

# DIGITALIZATION OF BATIK PARANG PATTERN USING TURTLE GRAPHICS

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## Abstrak

Salah satu warisan budaya Indonesia yang masih berkembang saat ini adalah batik. Kekayaan khasanah batik dapat dilihat dari berbagai motif batik yang ada di Indonesia. Batik Parang sebagai adalah motif batik tertua yang banyak ditemui di kota Surakarta dan sekitarnya. Motif batik Parang dikenal dan berkembang sejak zaman keraton Mataram Surakarta. Batik Parang sering digunakan pada acara-acara pembukaan pada zaman kerajaan. Motif batik Parang didominasi warna coklat gelap dan desain motif ini mengikuti garis diagonal dengan ukiran di setiap batas garisnya. Nama “Parang” berasal dari kata “Pereng” yang artinya “Lereng”. Sesuai dengan arti katanya maka motif batik Parang berbentuk seperti lereng menurun dari posisi tempat yang tinggi ke posisi tempat yang lebih rendah secara diagonal. Motif batik Parang pada penelitian di sini akan didokumentasikan dalam bentuk program sehingga dapat disimpan dalam bentuk digital. Metode yang digunakan pada pembuatan motif batik parang adalah metode turtle graphics. Metode Turtle graphics dilandasi dengan gerak kura-kura yang dapat bergerak maju, berputar ke kanan, atau berputar ke kiri. Dengan metode yang sederhana ini digabungkan dengan perhitungan matematika, maka dibentuk garis-garis yang menjadi tepian dari motif batik, sehingga dengan mengatur arah gerak kura-kura maka motif batik Parang dapat dibentuk dengan baik. Pada penelitian ini, telah dirancang suatu program untuk membentuk motif batik Parang, dengan dokumentasi dalam bentuk digital diharapkan kelestarian dari seni budaya batik akan dapat abadi dan terus berkembang.

Kata kunci : digitalisasi batik, batik parang, turtle graphics

## Abstract

One of Indonesia's cultural heritages that is still developing today is batik. The wealth of batik can be seen from the various batik motifs in Indonesia. Batik Parang as the oldest batik motif that is often found in the city of Surakarta and its surroundings. The Parang batik motif has been known and developed since the days of the Mataram Surakarta palace. Batik Parang was often used at opening ceremonies during the royal era. The Parang batik motif is dominated by a dark brown color and the design of this motif follows a diagonal line with carvings on each boundary. The name “Parang” comes from the word “Pereng” which means “slopes”. In accordance with the meaning of the word, the Parang batik motif is shaped like a slope down from a high position to a diagonally lower position. The Parang batik motif in the research here will be documented in the form of a program so that it can be stored in digital form. The method used in making batik parang motifs is the turtle graphics method. The Turtle graphics method is based on the motion of the turtle which can move forward, rotate to the right, or turn left. With this simple method combined with mathematical calculations, lines are formed that are the edges of the batik motif, so that by adjusting the direction of the turtle's motion, the Parang batik motif can be formed properly. In this research, a program has been designed to form the Parang batik motif, with documentation in digital form it is hoped that the preservation of the art and culture of batik will be eternal and continue to grow.

Keywords : digitalization batik, batik parang, turtle graphics

**INTRODUCTION**

In this era, almost all fields need to be documented digitally, so that physical forms can be accessed digitally. In this research, data of batik pattern is stored digitally in the form of a program using the turtle graphics. The advantages of storing batik pattern using turtle graphics are that the data is more memory efficient because it is in the form of text, and the pattern is more easier to be developed further more.

**Motif Batik Parang**

Based on data from the batik museum, it is stated that Parang comes from the word "karang" (coral or rock). The dip draws a diagonal descending line from top to bottom and has a slope of 45 degrees. The basic pattern is letter S winding.

The pattern of batik Parang is a decoration prohibited because only the king and his relatives are allowed to wear it [3] (Hasan 2012). The size of the pattern also symbolizes the social status of the person within the realm of the kingdom. The pattern chosen in this research is the pattern parang rusak.

The pattern of Parang Rusak was created when Panembahan Senopati was doing meditation on the South Coast. He was inspired by the

big waves that kept hitting the reef until it was damaged. The basic shape of the letter S is taken from ocean waves which depict the spirit that never goes out. This contains advice to never give up. The never-breaking S-braid on the pattern depicts a never-ending relationship, in the sense of self-improvement, efforts to fight for welfare and the form of relationship between family. The pattern of Parang Rusak was also a gift from the younger generations of aristocrats. In addition, this motif is also a symbol for children to continue the struggle that their ancestors have pioneered [12] (Sutiyati 2016).

The straight diagonal line on the pattern of Parang Rusak symbolizes respect, exemplary and obedience to the values of truth. The pattern of Parang Rusak were used by soldiers after the war, to tell the king that they had won the war. Another source states that the Art Forms of Batik Parang Rusak and Parang Barong Yogyakarta from geometric pattern to abstract pattern, historically has experienced a shift in meaning, function, value and form [2] (Farida and Muhima 2018). Starting from Batik Larangan, which used in the Kraton in the Keprabon ritual, it was widespread in society during the leadership of Sri Sultan Hamengkubuwono IX [9] (Roykhan et al. 2019). The develop-



Fig. 1.  
Source: [4] (Indriani 2015)



Fig. 2.  
Source: [7] (Prihandayani 2020).

ment of the Batik Larangan because recognition of Batik as a world cultural heritage, so Batik Parang Rusak and Parang Barong became more varied [4] (Indriani 2015).

This journal [7] (Prihandayani 2020) discusses the study of the transformation of the art form of the Parang Rusak and Parang Barong Yogyakarta, namely from geometrical pattern to abstract pattern art, because of a shift in meaning, function, value and form, so that the development of the Parang Rusak and Parang Barong has become more varied in the fashion industry.

The pattern of Batik consist of two groups, namely non-geometric (abstract) and geometric (regular). Batik Parang includes geometric pattern [11] (Septiana and Kurniawan 2016). The geometric preceded by the form of dots, lines, and the form of repetition (repetition) from simple to complex shapes [7] (Prihandayani 2020). Geometric

decoration, applied to cotton fabrics and silk fabrics

Simple geometric motif decoration, applied from lines such as zigzags, rectangles, circles, curved lines, triangles, rectangles, circles, kites, trapezoidal, and other creations. The arrangement of various lines, shapes, colors, and figures that are created contains values of beauty which are based on the development of creative imagination. This imagination is influenced by natural forms of objects, for example plants, figures (animals and humans), geometric lines, and abstract shapes [7] (Prihandayani 2020).

The art of abstract pattern batik contained in the development phenomenon of Batik Parang Rusak and Parang Barong Yogyakarta, and have the aesthetics of cloth fabrics, that is a work of motif art comes from scratches, meaning that the agility and skill of the batik pattern art maker will greatly determines the resulting art form.

The process of transforming the Batik Parang Rusak and Parang Barong into abstract pattern art, through a historical approach, and investigating a surface structure and deep structure using Levi-Strauss theory, so can help to find the answers of the problem in the research.

Based on the study and analysis of literature, it is concluded that: the transformation structure of the Batik Parang Rusak and Parang Barong, that only the surface structure changes, according to the reign of the King / Sultan. Meanwhile, the deep structure is related to meaning and value, which does not change.

Based on the history, the pattern of Batik Parang needs to be preserved, so that in this research, will be made a digital form of the pattern of Batik Parang so that storage of the pattern can be easier and more efficient.

### Turtle Graphics

The turtle graphics has been used on research [8] (Ratnadewi, Priyono, and Pandanwangi 2020) namely batik kawung pattern dan batik Purwakarta pattern [9] (Ratnadewi, Pandanwangi, and Priyono 2020) and had been realized. The method for digitalization used in the implementation here is a turtle graphics and mathematics graphics [6] (Lindenmayer 2004). Turtle charts are used for arbitrary batik motifs and mathematical graphs are used for batik motifs that can be formulated using mathematical equations [1] (Dobashi, Kaji, and Iwasaki 2019). Before drawing a graph turtle, the batik motif is sketched first on paper, then we formulate the graph equation. The basic idea of turtle interpretation is given below in Table 1. The state of the turtle is defined as a triplet  $(x, y, \alpha)$ , with Cartesian coordinates  $(x, y)$  representing

the position of the turtle, and the angle  $\alpha$ , called the heading (head), is interpreted as the direction the turtle faces. Given the step size  $d$  and the incremental angle  $\delta$ , the turtle can respond to the commands represented by the following symbols (Figure 5(a)).

For example, see Figure 5(b), the turtle first faces upward then moves three steps forward, the turtle rotates 90 degrees to the right and moves 3 steps forward, rotates 90 degrees right, two steps forward and spin right 90 degrees forward two steps, spin left 90 degrees, go forward one step, spin right 90 degrees forward one step. This command can be abbreviated as FFF-FFF-FF-FF + F-F.

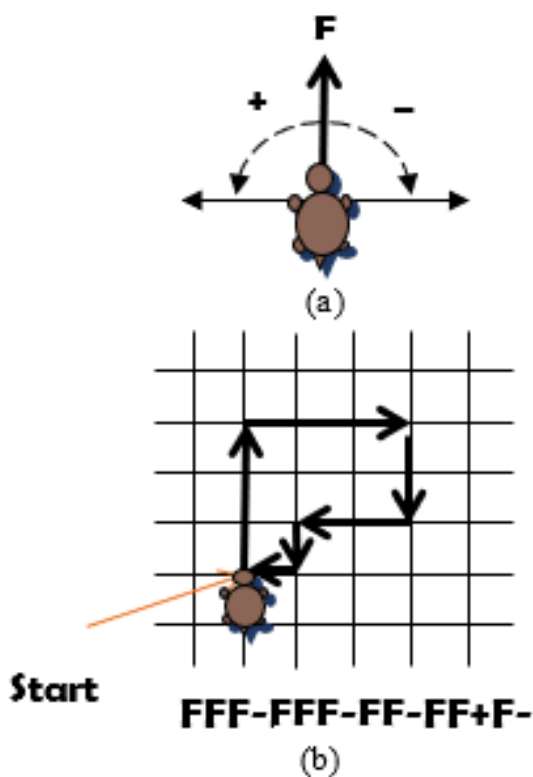


Fig. 3. (a) Turtle interpretation of the string symbol F, +, -. (b) Interpretation of a string. Increased angle  $\delta$  equals 90°. Initially the turtle faces upwards.

Symbol	Interpretation	Meaning
F	Move forward and draw a line	Proceeding one step along $d$ . The state of the turtle changed to $(x', y', \alpha)$ , with $x' = x + d \cdot \cos \alpha$ and $y' = y + d \cdot \sin \alpha$ . Draw line segments between points $(x, y)$ and $(x', y')$ .
f	Move forward without drawing a line	Go one step long $d$ without drawing a line
+	Turn left with the angle $\delta$ .	The state of the next turtle is $(x, y, \alpha + \delta)$ . Positive orientation from a counter-clockwise angle.
-	Turn right with the angle $\delta$ .	The next turtle state is $(x, y, \alpha - \delta)$ .
push	Remember the current state	Remember the current state (position, angle, line color).
pop	Restore the last remembered state	Restore the last remembered state and remove it from the list of remembered states.

Table 1. Turtle graphics rereng sigaret batik

Pseudocode Turtle graphics rereng sigaret batik	
1	procedure T
2	forward(25)
3	for $i \leftarrow 1$ to 30 do
4	forward(0.1)
5	turnright(6)

```

6     end for
7     forward(25)
8     for i ← 1 to 30 do
9         forward(0.1)
10        turnright(6)
11    end for
12    T1 := translate(T,x,y)
13    T2 := translate(T1,x,y)
14    T3 := translate(T2,x,y)
15    T4 := translate(T3,x,y)
16    plot (T, T1, T2, T3, T4)
17 end procedure
18 procedure A
19     turnleft(240)
20     forward(13.5)
21     A1:= translate(A,0,y1)
22     A2:= translate(A1,0,y2)
23     A3:= translate(A,0,y3)
24     A4:= translate(A1,0,y4)
25     plot (A1, A2, A3, A4)
26 end procedure
27 B1:=circle(0.3)
28 B2:=circle(0.3)
29 plot(B1,0,y5)
30 plot(B2,x1,y6)
    
```

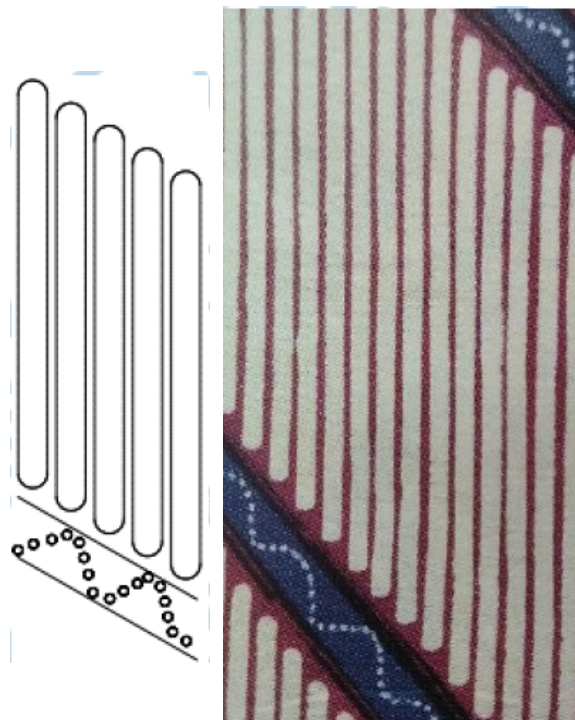


Fig. 4. Batik parang rereng sigaret  
Source: [5] (Kusrianto 2013)

The results of the turtle graph can be seen in Figure 4, this pattern can be replicated so that it forms a rereng sigaret batik. The color intensity used on the rereng sigaret motif is Red 122, Green 67, Blue 84 or brown , the center of the slope has the intensity Red 195, Green 194, Blue 181 , the background of the intensity slope is Red 66, Green 79, Blue 111 or dark green , the intensity limiting points are Red 170, Green 186, Blue 211. The intensity limiting line is Red 53, Green 44, Blue 58, or black .

**Table 2. Turtle graphics Parang tuding batik**

**Pseudocode** Turtle graphics Parang tuding batik

```

1 procedure T
2     for i ← 1 to 9 do
3         forward(0.13)
4         turnright(4.5)
5     end for
6     turnleft(120)
7     for i ← 1 to 5 do
8         forward(0.1)
9         turnright(18)
10    end for
11    turnright(60)
12    for i ← 1 to 7 do
13        forward(0.1)
14        turnright(18)
15    end for
16    forward(1.1)
17    turnleft(90)
18    for i ← 1 to 5 do
19        forward(0.1)
20        turnright(18)
21    end for
22    turnright(60)
23    for i ← 1 to 5 do
24        forward(0.11)
25        turnright(18.75)
26    end for
27    forward(0.13)
28    plot(T2,x,y)
29 end procedure
30 D1:=circle(0.01,x2,y2)
    
```

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31 D2:=circle(0.01,x3,y3)
32 D3:=circle(0.01,x4,y4)
33 D4:=circle(0.01,x5,y5)
34 D5:=circle(0.01,x6,y6)
35 plot (D1, D2, D3, D4,D5)

```

The Parang Tuding batik motif comes from the words Parang and Tuding. The word accusing itself means index finger or pointing, this can be seen from the shape of the motif which resembles the index finger which is arranged in a row and continuously.

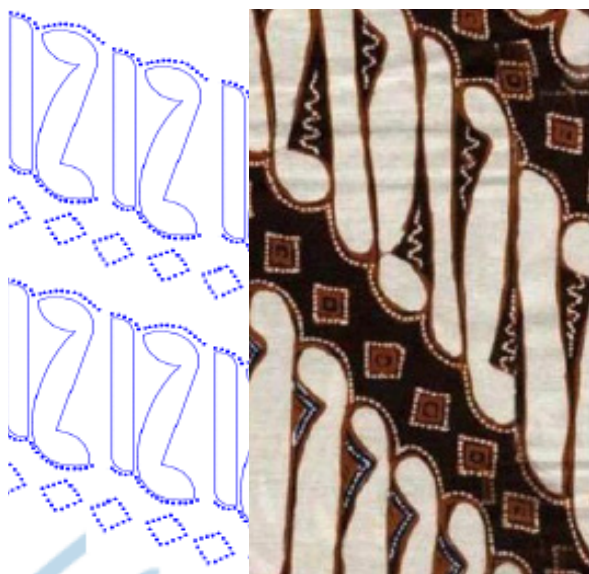


Fig. 5 Parang Tuding  
Source : [14] (Tumpi 2016)

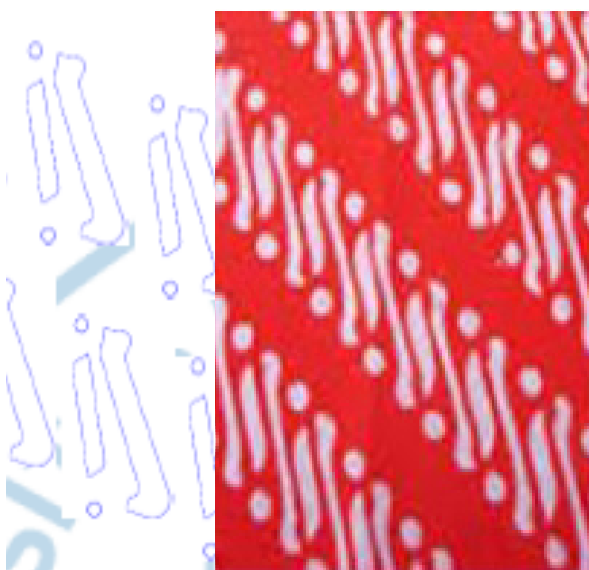


Fig. 6. Batik Parang Klitik  
Source: [13] (Thebatik 2020)

This motif contains the meaning that whoever wears it is expected to be a guide, a guide who can show good things and cause goodness. This batik motif is commonly used by parents. The intensity of the color used in the background of the knife here is Red 31, Green 17, Blue 14 or seen in black . While the color intensity of the parang tuding motif is Red 209, Green 207, Blue 192 or beige , the edge of the parang tuding motif has the color intensity of Red 101, Green 51, Blue 28, or brown , finally the border of the motif line has the color intensity of Red 144, Green 111, and Blue 95, or light brown in color .

**Table 3. Turtle graphics parang klitik batik**

Pseudocode Turtle graphics Parang klitik batik	
1	procedure T
2	T1:= circle(0.1,x,y)
3	T2:= translate(T2, x2,y2)
4	T3:= circle(0.1,x3,y3)
5	T4:= translate(T3, x4,y4)
16	plot (T2,, T4)
17	end procedure

The Parang Klitik batik motif is a parang pattern that has a smoother stylized shape than a broken parang, is simpler in shape and has a smaller size. The parang klitik motif depicts a feminine, gentle image, depicting subtle and wise behavior. In ancient times, this klitik parang motif was worn by the kings' daughters. Coloring of the motifs can be stored in the form of intensity values of Red 249, Green 40, and Blue 41 or red , for the part of the parang-klitik motif, the color intensity is Red 235, Green 198, and Blue 209 or pink .

**RESULT AND DISCUSSION**

The formation of batik motifs with turtle graphics has been successfully carried out, especially for the batik parang motif, here are exam-

ples of Garut slope batik, tuding machetes and klitik machetes. Other machete motifs can also be made using the turtle graphics method. Digital storage in the form of algorithms or programs can be more efficient in memory. Data about the color can be stored the intensity value of Red, Green, and Blue for each color.

## CONCLUSION

Stored pattern data can be more efficient in the form of programs, color intensity values, and motifs can be printed for the batik-making process. Motifs can be developed into other motif forms so that the motif variations are richer.

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