REPETITION AND DIFFERENCE IN NATURE: REINTERPRETING PLANTS' PATTERN MECHANISMSTRUCTURE THROUGH INSTALLATION ART

ANNA CHIN CHUI HAN

SULTAN IDRIS EDUCATION UNIVERSITY

2022

REPETITION AND DIFFERENCE IN NATURE: REINTERPRETING PLANTS' PATTERN MECHANISM STRUCTURE THROUGH INSTALLATION ART

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DISSERTATION PRESENTED TO QUALIFY FOR A MASTER IN ARTS
(RESEARCH MODE)

FACULTY OF ART, COMPUTING AND CREATIVE INDUSTRY
SULTAN IDRIS EDUCATION UNIVERSITY

2022

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ACKNOWLEDGEMENT

Throughout the writing of this dissertation, I have received a great deal of support and assistance.

Firstly, I would like to acknowledge my supervisor, Professor Dr. Mohd Fauzi Sedon. I am grateful for his expertise and supervision that have brought me to a higher level inmy creative development, and have sharpened my analytical thinking throughout my process of completing both the dissertation and the studio art works in the final studio investigation project of my research studies.

I am truly thankful for the kind sponsorship of the Malaysian Institute of Art (MIA), an art college in which I have worked and lectured for 25 years, on my MFA research studies in UPSI. I am very grateful to the management committee and colleagues of MIA for the opportunity that they have given to me and their technical support in the accomplishment of my studio art works.

I would also like to thank Hai Kuang Packing Industries Sdn. Bhd. that has enabled me to complete the studio art works by generously sponsoring the necessary art materials, and by letting me explore and utilize their technology and facilities.

In addition, I am grateful to my family members in Sabah, church sisters and friends, for their spiritual support and prayers that have provided me with the faith and courage to solve problems and to overcome challenges throughout my research studies.

Finally, I would like to thank my daughters, Amanda Chen Kah Yee and Tiffany Chen Kah Lim, for their love and understanding; I could not have completed this dissertation without their constant encouragement and emotional support.

ABSTRACT

This research project investigated the aesthetics of plants patterning formation through the exploration of design elements and principles based on the concept of repetition and difference (similarity and variation). The research project aimed to explore the concept of repetition and difference within the context of natural plants' organic patterning mechanism and to reinterprets the phenomenon of repetition and difference as agents in unifying the element order and chaos within the plants' organic patterning system, creating a balanced and harmoniousformation. The key elements in the research project consist of organic motifs of magnification, the proportional ratio of Fibonacci, colour harmonies, rhythmic organisations and the illusions of depth. The key artists involved in this research are Yayoi Kusama, GiuliaRicci, Richard Anuazkiewicz, Andy Goldsworthy, Claude Monet, Georges Seurat, Sol LeWitt, Richard Deacon, Peter Barnitz, Albert Yonathan Setyawan, and James Turrell. The reference artworks evoke and reemphasise the importance of repetition and variation as conceptual principles that secure the overall balance and rhythm of design compositions and generate a visual impact of illusory and infinite-dimensional depths, as well as a sense of continuity. The concept of Repetition and Difference by Deleuze, Ball and Balmond, and the Colour Theory by Itten were used to contextualise the research project. A Studio Practice Method was used through critical self-reflection, studio experimentation, and contextual review approaches. The research project is contributing to the field of Fine Art and other art and design industry by establishing the collective issues and ideas with various installation approaches and technical features in art productions demonstrating creativity on the aspects of the interrelationship between repetition and difference generating harmony and unity within the complexity of plants' organic patterning formation. Furthermore, this research project would inspire new perceptions of the interactivity between repetition and difference as patterning agents applicable in many aspects of constructing forms and structures in understanding the greatness and uniqueness of nature.

PENGULANGAN DAN PERBEZAAN DALAM ALAM SEMULA JADI: PENTAFSIRAN SEMULA STRUKTUR MEKANISME CORAK TUMBUHAN MENERUSI KARYA INSTALASI

ABSTRAK

Projek penyelidikan ini mengkaji estetika pembentukan corak tumbuhan melalui penerokaan elemen dan prinsip reka bentuk berdasarkan konsep pengulangan dan perbezaan (persamaandan variasi). Projek penyelidikan ini bertujuan untuk meneroka konsep pengulangan dan perbezaan dalam konteks mekanisme corak organik tumbuhan semula jadi dan untuk mentafsir semula fenomena pengulangan dan perbezaan sebagai agen dalam menyatukan elemen susunan dan kekacauan dalam sistem corak organik tumbuhan, mewujudkan keseimbangan.dan pembentukan harmoni. Elemen utama dalam projek penyelidikan terdiri daripada magnifikasi motif organik, nisbah berkadar Fibonacci, warna harmoni, organisasi berirama dan ilusi kedalaman. Artis utama yang terlibat dalam penyelidikan ini ialah Yayoi Kusama, Giulia Ricci, Richard Anuazkiewicz, Andy Goldsworthy, Claude Monet, Georges Seurat, Sol LeWitt, Richard Deacon, Peter Barnitz, Yayoi Kusama, Albert Yonathan Setyawan, dan James Turrell. Karya-karya rujukan ini membangkitkan dan menekankan semula kepentingan pengulangan dan variasi sebagai prinsip konseptual yang menjamin keseimbangan dan irama keseluruhan dalam gubahan reka bentuk, dan menjana kesan ilusi visual dan kesan infiniti kedalaman serta rasa kesinambungan. Konsep Pengulangan dan Perbezaan oleh Deleuze, Ball dan Balmond, dan Teori Warna oleh Itten digunakan untuk mengkontekstualisasikan projek penyelidikan. Kaedah Penyelidikan Praktik Studio telah digunakan menerusi pendekatan refleksi kritikal kendiri, eksperimentasi studio dan ulasan kontekstual. Projek penyelidikan ini menyumbang kepada bidang Seni Halus dan industri seni dan reka bentuk lain dengan mewujudkan isu dan idea kolektif dengan pelbagai pendekatan karya instalasi dan ciri teknikal dalam produksi seni yang menunjukkan kreativiti pada aspek perkaitan antara pengulangan dan perbezaan yang menjana keharmonian dan perpaduan dalam kerumitan pembentukan corak organik tumbuhan.. Projek penyelidikan ini juga memberi inspirasi kepadapersepsi baharu tentang interaktiviti antara pengulangan dan perbezaan sebagai agen rekacorak yang boleh digunakan dalam pelbagai aspek pembinaan bentuk dan struktur, dalam memahami keagungan dan keunikan alam semula jadi.

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CHAPTER 1

CENTRAL ARGUMENT

1.1 Research Background

This research is to study the patterns in the natural plants world, generatingunder the ruling formation by the ideas of Repetition and Difference, within theconcept of order and changes within the plants' organic mechanism. This study will reinterpret and investigate the relationship and interrelationships between the order andrepetitive system in natural plants formation – the regularity, and the differences or changes caused by the formation, and the chaos derived from the rhythm of organic patterns.

A pattern is limitless and infinite as it is everywhere and continuous, which means that each unit of change echoes with one another, to support balance and harmonise as a whole. Patterning in nature consists of characteristics such as symmetry, spirals, fractals, chaos, flow, tessellations and so on; such beauty and structural quality can be found in all forms of plants in nature. It is a cycle of repetition

in motion, creating rhythm and balance to the system.

These organic activities of repetitive mechanism in plants demonstrate a natural phenomenon of patterning formation and transformation, which consists of various possibilities in visual elements and organizations that generate divisions and distributions of proportion. These activities promote movement and changes of unit pattern, forming “chaos” and variety in the order by working within the system of repetition in quantities and expansion to space, which generates rhythm and unity in diversity as a whole.

The aim of this study’s exploration and reinvestigation is to examine thebeauty of changes/differences found within the repetitive structure in plants organism and pattern formation. Through series of artworks in various mediums, this studio research study visually interprets the magnificent mythic completeness of the plant organism in its repetitive formation and infinite patterning. As such, this brings attention to the natural phenomenon of the relationship and activity between natureand the plants’ organic system of patterning.

In nature, there are patterns of plants mechanism found such as the Fibonacci spiral, phyllotaxis of spiral Aloe, Aloe Polyphylla, Fermat’s spiral: seed head of Sunflower, and multiple Fibonacci Spirals: Red Cabbage in cross section (Figure 1.1.1). These patterns share a phenomenon of repetition and difference that generates order and changes, regularity and chaos, simultaneously; their relationship and interrelationships allow groups of features in their own genetic organic organisation recur throughout space, units extended in space.

Figure 1.1. Examples of the Phyllotaxi plants with pattern of Fibonacci spirals and cross section. Images taken from https://clevelanddesign.com/insights/the-nature-of- design-the-fibonacci-sequence-and-the-golden-ratio/. Retrieved on 7 February 2020.

Growing plants live in a cyclic motion; regularity is the motional form of pattern, difference and chaos immerged when each repetitive unit breaks out andpossesses a slight variation between individuals among all similarities. A plant formation in nature may overall appear the same and repetitive to us; however, the chaos and changes that occur in each individual repetition is the beauty generated and integrated within the nature of regularity and repetition.

1.1.1. Rhythmic pattern – Repetitions and differences in plants organicformation

Patterns in nature, especially in most plants' mechanism structure, visual rhythm and balance, are generally accomplished by its unique arrangement of harmonious sequence or correlation of colours and other natural elements. This sense of rhythmic motion is observed to be generated through a regular order of repetitive arrangement and progressive variations of the size of a shape, its colour, value, and/or texture; as elements progress to repeat in a regular manner, figure and ground become clearly distributed, enhancing its overall visual illusion of depth and dimension.

Repetition and difference are partners in this phenomenon of patterning mechanism and sustenance system, keeping the system in unity and harmony. It is the continuity of growing gesture and movement sustaining the balance and harmonies of their livelihoods and cycles, as described by Power (1999, p. 31), "Nature is not just about objects; it is also about systems and the shifting relationship between an object and its context." The visual illusion of depth and dimension appeared to be the rhythmic movement in organic pattern which emerged when an organic form repeats inits genetic routine and order, with the smallest form increasing proportionally, multiplying the changes in each transformation and repetition.

This study is to develop a rediscovery in the phenomenon of plant organism and mechanism in the aspects of the interaction between repetition and variation which follows the proportional ratio mode of Phyllotaxis plants inherited mechanism. All curvesof growth are derivatives and produces beautiful mappings in space, colours and overall forms; this patterning formation is a formula in uniformity of repetition which allows plants to expand into space and generate in scales with each repetition and irregularity. Such geometric structural in the plant mechanism has suggested dynamic rhythm in their pattern of formation; according to Ball (2007),

> *For it has been suggested that the mathematical patterns of phyllotaxis have far more profound significance than the mere fact of spiral ordering, and that at their root lie principles that govern*
>
> *our own sense of beauty and aesthetics. Phyllotaxis has become nothing less than the justification for a geometrization of nature.*
>
> (Ball, 2007, p.233)

There is a formula for the distinct movements of dividing and mapping inspace and volume based on the natural instinctive intelligence in their growing pattern which generates a balanced progressive rhythm that repeats in the motion of radial andgradual movements, scaled under the control characteristic of the Fibonacci sequence (Figure 1.1.4), as explained by Powers (1999);

> *The proportion known as the Golden Section is encountered in many natural forms. It involves dividing a line into two parts so that the relationship between the small and large parts is the same as the relationship of the larger part to the whole.*
>
> (Powers, 1999, p. 33)

The rhythm of Phyllotaxis constructive movement of plant growth is almost geometricand mathematically constructed in patterns, based on a proportional ratio measurement called the Fibonacci. This mechanism in plants moves along with proportionateddivision and transformation of tonal colours to match; it repeats with movements to generate and regenerate, which forms chaotic equations and contains self- similar patterns of complexity with magnifications. This is known as a phenomenon of repetition and difference, as rhythmic patterning in a plant's growing system follows a mathematical ratio in their growth's proportion and scale.

The Fibonacci proportional golden radio (Figure 1.1.2) is a sequence presentedin the form of a spiral that coils outwards according to a hidden pattern of square and rectangles, which based on a numerical ratio. Each unit travels around a circle in an order, stopping at each stage and engaging with each form, then moves beyond and continues to form another cycle, scaling in proportion and rotating in a sequence.

Figure 1.2. The Golden section, the numerical ratio of the Fibonacci sequence found in the proportional golden ratio of spiral aloe. Image taken from http://www.ijmttjournal.org/2018/Volume-61/IJMTT-V61P514.pdf. Retrieved on 25 October 2019.

This natural sequence order follows the Fibonacci proportional golden radio; in which each number in the sequence is the sum of the two preceding ones, the next number would be '1' repeating the first, because there is nothing yet to add on to the first, and the third number is the sum of first and second numbers, resulted in '2', subsequently, adding the two numbers before, the sequence become 1, 1, 2, 3, 5, 8, 13, 21, 34, 55…etc. This sequence of numeric pattern is found relevant and supportive to spiral construction in plants, as Balmond (2007) has stated:

> *From a set of numbers called the 'Fibonacci' sequence this value arises, a unique property where there needs to be a measure of control and growth, repeated at different scales. Nature likes such a strategy, and not surprisingly fractals also have the same controlling characteristic, beneath their cascades of self-similar patterning.*
>
> (Balmond, 2007, p. 112)

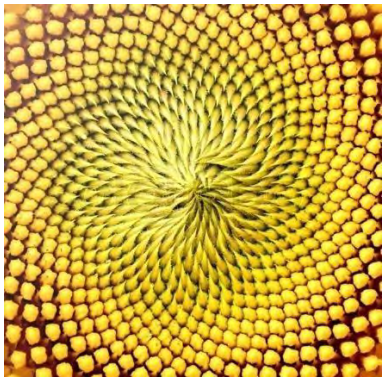

Figure 1.3. Example of Sunflower Seed disc. Image taken from https://www.colourbox.com/image/close-up-of-center-of-a-sunflower-image-16627718. Retrieved on 27 March 2020.

Fibonacci's numbering in Ferment's spiral is a formation of double sets of spirals in two different directions like the seed head of the Sunflower (Figure 1.1.3), it can be seen that multiple spirals run both clockwise and anticlockwise. These organic patterns of intersections and cross sections in the spiraling construction have displayed fascinating complexity and chaos in its uniformity, repeating its own similarities and characteristics yet manifesting irregularities in scales and colours, in divisions and proportions, as such, creating chaos in order. Among all the plants and flowers, Sunflower seed disc is the most recognized natural structural organism for this phenomenon.

Figure 1.4. An example of Fractal patterned plants and florals. Image taken from http://www.montessori-blog.org/2017/08/29/geometry-in-nature-the-fibonacci-sequence/ and https://plantsandbeyond.com/2018/01/08/fibonacci-sequence-in-nature-and-plants/. Retrieved on 18 January 2021.

Many plants and flowers (Figure 1.1.4) have a Fractal or Fibonacci number of petals which are natural growing patterns that rotate and move away from itself; the end becomes the beginning of something new, which may extend to become bigger or contract to become smaller. These petals significantly grow in radial, intersecting or cross section patterns with repetitive gradual scaling and moving outwards into the negative space, demonstrating double set of spirals in two different directions (Ferment's spiral) on its rhythmic construction, hence, enhancing the visual effects of illusory depth and spiral movements.

A rhythmic motion is generated through the regular order of repetitive arrangements and progression of 'chaos'. Along the spiral movements and progressions, these shapes are varied in sizes and patterns of interrelationship, while colours and textures may move from simplicity to complexity and from singularity to multiplicity. Colour is a factor and a dynamic element which lives and moves in the energy of rhythmic patterning; it varies in hues and tones, following its genetic order in organic form and pattern, changed and impacted by environmental and atmospheric influences, as Balmond (2007) described:

> *Colour is fed on pigment and densities, porosities, refraction indices. There are viscosities, flows that yield gradients, electrical charges which form the substrate that trigger reactions: local actionof frequency, pH value, nutrients, form the object or shape. No surprise then thatthere are self-similarities.*
>
> (Balmond, 2007, p. 155)

In this studio research project, a study on multiple Fibonacci spirals in a red cabbage cross section is very much applied (Figure 1.1.5), as it is one of the most fascinating patterns that represents the context of incredible patterning progression of self-similar formation in repetition and chaos. Besides self-similar and repetition, its construction also involves growing activities that build up shapes of immense complexity. However, under all the controlling characteristics and self-similar patterns,there is an "open-ended element, an asymmetry within symmetry" (Balmond, 2007, p. 113), which opens the most significant part of this study, the infinite changes and differences in the recurring cycles of repetition.

Figure 1.5. An example of red cabbage that generates and regenerates a self-similar patterning with complex changes in a similar fashion. Image taken from https://www.123rf.com/photo_4483977_red-cabbage.html. Retrieved on 11 August 2018.

In conclusion, the cycle of organism patterning in the construction of harmonious sequence, correlates with colours and other elements, with rhythm and balance keeping the completeness of patterning in order through the repetition and unifying of differences in the system. This pattern completeness moves in its own intrinsic formula of repetition and difference, scaling in sequenced proportion and the spiral construction, expanding to formed planes and negative space, generating gradual tones and shades of a genetic hue

All these characteristics of repetition and differences ruling in plants pattern resulted in obtaining visual illusion of dimension, depth and movement, which manifest the rhythm of order and chaos in the whole livelihood of nature. This order and chaos, in transgression, formed in cycle, an eternal return that determined the structure of a curve or within the internal and external the curve itself and elaborated thepossibilities of visual and the concept of infinity and endlessness.

1.2 Issue Statement

The pattern in nature is cycled by regularity and changes - the ruling mechanism of repetition and difference. This phenomenon has inspired people's creativity in design and contributed ideas in forming knowledge and civilizations, arts and cultures throughout human history. In this research study, the pattern of regularity and difference in the plant's organism is reinvestigated; ideas and understandings are studied on how the order and variety works in plants patterning formation to balance and to harmonize themselves in their constructive pattern of interrelationship.

Many fine artists were inspired by patterning structures in nature. They portrayed a natural pattern in various forms and expressions; some practice the concept of repetition in their artworks reflecting personal views of the natural world, and some apply repetition as the simplest principles to organise the designs in their works. These issues were brought up by artists of different creative disciplines and industries; however, in this research study, the issue of the concept of repetition and different serves as a ruling agent in the plants' patterning mechanism which becomes the focus of the studio research.

In comparison, this research project focuses on deeper aspects of repetition and difference in spiral constructive patterning of plants through generating visual illusions of depths and movements, both mathematically and simultaneously. Therefore, to further elaborate the issue of this phenomenon of difference/chaos in cooperating within the forms of repetition; the order of mathematical equation of Fibonacci is studied to support the plants self-perpetuate patterning, which is correlates with chaos and changes in visual forms of shapes, colours, structures and dimension.

This research study intends to bring impact to understand the issue of plant's various constructive mechanisms which rely on the genetic repetitive agents to keep order and chaos harmonious and unified. A body of artworks is produced by mixing various media installations to bring emphasis on the theory of repetition and difference ruling the plant's patterning nature, and the proportional sequence logic found in plant's Fibonacci as well as to support the balancing expansion of natural plants' mechanism.

In order to demonstrate the complexities and optical illusions of depth and

movement in dimensions, repetitions of motifs were displayed on various forms of repetitive manners and progresses by scaling and changing in details and colours, to represent the changes and chaos appeared in each repetition. Through multiple design approaches, the manipulation of the ideas of repetition and variation was applied on several sets of works for this study, both 2D and 3D setting; the phenomena of natural patterning of organic plants' mechanism are exhibited with visual rhythmic effects through various mediums and techniques.

In this study, artworks are produced with repetitive varied images where differences are correlated to achieve visual balance, bringing support to the research issue of repetition and difference in natural patterning. It is not only to manifest the beauty of pattern in plants genetic formation, but it is a reminder and in fact a celebration of capturing the phenomena of the plants' power to live and to sustain. It is also a path to venture and see the philosophy of the unchangeable rule of repetition keeping natural lives in balance and harmonies; in the myth of endless recurring in plant's organic patterning, each new repetitive formation was born different and unique which brings wonder and balance to the whole system.

1.3 Research Objectives

1. To identify and examine the concept of Repetition and Difference within the context of natural plants' organic patterning system.

2. To explore the Fibonacci sequence which generated constructive patterning formation in terms of fractal rotation, magnification, proportion, division, intersection and cross-section structures.

3. To explore the design principles of visual balance and rhythm of Repetition and Difference interrelationships in creating harmony within the chaotic and ever-changing

repetitive representation.

1.4 Research Questions

1. How does the concept of Difference and Repetition work within the context of natural plants' organic mechanism and patterning system?

2. How does the Fibonacci sequence generate constructive patterning formation in terms of fractal rotation, magnification, proportion, division, intersection and cross section structures?

3. How does the design principles of visual balance and rhythm of Repetition and Difference interrelationships in creating harmony within the chaotic and ever- changing repetitive representation?

1.5 Project Outline

This research project is created and constructed through a series of mixed media installations that focused on interpreting and integrating the characteristics of natural plant patterns with a specific conceptual study of repetition and difference. The studio research art practice aims to reinvestigate the idea of plant structural repetitive mechanism and the manipulation of the Fibonacci proportional formulation patterning, contrast and balance the repetitive and the complexity, to demonstrate differences/chaos and multiplying changes within the order of repetition.

The idea of repetition and variation is a constant inspiration taken from the nature by artists and designers in their creative pursuits of arts; however, in this studio research, the concept is not only borrowed but is a continuous creative development of ideas improvised following the plants' constructive patterning and colour mechanism. This studio research art practice provokes new technology and creative approaches, generating deep understanding of the design and theoretical principles on shapes, forms, proportion and colours.

Through computer-generated instrument and software such as Adobe Photoshop, this study begins with a couple of selected organic pattern unit(s) as investigating elements such as the multi-Fibonacci spiral of red cabbage in cross section and other plant's intersection structure. The designing approaches in this project include computer generated manipulation, layering, integration, juxtaposition, intersection and reconstruction of organic unit pattern(s) to generate repetitive compositions representing an up-close view of the balancing within a plant organism.

Every artwork in this research project is produced to demonstrate the idea of the patterning units in multiplication and manipulation to achieve optical illusions of depth and movement among organic patterning motifs of plants. With such notion, adjustments on shapes and sizes in terms of reduction and enlargement arefrequently applied, therefore, the ideas of repetition and chaos portrayed in the aspect of contextual visual organization, are mostly abstract and conceptual. In addition, various applications of colour schemes are included to represent interferences from natural factors such as light, time and space.

The overall artworks for this project are produced to be impactful and dynamic in terms of their scale, colours and composition, with the completion of different formats such as sets of 2D wall pieces, set of 3D relief panels and installation works. More complex finishing to magnify each of the set of work with the additional support of equipment and tools such as the light boxes, UV light setting, mirrored frame and installation space distribution, are utilised to achieve the desired completionfor this studio research study.

There are three phases for this research project:

- 1st phase: the study on fractal rotation, repetition and variability, focusing the studio investigation on position changes within massive repetitions, generating illusory visual movement as differences in repetition.
- 2nd phase: the study on proportion, division and the intersection structures, putting focus on form's scale and proportion referring to the Fibonacci sequence ratio within repetition formation, generating difference in scale and promoting balance in expansion to grow.
- 3rd phase: the study of plant's intersection and cross section structure, manifesting the interrelationship among unit motif, generate rhythm and unity, the balancing between repetition and differences.

1.6 Scope of the Study

1.6.1. The Issues

This research project is based on the aesthetic concept of the repetition and difference observed in plants self-perpetuates patterning and their rhythmic structures of repetitive formation. In this research study, reinvestigation took place to interpret the idea of regularity and difference / order and variety, as patterning formulation, keeping plants' organic constructive formation in balance and rhythmic contrast.

The study of nature has always stimulated human's artistic views and creative minds. As for this research, the beauty of patterning formation in plants mechanism conforms the principles of repetition and difference. The study does not involve any aspect or element of nature studies that leads to social issues nor supporting environmental awareness; in fact, it is solely emphasised on the phenomena of how

theconcept of repetition and variety appeared to be the major formation in the plants sustaining pattern.

Through exploration of various repetitive position, division, proportion, interrelationship and the order of a mathematical equation found in plants of Fibonacci nature, balance and rhythmic harmony are formed based on their inherent formulated growing pattern and phenomena. However, the issues raised are not viewed from the standpoint of botanical biology studies nor scientifically following the Phyllotaxy order of mathematical equation in the exact proportional ratio measurement / calculation, but rather seen from a creative point of view.

This study is to reintroduce the deeper aspects of this natural constructive patterning of plants, found in few specific plants of Fibonacci nature such as the red cabbage geometry, sunflower seed disc, and pineapple spiral rind. This artistic investigation is an important learning platform to see repetition and difference as an overall ruling phenomenon in the plants world and patterning principles that inspired and applied by artist and designers in most art forms.

1.7 Research Significant

The research project based its significance on the production of visual investigation of how the concept of Repetition and Difference is applied in the context of plants' natural mechanism patterning system. Significantly, the research has established a body of fine art productions that generates deeper understanding on the design theoretical principles in organizing forms, proportion and colours theories. This study research has enabled solutions on many aspects of compositional design principles in achieving balance, rhythm and sense of unity in creative art and design

production.

Repetition and Difference in this research project, is evidence by the natural phenomena in organic patterning, representing the constructive and infinite harmonies in nature. Previously, artists who practiced repetition, involved painters who painted the pointillism, or land-art artists / sculptors who utilised natural resources to demonstrate repetition in the environmental structural form, or the Pop art artists who styled their iconic representation in repetition as art, and the list goes on. However, this research project offers a different perspective in terms of the patterning in plants' nature involving principles of repetition and difference.

The research project established an understanding that repetition and difference are inseparable; every repetition is new and different. In this project, unit motif design is derived from natural organic form, reorganized into mass production of repetition with manipulation of difference interrelated elements such as position, colours and shapes, thus created anomaly and irregularity in the order of repetitive formation.

The research project has established the study of the relationship between repetition and difference with the multiplication and division concepts, which enables a connection among design elements progressed in proportion. The exploration of this concept has contributed to the project that enabled different pattern configurations in association with the expansion of scales and space relate to installation art context. With the basis that Repetition creates rhythm andDifference creates movement and contrast, these phenomena of patterning allowed the combination of unit designs and elements to fulfil and establish spatial rhythm and unity.

The research project has enabled mixed media exploration to represent repetition and difference; it creates possibilities for new technology and creative approaches. In combination with special tools and gadgets dealing with lights and space, repetitive designs on different surface panels and mixed medium approaches have contributed to the connection and function between repetition and difference in various creative manners.

1.8 Research Framework

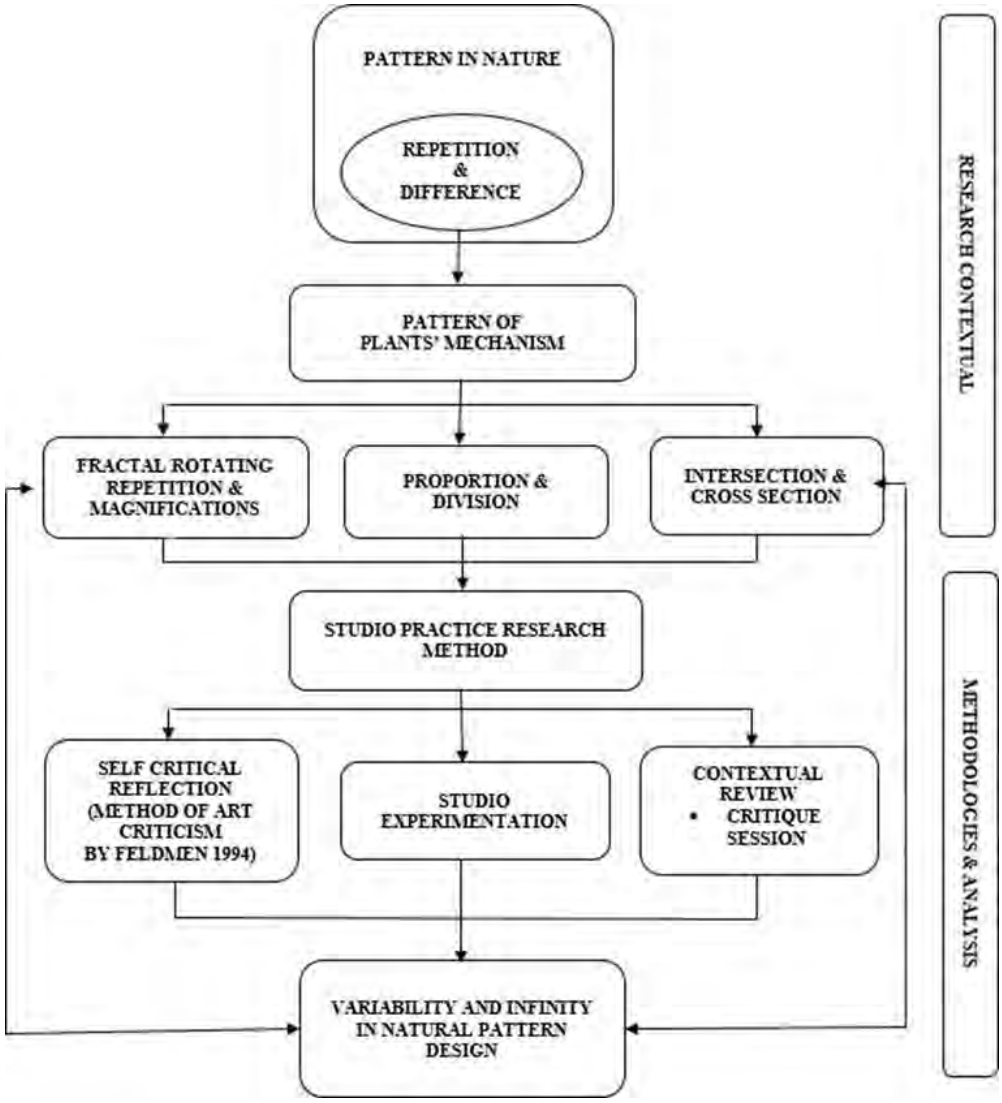

Figure 1.8.1 Research Framework

The research framework (Figure 1.8.1) is developed based on two main aspects involving research contextual and methodology and analysis. The research contextual aspects refer to the formation of the plants' patterning in nature and plant's mechanism involved in the phenomenon of repetition and chaos in the system. Two main elements that form the fundamental organic construction consisted in this patterning in nature are firstly, the Fractal plants with the spiral constructive mechanism; secondly, the patterning of plants' organic mechanism involved the elements of colours and spatial phenomena. For this aspect, three major aspects of plants' patterning is identified;they are the Fractal rotating repetition and magnifications, the proportion and division,and the intersection and cross section in plant's constructive formation.

Through this studio practice, the research is conduct based on three key aspects or elements. The first aspect is the critical self-reflection, by using the approachof Feldman's Model of Art Criticism (1994). The second aspect is to describe the context of this study through conducting a series of studio experimentation based onthe researched issues. The third aspect involves regular and continuous critic sessions, in which critical responses and point of views on artwork production are provide; these sessions involve expert reviews that are taken from professional visual practitioners and academician, who will give feedback related to the work produced forthe studio research. Towards the completion of the project, the combination of these three major aspects will come to a conclusive conceptual development that emphasises on Variability and Infinity in Natural Pattern Design.

1.9 Previous works (Subject and Idea)

The artworks that I produced were mainly paintings with acrylic on canvas, in which I was deeply inspired by artists such as Rene Magritte, Frida Khalo, Salvador Dali, George Tooker. I worked on compositions gathered by images that I observed and imagined, which I realised later that they were similar with those works that I have developed in this research project; in the context of using images of the nature and environmental background in a symbolic manner.

2008 – 2013

During this period of my art production, my affection in using natural images and issues remained solid, however, it showed more messages of family values and living environmental conditions as I have become a mother myself. I emphasised the similarities and differences of shapes between the geometry and the organic form by their nature of visual identity and characteristics. The experience in creating these paintings has led me to great interests in furthering my exposure to natural plants and floral organism and their pattern characteristics.

I worked on paintings with themes that are based on the identities cultivated from my childhood memories and family values; to bring significant meaning to this series of works, I used a side-view image/shadowy shape of my late father's facial feature to represent and symbolise the meaning of ancestral family identity and values. On the other hand, nature and landscape images have always been a part of the background in mypaintings to express the important of livelihood and the beauty of the natural world.

Figure 1.9.1. Anna Chin Chui Han, 'Toleration 1', 2011. Artist Collection

'Toleration 1', 2011 (Figure 1.9.3) symbolises the complexity of the human mind and the will in fighting to find balance and sustainability in life; I painted groups ofnatural shapes and forms such as the shell, human figure organism to symbolically represent human's desire to live, struggles in health mechanism and facing the uncertainty from the cause of nature. The curvy and organic-like image implies air to breathe, the organs to depend on to survive, and a shell in a cube shows that a protected life may be in control and in order, yet the soul within often lacks freedom.

'Toleration 3', 2011 (Figure 1.9.4) was created driven by my interest in manipulating colours and visual textures with a combination of different shapes, aimed to achieve contrast and balance simultaneously in my composition.

The rationale here is to express the condition of being in conflict yet determined to go against the odds and to survive, mentally and emotionally; in which symbolised by the chaos and harmonies between organisms (the living mechanism) and the geometry (theman-made and control). The differences between shapes of the naturals and geometries,and various dynamic colours scheme, aimed to express my emotion and state of mind while balancing the differences and the odds.

Figure 1.9.2. Anna Chin Chui Han, 'Toleration 3', 2011. Artist Collection

'The Growth Within', 2013 (Figure 1.9.5) portrayed images and formsthat symbolised the contradiction and relationship between the negative and the positive, the soft and the hard, the vulnerable and the invincible. I am alwaysfascinated by visual contrasts of the characteristics between the soft and the strong simultaneously found inorganisms and living forms.

Figure 1.9.3. Anna Chin Chui Han, 'The Growth Within', 2013. Artist Collection

In this painting, I used organic shapes to represent feminism, and applied the similarities and differences among shapes and forms to symbolically describe women's natural characteristic and mothers' fighting spirit and strength, against all odds with sacrificial and unconditional love. The liquid-like form symbolises the vulnerability and flexibility in toleration, while the geometrical and hard-edged shapes symbolise the opposite and intolerable. As a whole, it interprets the meaning of tolerating to the spirit of compromising and finding balance between order and chaos.

'Underneath Faces and Voices', 2012 (Figure 1.9.6) was produced to interpret the chaotic mental struggles condition in humanity, and to express my point of view regarding environmental health issues in the man-made environment and livelihood. This painting conveyed more ideas of contradicting visual elements to portray more complex composition in order to suggest "voices" in people's mind and souls, which

inthe painting are symbolised by the image of the tropical fruit ‘Buddha’s Hand’s twistedform and open mouth figures.

Figure 1.9.4. Anna Chin Chui Han, ‘Underneath Faces and Voices’, 2012. ArtistCollection

The images of many faces in this painting composition represent majority of the people in the society facing constant repetitive struggles against health-damaging social or living conditions. The use of the images of various organic and geometric forms is not only intended to display the beauty of structures and forms, but to further reflect a significant meaning of striving to live and sustaining against chaos and twists; physically, mentally and/or emotionally, to survive fighting against health-damaging social and living conditions.

Figure 1.9.5. Anna Chin Chui Han, 'The Breath of Love', 2011. Artist collection

'The Breath of Love', 2009 – 2011 (Figure 1.9.7) was painted based on the inspirations and influences I have had from my late father's life story and love that was rarely spoken. In this mixed medium painting, I use images of natural form like the flowers and other plants, human's figures and crow symbolise the living and mortality, while on the other hand, the man-made materialistic and building imageries represent the temporality. I brought together a contrast of opposite shapes, colours and visual textures to symbolize mixtures and the relationship between conflicts and harmonies in human lives, contradicting and balancing at the same time, harmonizing both the negative and the positive forms and structures.

In conclusion, the production of previous paintings has demonstrated immense passion in using images and shapes of organic form into visual translations of issues on personal view of spirituality and livelihood. It involves the use of image manipulation and integration of contrasting shapes and forms to achieve the objective of symbolism. The issues taken in the earlier work have opened up the idea to this current research in the context of developing the focus on organic pattern and its mechanism of patterning that led to the concept of repetition and difference; which generated rhythm and illusory of movement and depth, to represent balance and harmony.

1.10 Major Development within the Practical Research

This research is divided into three phases by producing as much as six sets of main artworks in which each phase would give a different emphasise in order to answer the research questions. Through this research, the first artwork for the first phase, namely 'The 88 Dancing Echoes', was produced in the year 2018. It began with the use of computer software Adobe Photoshop to generate image as a motif todevelop design compositions of repetition and difference.

In view of the research context of organic patterning form, this set of artworks, explains how the research context seen through the complex visual outcome; it demonstrated through multiple repetitive motifs in different movements and positions. Thus, I create 88 variations of digital printed with manual painting on 88 small canvaspanels sized 10 x 7 inches each, covering a big wall of approximately minimum sized 128 x 94 inches; hence, ensuring the overall optical illusory visual movement and the togetherness of repetition to fulfil the concept.

The second artwork for the first phase, was produced in the year 2019 – 2020, titled 'Variability in Recursion of Similarity'; a body of work which consists of three panel canvases sized 80 x 40 inches each. In this work, four individually-selected unit designs were derived from different organic microscopic motifs to create manipulative repetition. Through screen printing, each motif was printed and arranged in various overlapping ways, turned and flipped in an orderly manner, so each was different yet similar as a whole. These design units were created 450 times distributed in three panels with 150 repetitions for each panel. In addition, referring to Itten's theory of colour wheel; ,the complementary pairs and colour combinations were applied and set ascolour contrast and harmonies scheme for the three panels respectively; indicating the differences incurred in the forms of repetition where colour variation is influenced by light and space.

In the second phase of the artwork production, the theme being emphasised isto interpret the concept of division and proportional progression in size occurring inthe plants' recurring organic formation. Two artworks were produced between 2019 to2020, the '1,1,2,3,5,8,13 Continuity' and 'Reflection of the Eternal Return', to portray the research context of plants' genetic proportional division and the sense of continuous expansion in scale and colours. Materials such as the sublimation hot-press print on canvas and screen print with neon acrylic colours on canvases were applied along with agent tools such as mirrored framing and UV light projection to complete the expected visual outcome and impact.

The '1,1,2,3,5,8,13 Continuity' is completed using screen print and applying fluorescent rubber pigment with rubber dye and acrylic colours to create a striking colour visual impact on the composition design and enhancement by using UV light

projection to exaggerate the final impact of the overall view. This was done to describe the proportional enlargement that followed the Fibonacci ratio sequence in scale and space. On the other hand, the Reflection of the Eternal Return is a body of works consisting of four 3D relief pieces in a set, focusing on a series of highly saturated colour pattern composition designs, with the enhancement of a mirrored frame of 8 inches' depth framed on each canvas, creating a reflection of patterns that generate optical illusion of a continuous expansion of patterning to space.

In phase three, the fifth artwork was produced in 2020, namely 'Loops of Light Waves', delivering the idea of repetition and differences in the aspects of light and colours. By retaining some of the concepts from earlier artworks, and to maintain the togetherness of the ideas and concept, a repeated pattern design is to be reuse and manipulate into new format. This artwork consisted of four 3D relief light boxes, created using organic motifs and colour scheme design. It is later realised that using light effects in magnifying the colour designs and the feature of the patterns is an ideal method for the production.

For the work 'Loops of Light Waves', it is essential to apply digital print on translucent materials such as the acrylic sheet/Perspex, so the pattern's design can be projected by light within the light box. The colour digital print is highly saturated when printed digitally on 6mm thick acrylic sheets and laser cut to size 4 x 2 feet each to fit in to the custom-made light box. Each light box contained three pieces of printed acrylic sheets lot into the light box with accurate build-in teeth and gap to hold the three acrylic sheets which also enables them to make changes by combining with acrylic sheets in the future. Thus, all in all, four light boxes and 12 pieces of acrylic sheets were produced.

The sixth and final artwork produced in the phase three, titled ‘Intersecting of the Cycle in Motion’, was produced between 2020 -2021. This artwork is different from theearly phase because it was developed based on space and illusory movement as the main element. This artwork uses silk-like semi-transparent fabric materials printed with a special liquid chemical ink pigment which provide beautiful curves confined by liquid formation, which is a special water-based image transferring techniques similar to marbling art. The whole set of work comprised of 20 pieces of printed clothes sized 50 x 40 inches, installed in hanging setting to generate rhythmic movement and variation of inter-crossing and intersecting illusory visual outcome.

To achieve the visualized illusory effects of rhythmic motion in space with the circular pattern representing the spiral intersecting formation, it is essential to produce a set of hanging overlapping installation of the display of lights surrounded the hanging installation in the exhibition space to assist on the reflection of crossing shadows and images. This visual outcome also gives the impression that the intersecting patterns appeared in the illusory crossing images and shadows setting showed limitless motions and dimensions incurring and recurring within the cycle of each repetition in transgression.

In conclusion, the production of works for this research is an adaptation of observation on phenomenon of fundamental concept of repetition and differences, governing the patterning mechanism of plants, generating endless returns to the cycles ofnatural livelihood and progression in the aspect of visual interpretation of shapes and colours, space and dimension, rhythms and movement, illusory depth and intersecting interrelationship among forms.