# Leaf exploration: Visual Element through Natural Resources; Khao Nam Khang National Park, Thailand

## งานวิจัยเชิงสร้างสรรค์ผ่านการศึกษาใบไม้จากอุทยานแห่งชาติเขาน้ำค้าง อำเภอนาทวี จังหวัดสงขลา ประเทศไทย[*]

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## Abstract

Located in the south of Thailand, there hides a quiet and peaceful tropical rain forest called 'Khao Nam Khang National Park'. The 220 square kilometers national park holds plenty of conserved plant and important woods that sustain the balance in the environment. The area served as the Malayan Communist fighters' hideout during the 40 years of political insurgency between Thai government and the Communist Party of Malaya. With that reason, the area was almost abandoned from the outside world. It was somehow benefit to the biodiversity of flora and fauna that wait for the natural exploration. Aiming to explore the beauty of nature, the research has applied visual elements from "Leaf" together with fundamental of L-system and Fibonacci theory. Although "Leaf" is a small element, it can represent trees in the forest. It also demonstrates a small universe about life and beauty. Furthermore, leaf is able to tell us about climate change, seasons and ecology. Visual elements, occurred in leaves, are able to tell us about life nourishing and growing. The purpose of this research is to collect data from leaf which composes of visual elements such as shape, form, colour and vein's pattern to decode and use in visual communication design system. All elements showed on leaf can be developed and applied in many design fields. Referring to the purposes of the research, it targets to assemble data collection for the

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designers to employ in their careers and provoke their concern and awareness about climate change as well as the benefit of forest through story telling (Illustration).

**Keywords:** National Park, Leaf, Visual, Communication Design, Illustration

**บทคัดย่อ**

บทความนี้มุ่งเน้นการศึกษาวิจัยในพื้นที่อุทยานแห่งชาติเขาน้ำค้าง อ.นาทวี จ.สงขลา ซึ่งเป็นพื้นที่ป่าที่อุดมสมบูรณ์ไปด้วยพืชพรรณ และไม้อนุรักษ์ รวมทั้งพื้นที่แห่งนี้ยังมีประวัติศาสตร์ด้านการเมืองและการปกครองมาอย่างยาวนาน โดยในสมัยก่อนนั้นมีการต่อสู้ระหว่างรัฐบาลไทยและกลุ่มโจรคอมมิวนิสต์ (Malayan Communist) โดยการต่อสู้นี้กินเวลายาวนานถึง 40 ปี ทำให้พื้นที่แห่งนี้ต้องถูกปิดไป ซึ่งในตอนหลังรัฐบาลเห็นว่าพื้นที่แห่งนี้เต็มไปด้วยพรรณไม้ ทั้งพืชเศรษฐกิจและพืชหายาก จึงจัดให้พื้นที่นี้เป็นพื้นที่อุทยานแห่งชาติ

งานวิจัยชิ้นนี้ไม่เพียงแต่เป็นการศึกษาและวิจัยเกี่ยวกับพื้นที่ป่าเท่านั้น แต่ยังรวมไปถึงการรณรงค์ในเรื่องของการอนุรักษ์และความเปลี่ยนแปลงของสภาพภูมิอากาศโลก (Climate Change) ผ่านการศึกษาวิจัย "ใบไม้" ในพื้นที่ป่าแห่งนี้ โดยงานวิจัยชิ้นนี้เป็นงานวิจัยเชิงสร้างสรรค์ที่ผนวกองค์ความรู้ในเรื่อง ทฤษฎี L - system และ Fibonacci เข้ากับงานออกแบบ

"ใบไม้" เป็นหน่วยที่เล็กมากหากเทียบกับพื้นที่ป่าทั้งหมด แต่ใบไม้เป็นองค์ประกอบสำคัญของต้นไม้ และเป็นสิ่งที่สะท้อนการเปลี่ยนแปลงของสภาพภูมิอากาศอย่างเห็นได้ชัด ผันเปลี่ยนไปตามฤดูกาล และเป็นองค์ประกอบสำคัญของระบบนิเวศน์ ทั้งเป็นอาหารของสัตว์ ให้ร่มเงา และดูดซับสารพิษในอากาศ ใบไม้จึงเป็นตัวแทนของธรรมชาติที่สามารถเห็นและจับต้องได้ การศึกษาวิจัยมุ่งเน้นการถอดรหัสธรรมชาติ จากองค์ประกอบของการมองเห็นด้วยตาเปล่า (Visual Elements) เช่น รูปร่าง รูปทรง ก้านใบ เส้นหล่อเลี้ยงใบ รวมไปถึงสีสัน และลวดลายที่เห็นได้ บันทึกและรวบรวมเป็นข้อมูลพื้นฐาน (Data Collection) ซึ่งข้อมูลพื้นฐานนี้จะถูกนำไปต่อยอดและพัฒนาเข้ากับการออกแบบสื่อสาร และงานภาพประกอบ เพื่อถ่ายทอดเรื่องราวของความสำคัญของป่าไม้ และการอยู่ร่วมกันระหว่างคนกับป่า การสร้างความสมดุลของระบบนิเวศน์ รวมทั้งการปลูกฝังให้เยาวชนและบุคคลทั่วไป องค์กรของรัฐ และเอกชน หันมาให้ความสนใจในเรื่องของการอนุรักษ์ธรรมชาติและป่าไม้มากยิ่งขึ้น

**คำสำคัญ:** อุทยานแห่งชาติ ใบไม้ การออกแบบสื่อสาร ภาพประกอบ

## Introduction

The aims of research are focus on collect the data collection from leaves in Khao-Nam-Khang National Park area where located in the south of Thailand where is plenty of plants, economic plants and conserved plant. The research tries to explore the area and investigate the plants especially on leaves.

About the Khao-Nam-Khang National Park area is abandoned from the outside for so long due with political issue. That is why this area is hidden from the world and full of floral and fauna to discover. Thus, the 220 square kilometers national park is enormous area where a small village is located surround the forest. Local people in the area learn to live with the nature, some of them collect herbs to make a medicine and some of them just visit the national park for relaxing.
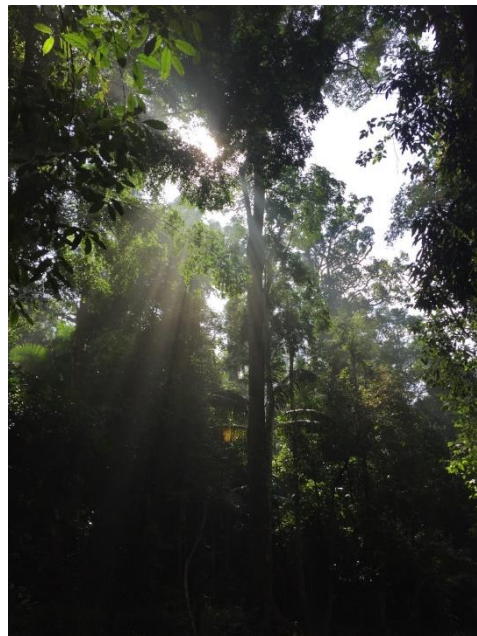


Figure 1 Environment in National Park. Source: Research area.

"Leaves" are the main specific thing in the research since we can easily reach it and it is ordinary thing in human life. We can find leaves almost everywhere in diary life nevertheless its could acknowledge us about the power of nature. The research intends to collect the visual elements from leaves and analysis the data from it such as shape, branch and vein include other elements like colour and texture.

Figure 2 Collection of leaves from Khao Nam Khang National Park. Source: Research area.

The scope of studying not only focus on leaves likewise concern about climate change and environment through a visual communication design. If we examine the problem about climate change nowadays, we found some many researches which demonstrate about the climate change and show the data about how much forest decreased. According to case study from many organization campaigns which promote the concept about climate change and how we can save our forest. For example, the campaign from Trumpforest.com which promote the campaign against US President Donald Trump since he didn't except about the climate change issue. They have contributed a campaign on the website by invite people around the world plant a tree and name it as a Donald Trump. This case study is the way which we can use visual communication design and digital media platform to attach people. Moreover, the national park organization is important player in this particular concept. A case study from Grey New York showcases sites like the Statue of Liberty, Alcatraz and Little Rock Central High School which launched project calls "PARK" to represent the connection between historic place with young people. The campaign promotes ads urge visitors to remember "parks aren't just about respecting nature's diversity. They're also about respect for all people."

In term of practical research, the research combines studying between Design in 2 dimensional with 3 dimensional. Besides, the research applies fundamental theory; L-system and Fibonacci.

L-system is the normally mention as a tool to create model plant growth and used to produce complex image such as fractal object by using a computer program. The research emphasis to use fundamental knowledge of L-system to understand the tree's form and how it grows. It could lead us to predict the shape and form of the tree.
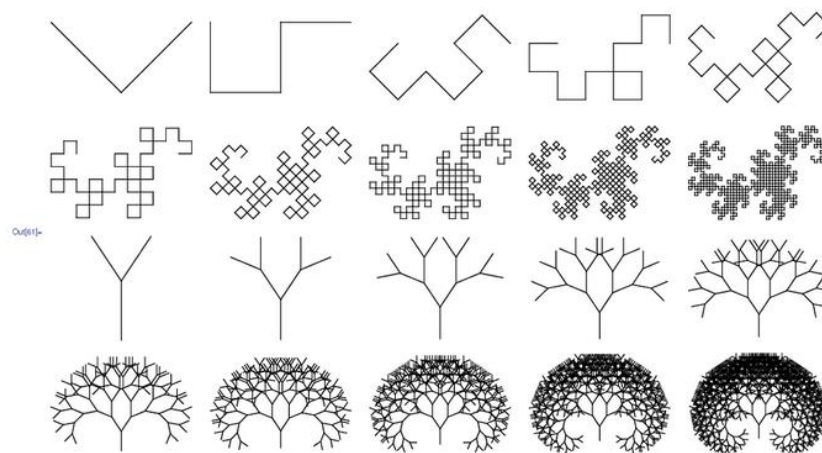


Figure 3 The elements from L-system analysis. Source: reference from internet.

Fibonacci is a sequence number which is a set of numbers that starts with a one or a zero, followed by a one, and proceeds based on the rule that each number (called a Fibonacci number) is equal to the sum of the preceding two numbers. Fibonacci numbers was used to explain the phenomenon in the nature such as branching pattern, leaves. Some biologist and physicists are interested in Fibonacci number since they used to explore the various natural objects.
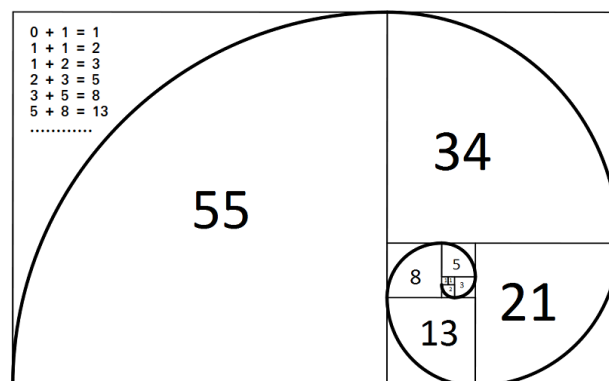
Figure 4 Fibonacci sequence Source: Reference from internet.

These two theories were used to experiment in the art and design works. The experiment in the research starts by using these two theories or knowledge to explore the possibility to create the art and design works which combine two dimensional such as illustration and graphic design with three dimensional like 3D structure and 3D printing to set up in the space. It could be installing and let people to participate with the art and design piece.

Furthermore, the experiment conveys the ideal of coexistence between human and nature also city and forest. There is a concept of balance in the middle of space for example, Khao-Nam-Khang national park area where surround with small village. People who live close to the forest, they respect the nature and understand the significant of nature. That is mean two areas have balance. In the other hands, people who live in big city face the pollution problem since the green area is not enough for absorb carbon dioxide. Approximately 1.6 billion people depend on forest for their livelihoods (United Nation, 2015, p.1) following from the sentence is forest provide the human with many essential ecosystem services like food and Agriculture. The main topics which forest involve with is 3 different topics.

1.  Environmental: Forest can decrease the risk of natural disasters such as protect runoff and water flows. In the higher-level forest can prevent climate change.

2.  Social: Human and forest depend on each other. Moreover 300 million people live in the forest and including 60 million indigenous people (United Nation, 2015). Furthermore, forest could reduce the stress for human and removing some local pollution. Forest can provide food for animal and human.

3. Economic: The importance thing for economic value to contribute to a country's GDP is the forest sector contributes approximately 0.9% of global GDP, and it provide opportunities for over 50 million people to get a job worldwide.

| Air quality | Forests absorb toxic pollutants such as ozone, $SO_2$, and $NO_2$. |
|---|---|
| Carbon sequestration | Trees absorb and sequester $CO_2$ from the atmosphere through photosynthesis. However, the carbon that trees store is emitted into the atmosphere when they are burned or decompose. |
| Natural disaster | Deforestation or poor management can increase flooding, landslides, and soil erosion. |
| Pollination | Forests provide food and shelter for pollinators, such as bees, birds, and bats. Pollinators in a forest increase the levels of pollination which thus encourages the regrowth of trees. |
| Soil erosion | Vegetation cover, such as canopy structure and tree spacing, stops soil erosion through nitrogen fixation among other processes. |
| Wastewater | The root structures of trees aid wastewater treatment, reducing the potential risk of disease due to inadequate drinking water and sanitation (Herrera et al., 2017). |
| Water resources | Forests protect water resources and impact the quantity of water supplied through soil erosion and runoff prevention. |

Figure 5 The table show the significant of forest. Source: Food and Agriculture Organization of the United Nations, 2016; Hansen et al., 2013.

In addition, in UK, the huge project names 'The queen's Commonwealth Canopy (QCC)' started with a conversation about the weather between Her Majesty Queen Elizabeth II and her guest, Sir David Attenborough in the private garden of Buckingham Palace. This project was encompassed by a third of the world's total population to increase the awareness of threats. Including the idea of exchange knowledge and research by create the platform for the project. This project is international case study which reflect the significant of forest conservative across the world, more than 42 countries committed to join and participate included countries in the Asia such as Singapore and Malaysia. Unfortunately, Thailand is not involving in this project.

A research of Model of Area-Base Learning Experience for Enhancing Environmental Consciousness of Student in Maemoh Mine Community, Lampang Province. There is a huge mine community in the north of Thailand which has issued between Thai government and local community about the effect of pollution. In this case study, examine the problem that occurred in the area and consequence to people's health. The findings found that the learning experience has created model of area-based learning experiences called 3P ( PAOR ) and using learning experiences encouraging students the environmental conservation behaviors was at the highest level in water conservation, cleanliness and maintenance of green areas, good citizenship at the highest level. Addition the environmental conservation behaviors of students was at the high level in the energy conservation, waste management and cultural awareness at the high level. ( Charin Mangkhang, Chettapoom Wannapaisan, Chainarong Jarupongpattana, Chayanid Yimsawat, Chatchawal Buttong, 2560 ). That is the good starting point of strong community which started to fight for their life and environment. Also, the benefit of case study was cultivated young generation to learn to save the planet and forest.

In the other hands, green space in Bangkok, Thailand is not enough. The case study from research topic 'Design Guidelines for Recreation Area of Romklao Kallapruek Park in Khon Kaen University ( 2015 )' the research focus on relationship between people and activities in the park. The other big issue of bad pollution in the big city nowadays is not enough park if we compare with buildings and cars. The case study examines the way to improve the space and make people more participate with the park. From the studying all researches case study show that the people in Thailand concerned about the pollution in low level especially about climate change which seems the things that were close to home, but people just ignore it.

In conclusion, the research goal is to examine and convey the significant of forest by using art and design platform to support the ideal of create the awareness to people especially focus on environment, ecosystem and climate change to young generation.

**Research Objective**

1. To establish the significant of nature and climate change issue from studying elements of leaves.

2. To collect and analysis visual elements of leaves as a data collection.

3. To create art and design platform from visual elements of leaves.

4. To reflect the benefit of forest conservative for people.

**Research and design processes**

      **1.** Research the national park area with forest officer. Collect the data by taking a photograph and video also mark the location of the conserved and economic trees.
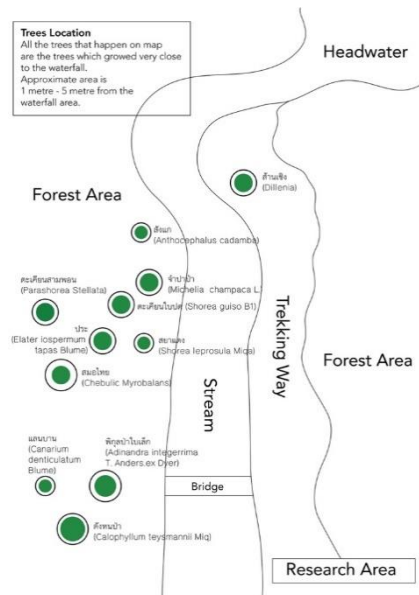


Figure 1: Conserve plants in the national park. Source: Create by illustrator program.

      2. Collect the data from the area.

      After research in the national park area many times. The research aims to specific to study on leaves element by photograph and decode visual element from the leaf. Some of leaves were turned to dry by use herbarium techniques and some of them were recorded by photograph with light box. In addition, the data was collected with hand drawing and put into the paper.



Figure 2 Conserve plants in the national park. Source: the hand drawing from leaves collection.

3. Decode the visual elements from leaves.

In this research aims to navigate the visual elements which appear on leaves. This is technical part which involve graphic program such as Illustrator and Photoshop to interpret with the data.
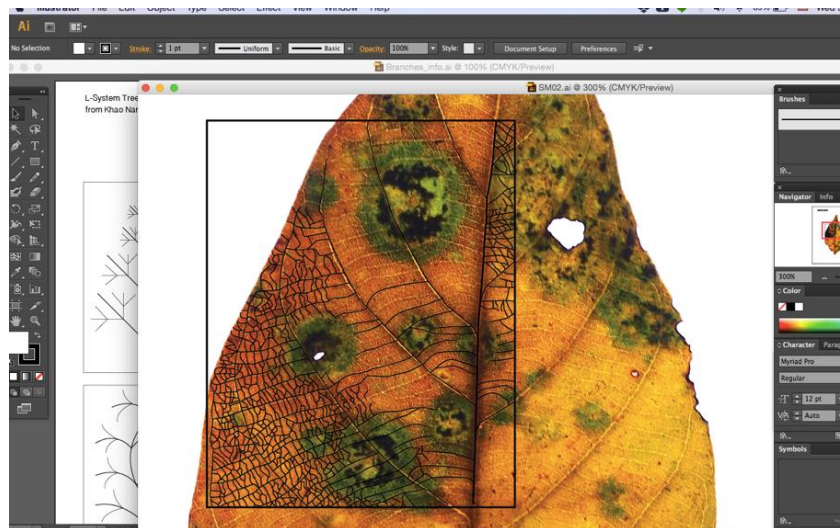


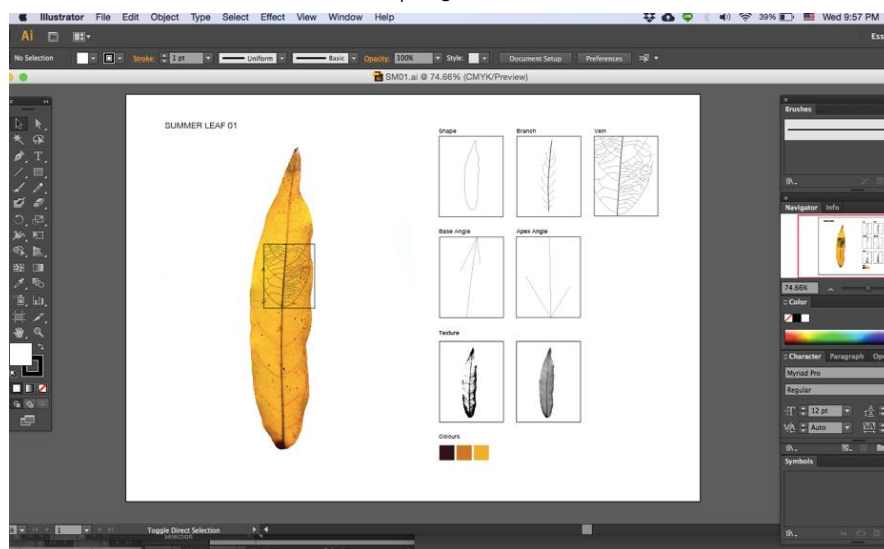Figure 3 Decode the leaf's vain by use illustrator program. Source: capture from illustrator program.



Figure 4 Decode the leaf's vain by use illustrator program. Source: capture from illustrator program.

**Tree's branches with L-system.**

The L-system could apply into the visual communication design. Especially, L-system represents about tree's growth, shape and form. This part are the part which show the experiment which L-system imply with visual elements.
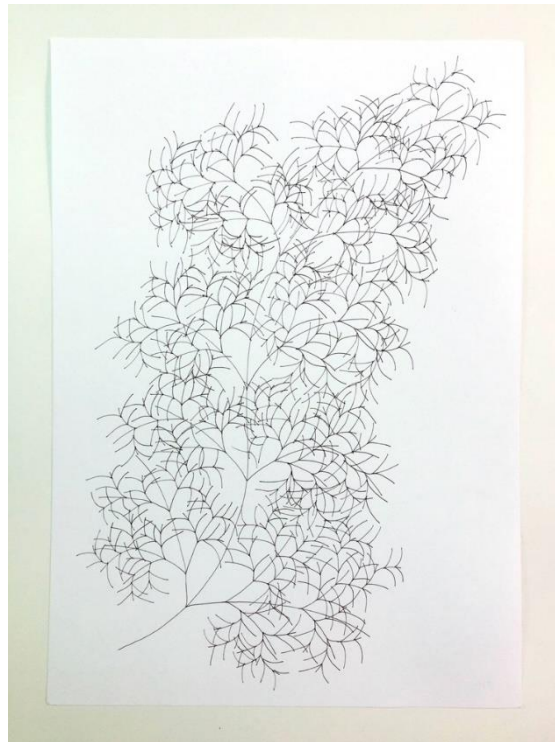


Figure 5 Experiment with L-system to create plant structure. Source:  Drawing from the design processes.

4. Experiment and apply to create storytelling

This part of research is experimentation with the data to apply on illustration. The visual element from leaves are delicate and has their own characteristic. There is plenty of lines and space which appear inside a leaf. The experiment keen on to reflect the story telling in 2 seasons.

Working Processes and Applying.

The work shows visual elements of leaf. The vein was applied in the drawing as a delicate lines and storytelling. The leaf's shape was used to created a space in the drawing.

Figure 6 Apply the data collection to create storytelling and illustration. Source:  Artwork from the design processes.
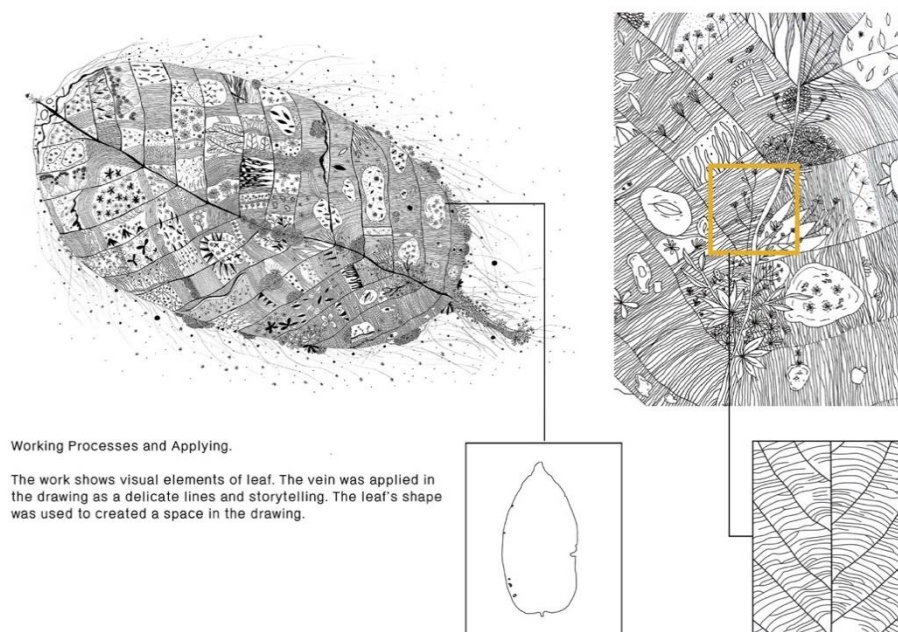


Working Processes and Applying.

The work shows visual elements of leaf. The vein was applied in the drawing as a delicate lines and storytelling. The leaf's shape was used to created a space in the drawing.

Figure 7 Apply the data collection to create storytelling and illustration. Source:  Artwork from the design processes.
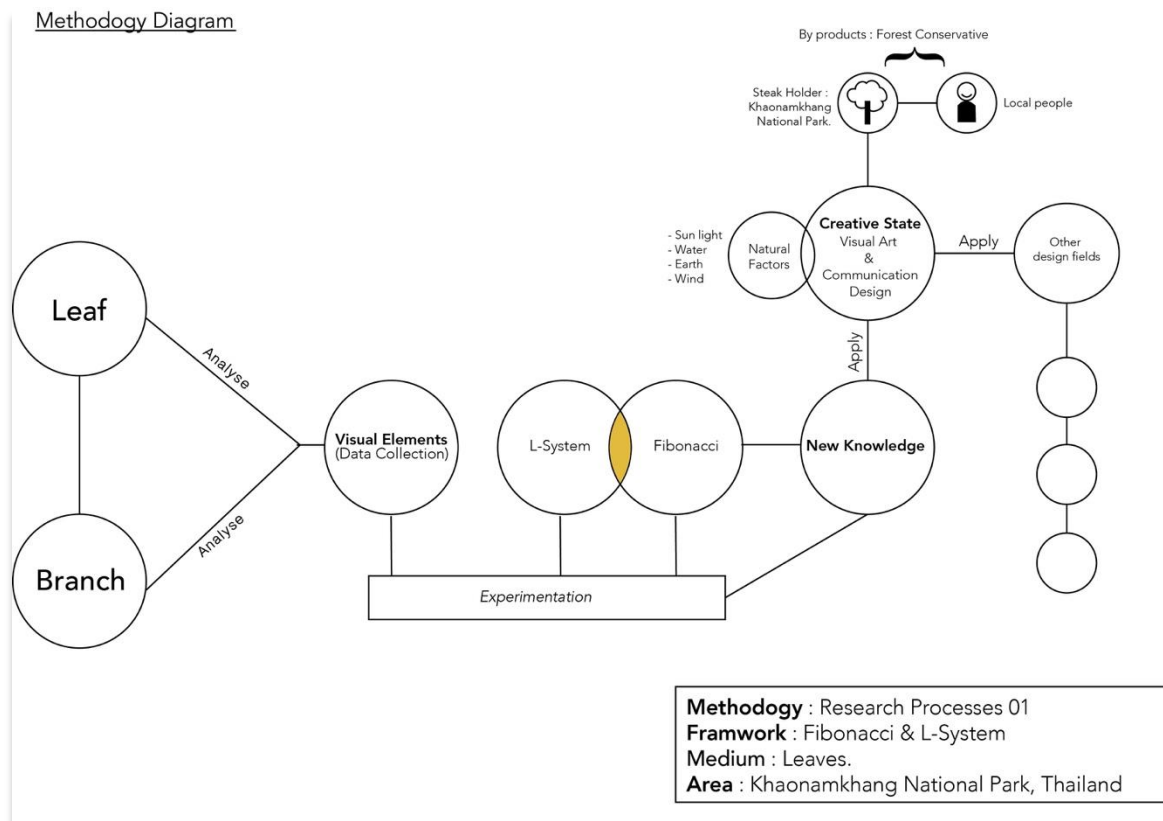
**Methodology**



Figure 8 Diagram of methodology in the research.

Research methodology focus on experiment with L-system and Fibonacci to get a new knowledge and apply in creative platform. The studying begins by observe the area and chose the specific things to study. The theory will be used to experiment with visual elements to get a new knowledge and it could be apply in visual communication design or visual art. The art and design platform could participate with the people and let people to get involve within the processes of design. The benefit of the last result contributes the awareness to people about climate change, eco system and forest conservative.

**The result of research.**

The researcher found lots of visual elements from leaves and collected it as a data collection guide book. The data collection contains the information of elements such as shape, form, vain, texture and colour. The vain of leaves were used to experiment to create the story telling and illustration to represent the seasons in the south of Thailand. The story telling and lines inside the illustration come from leaf's vain to create the space. The new

knowledge comes from the way that researcher try to apply L-system and Fibonacci into the blank space. The data collection encompasses almost 50 leaves which artist and designer could use as some fundamental elements to continue in their design.

The visual elements are not just only representing the nature since there is a data which convey the small detail of eco system. A leaf could represent the season and leaf's vain also convey the story about connection. To continue the research in the future, the researcher would be developing the idea of using data collection of leaves mainly focus on leaf's vain to combine with L-system and Fibonacci. The result could represent in the art and design platform like exhibition and encompass with architect or designer to create the artwork which indicate the awareness to people. It could develop to be a campaign which approach to community and local people to join or participate in the exhibition. In addition, technology such as 3D printing and digital media could be implying in each processes of design.
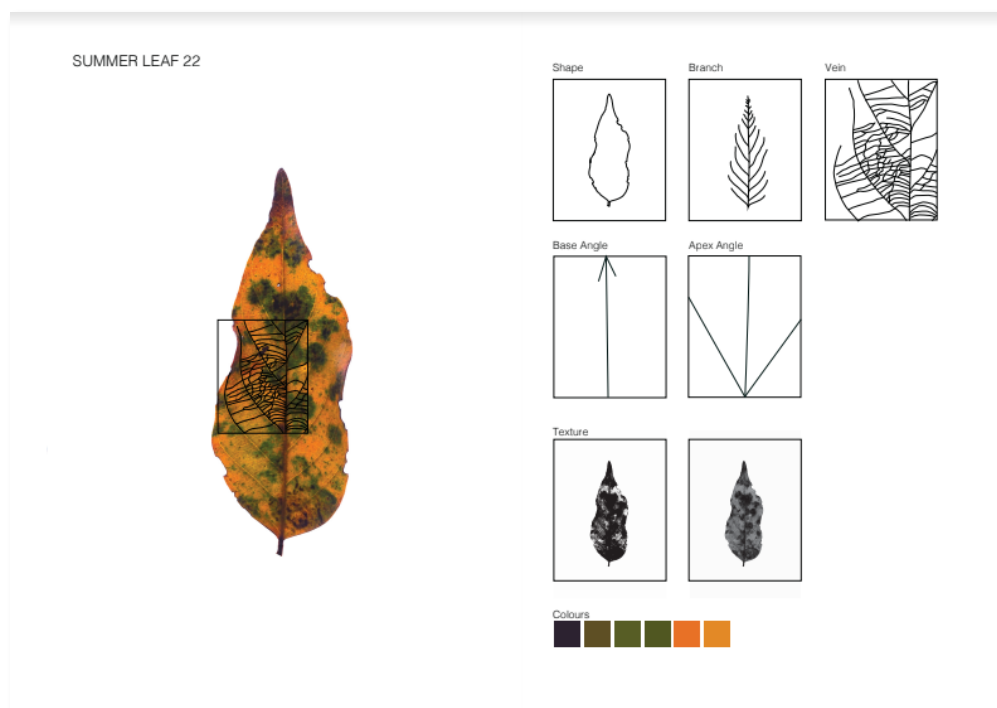


Figure 9 Example of visual element of leaf from summer season.

9.1 Visual element of leaf shows a data collection which contain shape, branch and vain. Also, there is a base angle of branch and texture. Colour in the data show the different shade of colour which occur in each leaf.
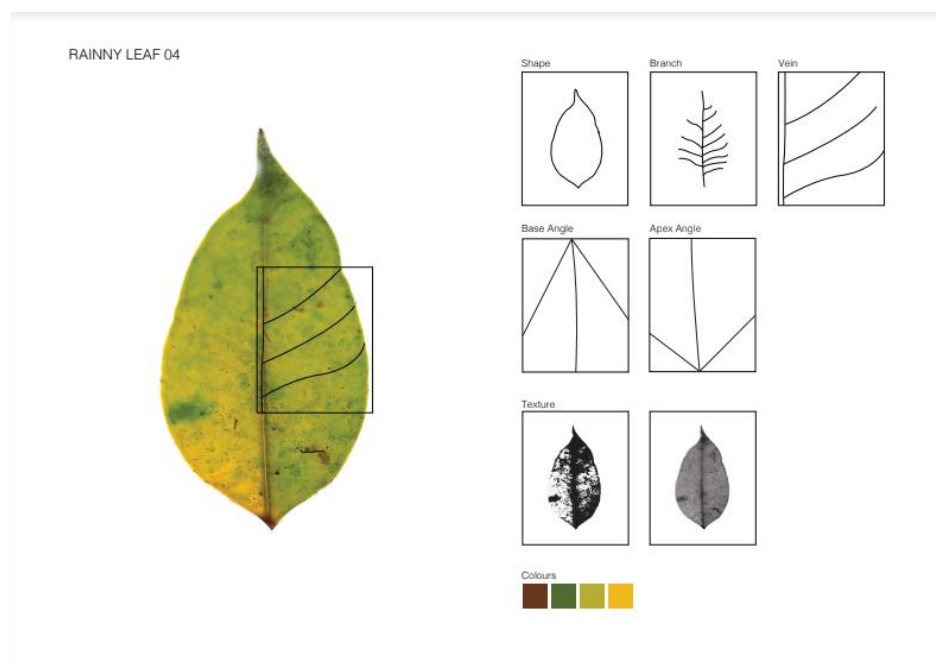
Figure 10 Example of visual element of leaf from rainy season.

10.1 Visual element of leaf shows the result of analysis element in the different ways. The rainy season represent the green and abundance.

**In conclusion of visualizing data of leaves.**

1. The visual elements of leaves could have divided into 2 groups. The result of studying shows seasons has affected to the elements which appear on each leaf.

2. Some of leaves doesn't have visual element in some topics such as branch and vain.

3. The leaves colour depend on weather, season and environment in that time.

4. The outside condition can affect all visual element on leaves.

In the last state of research, there is the art or design exhibition which people could be participate and encompass with the project. The result will be evaluated by the people who take part of the exhibition. The research objective could continue and grow the idea in the future.

1. The data collection will provide to designer and people to download free.

2. The benefit of the exhibition is building the awareness of forest conservative and climate change issue to the people in 2D and 3D.

3. The new knowledge could be a design platform or prototype of the design or art piece combine with visual communication design and illustration.

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