

Koch Snowflakes Batik Design

Norzieha Mustapha
*Faculty of Computer and Mathematical
Sciences*
Universiti Teknologi MARA Kelantan
Machang, Kelantan, Malaysia
norzieha864@uitm.edu.my

Norarida Abd Rhani
*Faculty of Computer and Mathematical
Sciences*
Universiti Teknologi MARA Kelantan
Machang, Kelantan, Malaysia
norarida@uitm.edu.my

Roliza Md Yasin
*Faculty of Computer and Mathematical
Sciences*
Universiti Teknologi MARA Kelantan
Machang, Kelantan, Malaysia
roliza927@uitm.edu.my

Roziani bt. Mat Nashir @ Mohd Nasir
Faculty of Art and Design
Universiti Teknologi MARA Kelantan
Machang, Kelantan, Malaysia
roziani_nashir@uitm.edu.my

Junaidi Awang
Faculty of Art and Design
Universiti Teknologi MARA Kelantan
Machang, Kelantan, Malaysia
junaidi042@uitm.edu.my

Wan Roslini Wan Yusoff
*Faculty of Computer and Mathematical
Sciences*
Universiti Teknologi MARA Kelantan
Machang, Kelantan, Malaysia
wroslini@uitm.edu.my

Abstract—Batik in Malaysia is a very popular textile, especially in Malaysia's east coast, Kelantan, Terengganu and Pahang. Its uniqueness in batik designs reflecting local identity, distinguish it from its counterpart, the Indonesian batik. The most popular motifs in Malaysian batik are leaves and flowers as well as some geometric designs such as spiral. However, more innovative ideas are needed to meet the demand in designing Malaysian batik. An effort to provide such great inspiration to the designer is through a project using mathematics geometry with the aid of sophisticated computer software and graphics. Mathematics and art have a long historical relationship, commonly known as fractals. Koch snowflake is a kind of geometrical shape and is one of the earliest fractals. Koch snowflake has great potential to be a motif design for Malaysian batik because of its simplicity and beauty and yet never been extensively explored before. The impact of this product to the society is to demonstrate the importance of mathematics in the world of fashion as well as enhancing the commercialization of Malaysian Batik using fractals

Keywords—design, fractals, Koch snowflakes, Malaysian batik

I. INTRODUCTION

Batik in Malaysia is a very popular textile especially in the east coast of Malaysia, running along the states of Kelantan, Terengganu and Pahang. Motif design creates the identity of Malaysian Batik and it differs from the Indonesian Batik. Most popular motifs in Malaysian Batik are mainly leaves and flowers as well as some geometric abstract designs. Motifs depicting human or animals are rare because of Islamic background of the region that forbids living things used for decoration.

The making of Malaysian Batik is different from the Indonesian (Javanese) Batik. While the pattern is

simpler and larger in size and yet seldom or never uses canting to create intricate patterns on the fabric, it merely rely heavily on brush painting method. The colours tend to be lighter and more vibrant than the deep coloured Javanese Batik. In line with the Malaysian government aspiration to endorse batik as a national dress code, a strong call for local designers to create new batik motifs to reflect the Malaysian identity.

However, to be innovative and creative in designing is not an easy mission. Inspirations will come if accessibility of computer graphic software are made possible as well as the availability of ready - made coding from computer programs. One such coding based on mathematical equations is known as Fractal.

Fractals have played a vital part in creating beautiful arts in recent years. Some examples of famous fractals are Mandelbrot sets, Julia sets, Koch Snowflakes, Pythagoras trees, Pascal triangles and many more. In addition, there are natural fractals such as clouds and smokes, mountains and trees as well as cardiovascular systems. Fractals also contribute to new knowledge in understanding many important scientific concepts like the growth of bacteria and brain waves.

Batik is a type of a traditional art resulting from the hand drawing process using either canting or block technique and colouring on suitable fabrics. Generally, Batik is synonym in Malaysia and Indonesia, but it can also be found in other countries like Egypt, Africa and India [1]. In Malaysia, the products of Batik are mainly from the two states i.e Kelantan and Terengganu. As for the Batik industries in Malaysia, they are run mostly by small enterprises and yet they contribute significantly to the economy via indirect effects [2].

Fractal is a branch of mathematics blended with arts. It is a rough or fragmented geometric shape that can be subdivided into parts, each is (at least approximately) a reduced size copy of the whole. Fractal is generally self-similar and independent of scale. The Koch snowflake (also

known as the Koch curve, Koch star, or Koch island) is a mathematical curve and one of the earliest fractal curves to have been described. Consequently, the snowflake has a finite area bounded by an infinitely long line. In [3], the von Koch curve has features in many ways similar to those listed for the middle third Cantor set. It is made up of four 'quarters' each similar to the whole, but scaled by a factor $1/3$.

II. MATERIALS AND METHODS

Koch Snowflakes fractal is created based on a simple geometrical concept, beginning with an equilateral triangle follow by a series of defined mathematical steps a basic shape is generated. This is made possible with the aid of powerful mathematical software such as MATLAB. Furthermore, a combination of image processing techniques is applied to the fractal by using Adobe Illustrator to create a more artistic and unique graphics. Its shape is stylized through design processes such as rotations, enlargements and repetitions. However, one of the shape inverses from white to black colour and together with the variety of outlines thickness of each shape a new desired motif is formed.

Processing the Koch Snowflakes Malaysian Batik is tedious and delicate. It is a block stamping technique known as hand batik copper block print design. The copper block is handmade based on the Koch Snowflakes design, dipped into a certain dye before printing onto a white fabric. This process is repeated over a series of steps until a certain design is desired. The list of innovative features in this construction is seemingly endless yet its appearance is uncomplicated and pleasing to the eye.

III. RESULTS AND FINDINGS

The results and discussions of this product will be explained in this section. From figure 1, it can be seen that how a Koch Snowflake formed from the basic equilateral triangle by using MATLAB. As more iterations are run, more designs are created. Figure 1 shows some mathematics curves producing using MATLAB software for the first three iterations. In the first iteration the number of side is 12, iteration 2 48 sides and 192 sides in iteration 3. The length of a side in iteration 2 is $1/3$ the length of a side in Iteration 1. After iteration 3, the Koch Snowflakes show the beautiful art and suitable to adopt as a Malaysian batik motif.

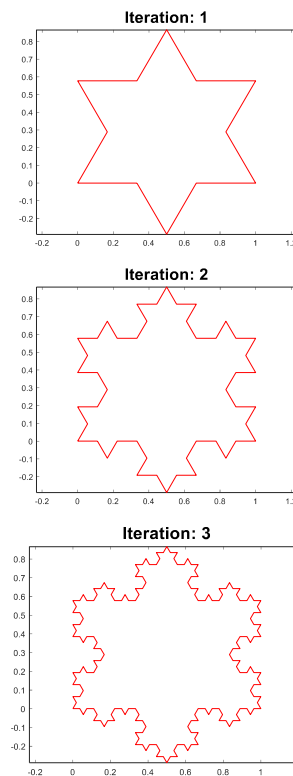


Figure 1: The first three iterations of the Koch snowflake

The shape of Koch Snowflakes after iteration 3, the art is designing using Adobe Illustrator. The results of Design Process in Adobe Illustrator can be seen in Figure 2. Some experiments with the design process in software Adobe Illustrator produces supporting images to the Koch Snowflakes. Finally, after the combination of all shapes, the Koch Snowflakes art graphics are ready to be apply as a motif.

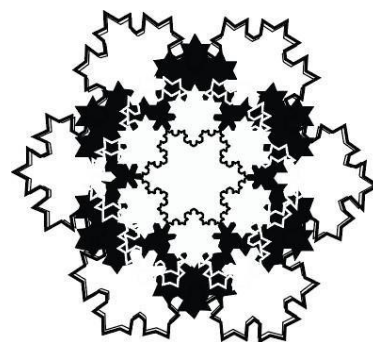


Figure 2 : The Koch snowflakes image results through Design Process in Adobe Illustrator's software.

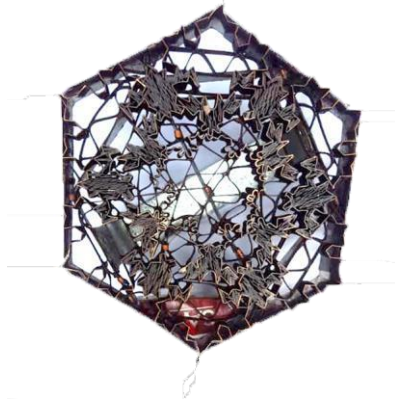


Figure 3 : The Koch snowflakes copper block
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Figure 4 : The Koch
snowflakes batik

In figure 3, the Koch snowflakes copper block is produced based on the image created in figure 2. This Koch snowflakes copper block is made from copper. Figure 4 shows the design of Koch snowflakes batik by applying the hand stamping copper block method. It is proved that the pattern of Malaysian batik is beautiful and artistic with Koch snowflakes.

IV. CONCLUSIONS

In this paper, our aim is to introduce an application of abstract mathematical concept, visually and physically. People in general are attracted to beautiful things including arts. We believed more intrigue designs can be generated using fractals because the technology in computer graphics is growing fast. Fractal graphics can be generated easily once the inspiration comes and making it feasible to have the designs on any Batik fabric in the near future.

ACKNOWLEDGMENT

The authors would like to

Teknologi MARA (UiTM) cawangan Kelantan for the strong supports in making this project a success.

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