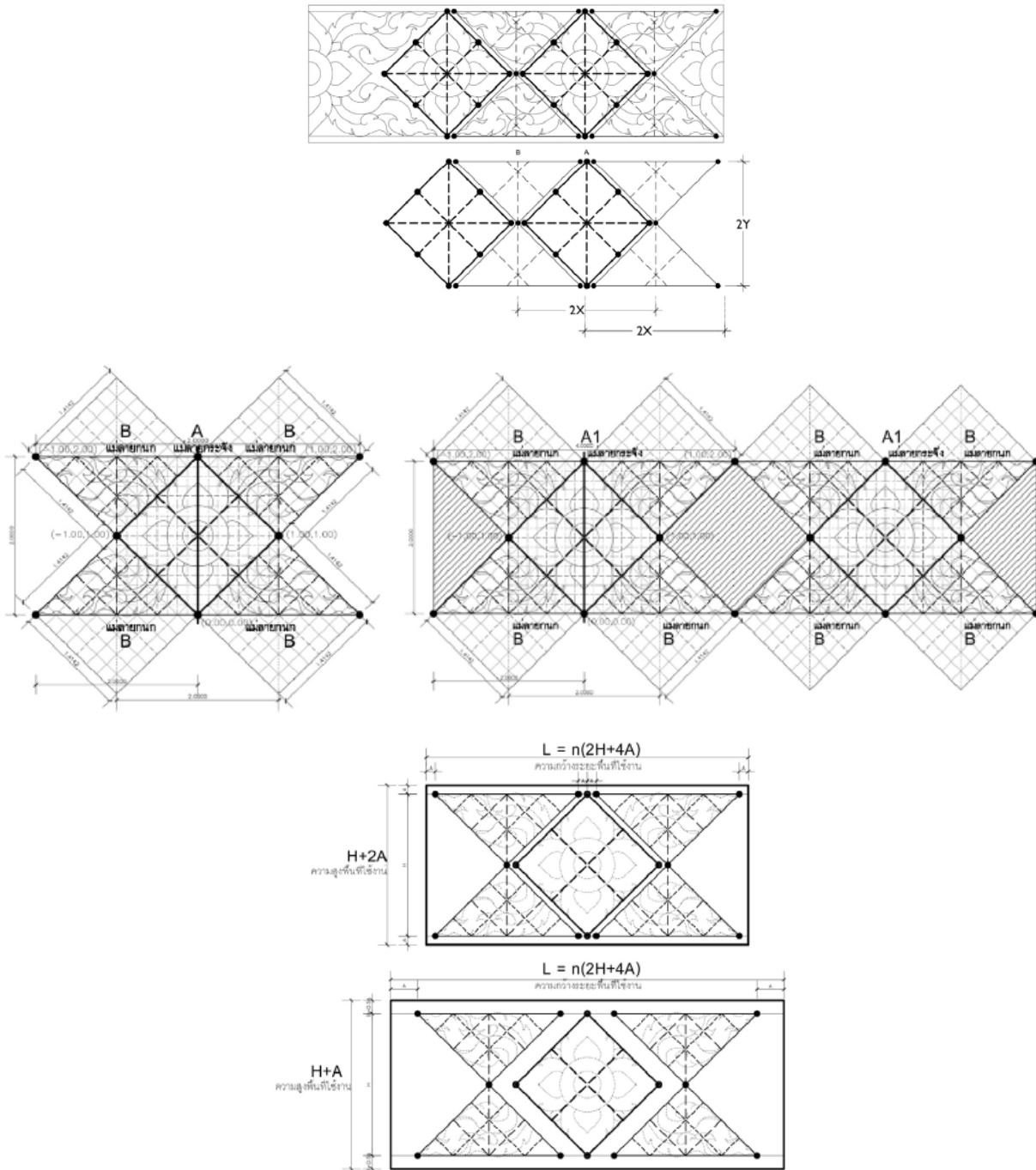


Figure 7. Analysis of structure of Na Kra Dan (หน้ากระดาน) pattern and testing process

Pattern 5: Dao (ดาว)

This pattern is commonly used as ceiling pattern for decoration in temples, it usually indicates the point where lighting fixture can be hung from the ceiling, hence the meaning star. It is using Dao base drawing to organize within square gridded space. Looking closely at the base drawing, we can identify Dao base drawing has a perfect circle shape with the Krajung (กระจัง) base drawing distributed along the circumference. As Krajung (กระจัง) base drawing has specific proportion, this indicate that the circle at the centre needs to be drawn as a Regular Convex Polygon by dividing the circumference into number of sections and using the length of each section as a fixed proportion of the Krajung (กระจัง) and might use layering technique to make the drawing more elaborate but due to the size limitation, maximum layering found is only 3 layers. Dao as a base drawing may or may not be symmetrical but Dao as a pattern is usually distributed into a rectangular gridded space. Additional decorations using smaller versions of Prajumyam (ประจํายาม) base drawing can be added in the gridded space as well to make the space appear fuller.

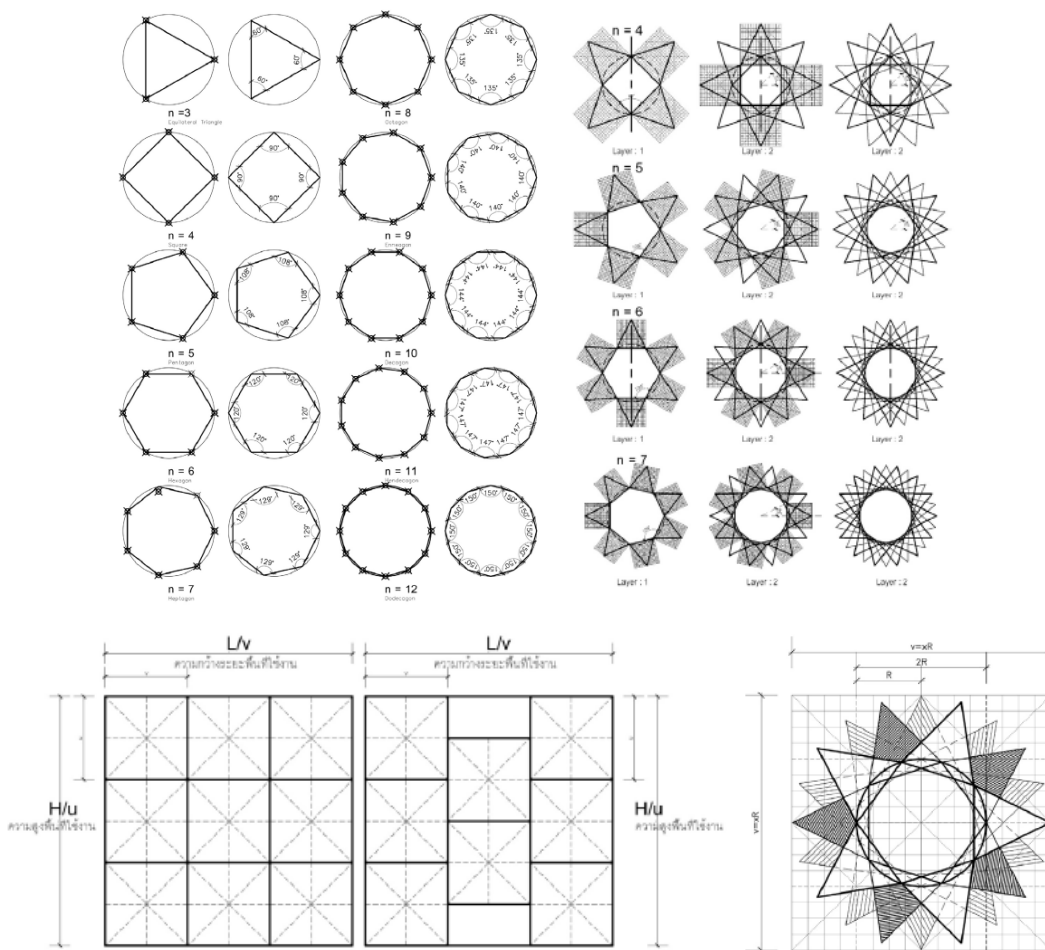


Figure 8. Analysis of structure of Dao (ดาว) pattern and testing process

Computerize the drawing.

Following an extensive experiment drawing process of all base drawings and then all the patterning, the tolerance factors were identified and giving range in 2 decimal points length. With all areas being transformed from a feeling into tangible numeric formats and has structure of relationships each other, we are able to create parametric script which redraw all base drawings and patterns and allows each user to have significant control over the designs.

Although, the drawing that can be generated might not have the full organic quality of a hand drawn drawing, but these matching of controllable parameters and decoration options can make the scripts that are flexible enough to generate countless drawings without repeating each other. The drawing generated through scripting comes out as curve lines which can be used as two-dimensional drawings or taken to be worked on further to create three-dimensional form and easily go through fabrication processes straight away whether to laser cutting, CNC milling or 2D or 3D Printing technology.

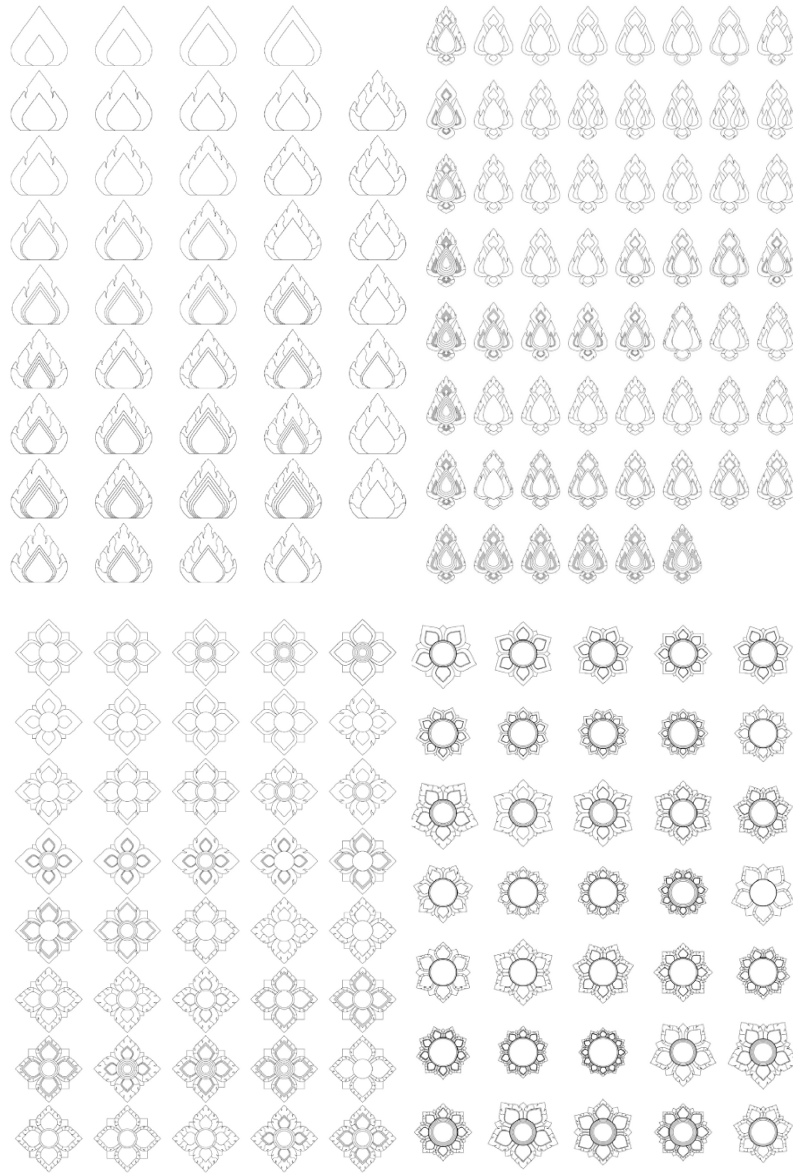


Figure 9. Example of variations created from parametrically controlled script.

After being able to see the relationships that goes in and around the drawings, more opportunities to decode was found as the base drawing has specific rules which then being applied to the rules of pattern construction which then will be relevant to where all these patterns are being used. Thai architecture has always been an expressive form with elaborated decoration. It was previously thought that the decoration of traditional Thai pattern was meaningless and meant to occupy the space but in fact, it should be further explored that the smallest cell of

decoration drawings might have effect on the architectural proportion. The bottom-up relationship which was never properly expressed.

Conclusion

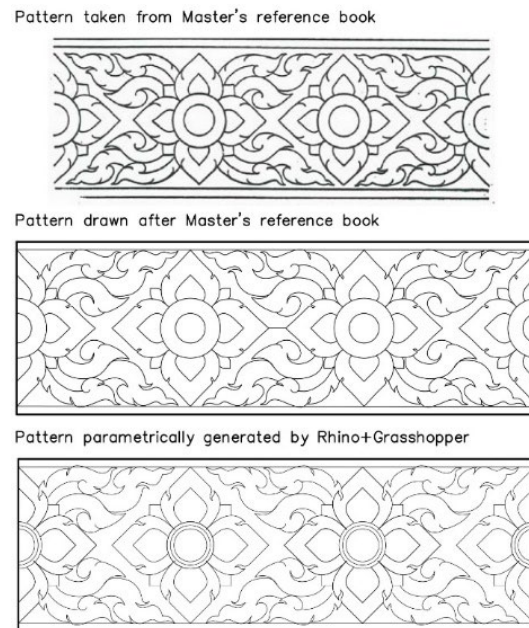


Figure 10. Comparison between generated pattern to the masters' drawing recording in book

This research aims to understand the traditional art of Thai drawing and pattern which has been used as integral part of Thai culture for thousands of years. The art was becoming estranged to modern life due to its difficulties to reconstruct. But the identified hierarchy from types of base drawings to pattern making has made it possible for decoding process which started the organizational processes and unravel the patterning structure. Through coding, the objective nature made it necessary for translation of subjective and intangible qualities into numeric formats and establishing ranges has allowed imitation of organic human drawings while maintaining authenticity to these drawings and patterns. Another important discovery is the prospect that these patterns can be one of the key aspects of designing Thai architecture. This can transform the function and value of the drawings and patterns from being decorations to becoming building blocks that shapes our aesthetic perceptions of Thai architecture which needs to be furthered investigated.

NOTES

ⁱ Leksukhum, Santi. "Thai Encyclopedia for youth: Topic 1 Thai drawing and Kranok drawing", <https://www.saranukromthai.or.th/sub/book/book.php?book=38&chap=1&page=t38-1-detail.html>. Accessed August 20,2023

ⁱⁱ P.Phrombhichitr. "Buddhist Art Architecture Part 1". (Bangkok:Prachan Publisher,1952): 9.

ⁱⁱⁱ Dhevaphinimit, Chai. "Thai drawing Book (สมุดลายไทย)". (Bangkok: Kurusapa Business Organization,1987). 1-3.

^{iv} Dhevaphinimit, Chai. "Thai drawing Book (สมุดลายไทย)". (Bangkok: Kurusapa Business Organization,1987). 10.

^v P.Phrombhichitr. "Buddhist Art Architecture Part 1". (Bangkok:Prachan Publisher,1952): 59-60.

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