

Local Potential of Purwakarta Jugs as the Source of *Batik* Design using Turtle Graphics

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Keywords: Batik Motifs, Plered, Purwakarta Batik, Turtle Graphics.

Abstract: The Indonesian government actively keeps on promoting several areas which are well known for their batik. The motifs are promoted a lot through the local potentials. This research focuses on how to promote the local potentials through a typical batik design which is made using turtle graphics. Turtle graphics are vector graphics of the Lindenmayer system developed to model geometric objects, one of which is the jug shape. The research aims to develop the potentials of Purwakarta so that they become the region's outstanding values through the batik design made by using a turtle graphics program. The method used in the research is a combination of descriptive qualitative and quantitative methods. The descriptive qualitative method is applied to describe the local potentials that become the idea of the batik motif design, while the quantitative method is applied to design the turtle graphics. The research results in batik with *rereng kendi* motif designed using the turtle graphics program, which has the novelty value in a national scale and increases the local wisdom of Purwakarta. The research contributes to the transfer of knowledge from academicians to be implemented by creative industries also for the documentation system and required less memory.

1 INTRODUCTION


The local government of Purwakarta considers the local cultural values important by prioritizing the potentials found in the society, including the region's excellence (Perbawasari et al., 2019; Yulifar, 2016). This is emphasized by Ednawan that Purwakarta which is part of West Java province and located in the strategic path between Jakarta – Bandung – Cirebon. At present, develops not only its physical infrastructure but also the character of the people who love the local wisdom and preserve the Sundanese culture by prioritizing the Sundanese cultural values that become the energy in developing the city. Purwakarta is a district and city in West Java, Indonesia (E Prihana & Labolo, 2020; Ednawan Prihana et al., 2019; Sundari et al., 2019).


The local wisdom found in Purwakarta is formed because of the uniqueness of the people in managing the natural resources and the environment (Gustini et al., 2018; Indrawan, 2014). They develop things with


the awareness that they should not destroy the nature when forming what is considered their local wisdom.

Preserving the nature and protecting the environment are part of local wisdom (Gustini et al., 2018). Besides, the local potentials are also part of local wisdom that need to be explored as a concrete implementation that man and their environment interact with each other in order to fulfill their needs. To form the local wisdom, what is needed are the natural resources and the environment that are preserved from the people's thoughts, attitudes, and behavior, as well as the preservation of the nature and environment (Gustini et al., 2018).

Based on the potentials, namely the historical potential, cultural potential, and natural potential – especially places and buildings with grand architecture, with beautiful sceneries, and added by the potential of the human resources – Purwakarta has become a region that has abundant energy to develop. This is a region that has the spirit of “wibawa karta raharja” or being respectful, orderly, and prosperous

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(Gustini et al., 2018; Perbawasari et al., 2019). This potential contributes to the positive image so that it is not surprising that Purwakarta is specifically named as a region that is sourced from the characteristics of the well-treated environment, excellent agricultural products, and Jatiluhur Dam that becomes the main irrigation source, fish cultivation and power plant.

The synergy between the government and the people of Purwakarta in building the region's identity based on the local potentials is interesting to be analyzed further. The source of potentials is from the collective identities that are inherent in the society (Pandanwangi et al., 2019). These identities appear as interrelated links; the society has the awareness to fulfill the objectives set by the local government.

1.1 Literature Review

A lot of researchers have done research on batik which are documented using digital applications, one of which is Ratnadewi's research, which claims that documenting Batik Kawung motif using the application of Turtle Graphics makes the documentation simpler and easy to remember. In the research she examines Batik Kawung motif documented using Turtle Graphics. The types of motifs resulted in the research are the vector image made by Turtle algorithm, such as kawung picis, kawung bribil, and kawung sen. Batik Kawung is the oldest batik motif so that through the Turtle graphic vector, all the batik motifs including the isen (the patterns that fill the batik motif) can be documented. It is expected that other batik motifs can be documented as well through this study (Ratnadewi, Prijono, et al., 2020).

Previous research shows the collaborating science and art in a batik design is the method of making the pattern of batik motif using mathematical formulas. This research results in morning glory and manggis motif designs (Ratnadewi, Pandanwangi, et al., 2020).

Another finding related to batik design is the fractal batik which is modelled and designed in modern science. Fractal batik is organized using fractal geometric forms of Koch snowflakes (m, n, c) and anti-Koch snowflakes (m, n, c). The generation method used is the IFS method that utilizes Affine transformation, namely dilation, translation, and rotation. The generation method is done in two iterations. There are five basic patterns that are used and the ornament setup is done through translation. This research results in three batik designs which become the combination of local motifs, which are

batik parang rusak and batik nitik motifs (Purnomo et al., 2020).

The above-mentioned research is done by a researcher using various programs and applications, which is different from our research which focuses on the exploration of local potentials and then designs them using vector image. This opens a big opportunity to develop batik motif design explored from local potentials.

This potential source jugs becomes the idea in the making of Purwakarta batik motif. Currently the motifs made are in the form of sketches, which are directly drawn on cloth and there is not any digitalized documentation yet. Consequently, this research is an alternative offer for the local government of Purwakarta in digitalizing the motifs by using the vector graphics of Turtle Graphics.

The research results in the creation of batik designed using the turtle graphics program which has the novelty in the national scale as this is expected to help the documentation system and require less memory.

2 METHODS (AND MATERIALS)

The research focuses on discussing local potentials as an effort to improve the identity of Purwakarta through batik motifs that are documented using Turtle graphics application (Perbawasari et al., 2019).

From the local pottery potential, a batik sketch was made by drawing it manually, followed by making a program using the turtle graphics algorithm so that the edges of the batik motif image were obtained. Program makers need to check whether the results of the program are in accordance with the results of the sketch, if they are appropriate, then proceed to the next edge, if not, then revise the program, re-check the results of the batik motifs produced, and so on until the same motif is obtained as the results of the batik motif sketch manually (Ratnadewi, Pandanwangi, et.al, 2020).

The primary data of the research are in the form of field observation done during the research, which is preceded by the secondary data obtained through some data searched in the digital media as well as other literature, such as journals, some reading materials on batik, YouTube channels on batik development, and social media containing batik (Creswell, 2014; Sumartono, 2017; Yusuf, 2017). Previous research and pictures of the existing Purwakarta batik motifs, as well as the primary data, are also obtained through interviews of the informants, such as community leaders, cultural, that

have been designed in the research instruments. One of the informants is the local official in charge of the development of small and medium enterprises owned by the government. The method used in this research is a combined method, which is the qualitative descriptive method combined with the quantitative method. The reading of the batik motifs that is made into a narration applies the qualitative method, while the quantitative method is applied in doing the calculation in the design by using Turtle graphics.


3 RESULTS AND DISCUSSION

3.1 Batik Motif Ideas

Designing a batik motif with a strong identity requires field research first. Thus, a field observation is very essential in this research. The goal is to find the strongest local potential to be portrayed in Purwakarta batik motifs. The observation is done in Plered, which is one of the districts in Purwakarta. Plered is well known as an industrial centre of ceramics, and the products are exported to foreign countries. The sustainability of pottery production deserves appreciation. Amidst the threats coming from more various materials and designs, the potters can maintain the quality of the products. This is what makes Plered famous, which leads to it being one of the options in determining the design of Purwakarta batik motif.

Jugs are one of the flagship products made of clay which are sustainable up to now (Yustana, 2012). A jug is a water container, with the shape of a teapot that has a funnel to pour water. Besides, there is the neck of the jug that has the function of making the hand able to grip it and the pour the water inside it into a glass (Wahyuningsih, 2013; Winata, 2020). The simple shape is popular with foreign tourists so that it has been continuously produced for a long time. The simple design also becomes an idea for a batik design using Turtle graphics.


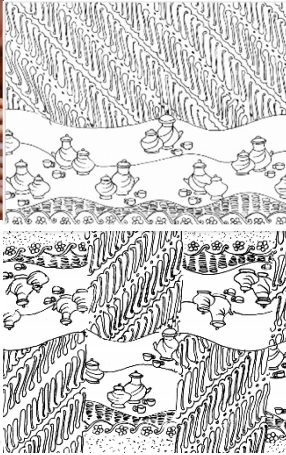
Table 1: Description of Subject Matter as a batik motif idea. Source: Research Team 2021.

Local Potential	Visual Description
	Plered is one of the areas in Purwakarta producing potteries (Sakban et al., 2020; Triharini et al., 2014). This line of pottery becomes an idea for batik motifs.

The explanation of the batik motif ideas (Table 1) and the visual transformation into batik motifs (Table 2) can be seen below:

The above idea is transformed into a batik pattern in the form of a sketch first, as is clear in Table 2.

Table 2: Transformation from visual studies into batik patterns. Source: Research Team 2021.

Visual Studies	The implementation in the form of a batik pattern
	

3.2 The Visual Narrative of Purwakarta Batik

Plered is one of pottery producers that still exist until now, and it even becomes a tourist destination (Perbawasari et al., 2019; Rosadi, 2018). The activity of pottery making in Plered was estimated to start in 1904 and it is still developing up to now. It is as if Plered has become part of the identity of Purwakarta; as a result, this is prioritized to be implemented as a batik motif by taking a jug as the object which is combined with rereng motif.

Initially *lereng* was *ageman luhur*, which means that it was exclusively worn by the royal family (Marwati, 2011). The servants were prohibited to wear it. *Lereng* motif has the characteristics of strips forming 40° angles, and arranged in such a way that it forms slopes (Chairiyani, 2014). Combinations can be made between the slopes. *Lereng* motif was then adjusted with the local language and it becomes *rereng* (Yan Yan Sunarya, 2019).

This motif is called Rereng the rereng motif has been around for a long time and is used as one of the Priangan batik motifs (Herdiana et al., 2020; Supriono, 2016a). This motif is often an idea in the creation of shapes and colors so that this motif has uniqueness and diversity. Plered motif, which displays jugs that are made into a repeated pattern and

with the background of rereng motif. This choice of batik is intended to make Purwakarta exist more so that the people’s economy can improve through the batik places, which will then increase the government’s economy as well as tourism (Pakpahan, 2012; Ratnadewi, Prijono, et al., 2020; Syahsudarmi, 2019). The choice of the orange color comes from the pottery material, which is the local clay which is processed in such a way, and then is processed by being baked, which will finally result in the orange color of the clay (Rosadi, 2018). At present, Plered industrial center maintains its original form; they not only export the products, but also fulfill the people’s needs, such as jugs, water containers, pots, and many others which are distributed to all areas in Indonesia (Mustajab et al., 2020; Yuliani et al., 2020).

The above explanation is the idea of determining the following batik motif.

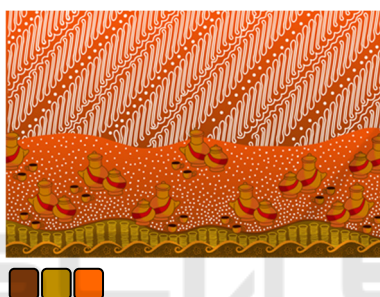


Figure 1: Rereng Plered. Source: Research Team 2021.

The batik design above consists of three horizontal layers and the jug motif is made repeatedly using the same pattern (Sumarsono et al., 2016; Sunarya, 2015). The object in the batik motif is inspired from the shape of a jug as a water container. Beside it, there are a container like a pottery bowl with a lid and two pottery cups. Below it, there is typical Purwakarta food, simping, which has a circle shape and is very thin. Through this batik, the message that is conveyed is about having tea with simping as a snack. On the top, there is a background in the form of rereng or slopes arranged diagonally (Hayati, 2012; *The Heritage of BATIK.*, n.d.).

There are three colors as the basic colors, which are dark brown coming from the color of soil, orange from the result of clay baking, and light brown from the color of clay.

3.3 The Design of Small and Big Jugs in Python Design

The design that will be explained is the main design in the form of a jug in Python Design. Drawing a jug in Figure 2 starts with a small jug on the right, and


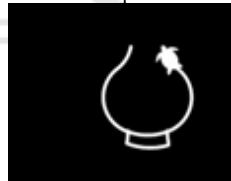
then continued by drawing a big jug on the left with the algorithm of Turtle Graphics with Python (Bogdanchikov et al., 2013; Chan, 2014; Name, 2020; Zane, 2012). The turtle will move forward n steps with the forward instructions (n), turning left u degrees with the left instruction (u), turning right v degree with the right instruction (v), moving to the column position w and row y with the go instruction (w, y); do not draw with the instruction penup (), or draw with the instruction pendown (). The following is the pseudocode, drawing big and small jugs in Python language:


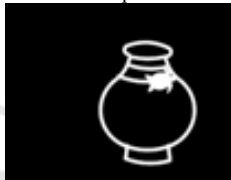

Table 3: The commands in turtle graphics.






No	Information
1	Procedure Restart {action to cleaning drawing plane and place turtle to initial position}
2	Procedure Move (Input L : real > 0.0) { turtle move L coordinate with direction}
3	Procedure ToPos (Input x,y : real > 0.0) { turtle move to position (x,y) with same direction}
4	Procedure Up { Pen = off, if turtle move without drawing}
5	Procedure Down { Pen = on, if turtle move with drawing}
6	Procedure Right (Input d : real [0.0 .. 360.0]) { turn direction d degree clockwise}
7	Procedure Left (Input d : real [0.0 .. 360.0]) { turn direction d degree counter-clockwise}




Table 4: The step commands to make jugs motif with turtle graphics.

Step	Information
1	Restart
2	Up
3	ToPos(500,400)
4	Down
5	#Make a small jug base on the right right(-10) for i ← 1 to 5 Move(3) Right(2) endfor Up ToPos(450,400) Down right(10) for i ← 1 to 5 Move(3) Right(-2) endfor Up ToPos(450,400) Down right(110) for i ← 1 to 17 Move(3) Right(-2.2) Endfor Up

Step	Information
	
6	<pre>#Make a jug body ToPos(455,285) Down right(120) for i ← 1 to 10 Move(3) Right(4) endfor for i ← 1 to 15 Move(3) Right(-4) endfor for i ← 1 to 15 Move(3) Right(-4) endfor for i ← 1 to 15 Move(3) Right(-4) endfor for i ← 1 to 10 Move(3) Right(4) endfor Up</pre> 
7	<pre>#Make a small jug lids ToPos(455,285) Down right(115) for i ← 1 to 14 Move(3) Right(-2) endfor for i ← 1 to 6 Move(2) Right(-23) endfor for i ← 1 to 16 Move(3) Right(-3) endfor for i ← 1 to 6 Move(2) Right(-23) endfor Move(3) Up</pre>

Step	Information
	
8	<pre>#Make a decorative line on a small jug ToPos(455,295) Down right(-4) for i ← 1 to 14 Move(3) Right(-2.2) endfor Up ToPos(442,307) Down right(35) for i ← 1 to 21 Move(3.1) Right(-2) endfor Up</pre> 
9	<pre>#Make a small jug lid handle ToPos(470,269) Down right(-90) for i ← 1 to 10 Move(2) Right(22) endfor Up</pre> 
10	<pre>#Make a small bottom jug decoration ToPos(528,340) Down right(60) for i ← 1 to 20 Move(5) Right(3) endfor Up ToPos(513,379) Down right(-38) for i ← 1 to 18 Move(5.8) Right(2.8) endfor Up</pre>

Step	Information	Step	Information
			
11	<pre>#Make a big jug body ToPos(444,305) Down right(1) for i ← 1 to 10 Move(5) Right(-3) endfor Right(-56) for i ← 1 to 21 Move(2.7) Right(2.3) endfor Right(-56) for i ← 1 to 8 Move(5) Right(-3) endfor for i ← 1 to 5 Move(4) Right(8) endfor for i ← 1 to 6 Move(4) Right(4) endfor Right(-85) for i ← 1 to 5 Move(3) Right(-3) endfor Right(-65) for i ← 1 to 9 Move(4) Right(-1) endfor Up</pre> 	13	<pre>#Make a big jug bottom ToPos(348,380) Down right(120) for i ← 1 to 6 Move(3) Right(2) endfor Right(-90) for i ← 1 to 20 Move(5) Right(-2) endfor Up</pre> 
		14	<pre>#Make a big jug decoration ToPos(425,338) Down right(-150) for i ← 1 to 20 Move(5.1) Right(3.3) endfor Up ToPos(428,368) Down right(-60) for i ← 1 to 23 Move(5.5) Right(3.0) endfor Up</pre> 
12	<pre>#Make the left big jug body ToPos(328,310) Down right(95) for i ← 1 to 12 Move(5) Right(-3.7) endfor for i ← 1 to 4 Move(1) Right(-8) endfor for i ← 1 to 21 Move(5) Right(-2.9) endfor Up</pre>	15	<pre>#Make a big jug neck ToPos(415,271) right(10) Down Move(30) Up ToPos(355,271) Down Move(30) right(110) for i ← 1 to 16 Move(4) Right(-2.9) endfor for i ← 1 to 6 Move(2) Right(-18) endfor Right(-18) for i ← 1 to 17</pre>

Step	Information
	<pre> Move(4) Right(-2.9) endfor for i ← 1 to 8 Move(2) Right(-18) endfor Up right(-90) Move(10) </pre> 
16	<pre> # Make the top lid of the jug Down right(110) for i ← 1 to 16 Move(3.8) Right(-3.8) endfor Up </pre> 
17	<pre> #Make a handle of the top of the big jug lid ToPos(380,217) Down right(-90) for i ← 1 to 10 Move(2) Right(22) endfor Up </pre> 

The above batik design can be more developed with various motifs promoting the local potentials, which is expected to immediately produce a variety of batik motifs with the local identity which will at the same time improve creative industries.



Source: Research Team 2021.

Figure 2: Small and big jug.

The memory required to store the batik jugs motif can be seen in Figure 3. The file "jugs manual skect.jpg" is the memory required to store the batik motif by photographing, which is 84KB, the file "jugs from turtle graphics.jpg" is the result of making a jugs motif from turtle graphics, 24KB, the file "jugsProgram.py" is a program file in Python that requires 3KB. From the required memory there has been a savings of 71%, and if the program is saved, there is a saving of 96%.




 jugs from turtle graphics.jpg	24 KB
 jugs manual sketch.jpg	84 KB
 jugsProgram.py	3 KB

Figure 3: Memory required for image photo, image turtle, and program motif batik jugs.

4 CONCLUSIONS

Purwakarta batik has been fostered since the last few years. Purwakarta local government has also included it in its strategic plan of the local development. This makes many stakeholders compete to be able to collaborate with various groups or communities in promoting the local potentials through Purwakarta batik design. The finding of the research is Purwakarta batik design that is inspired-from the jug shape that becomes the main motif with the orange color that is the characteristic of earthenware after

being baked. Other motifs are produced as complements to add the aesthetic value of batik cloth. This batik cloth has been produced and become part of Purwakarta local identity. The filling motif is in the form of a base put at the bottom of the cloth and filled in with dots that are spread on the cloth surface.

ACKNOWLEDGEMENTS

Our sincere, gratitude to LPPM Maranatha Christian University who has funded this research, and the research team who have collaborated in this research.

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