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Research Article

The Digitalization Acceleration Strategy of Semarang Batik Motif based on the Record of Coastal History Batik

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Abstract

The coastal batik historic record is more dynamic in creating patterns and taking most foreign developed influences, such as India, China, and Europe by combining the influences with the classic batik motif. Fractal, as the software of batik, becomes the technological enabler to accelerate and update the business of designing batik motif. It is based on the historic record or coastal batik philosophy that uses computer assisted mathematic formula to design the motif and variety. The digital documentation by modeling the batik motif data in the form of digital makes it readable and accessible. The process of creating fractal batik is a batik production by dividing it into two stage. The first stage is creating the design with a fractal designing team. Then, the second one is creating the batik by the batik craftsmen. The data collection and validation on Semarang batik ecosystem has been in line with the planned activity. It has gone some consideration and production of Batik Wali motif as the developed batik philosophy motif with fractal batik tools. The attributes and the data analysis were useful to check whether the market and the users could accept the manufactured products. Then, it provides positive impacts from the contemporary batik development.

Keywords
Semarang batik motif, digitalization, fractal batik

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Introduction

Batik is a drawing art on a piece of garment by using wax or plasticine to cover and to obtain various ornaments on the garment (Kusrianto, 2014). The coastal batik historic record is more dynamic to create pattern and to absorb various foreign developed influences, such as India, China, and Europe by combining the foreign influences into the classic batik model (Velduisen & Heringa, 2000). Based on the historic tracing process about the origin of coastal batik, the researchers have found the signature of Semarang area as found in Lasem, and Solo batik that contain many philosophy. Digital is a complex and flexible method to create a primary matter for human life (Manovich, 2010). The acceleration strategy of digitalization is strategy with various variety in a short time (Dominick, 2008).

Fractal, as software of batik, becomes the technological enabler to accelerate and update the business of designing batik motif. It is based on the historic record or coastal batik philosophy that uses computer assisted mathematic formula to design the motif and variety. Tjahjaningsih et al (2015) produced *Batik Wali* motif from their research grant. The batik was presented for Batik MSME in Semarang to enrich theri motifs. The motif has a specific pattern to be engineered with fractal concept uses. On the other hand, the *Kembang Isuk Sore Petikan Batik Wali* motif has a deep philosophy. The motifs of *Datan Serik Lamun* and *Datan Lamung Kelangan* bring meanings of not easily giving up and sad. The design acceleration of Semarangan batik motif digitalization as the sustainable ecosystem strategy for batik MSMEs in Semarang aims to make the MSMEs competitive in this 4.0 industrial revolution. It is especially to reach the new life arrangement after COVID-19 pandemic to survive. The instant product developments, such as fashions, accessories, bedding, house decorations, etc, with *batik wali* motif produced by the R&D division, are useful to determine the market segmentation and in determining the appropriate product based on the needs and the developed products.

The Significance of the Study

The review and studies about batik development, by Tjahjaningsih et al (2015), found that the batik review center could be an opportunity to conduct research & development and develop various product and process innovations. The establishment of business center unit, Karya Kriya Batik, aims to provide mentoring for the community about creative technique of producing batik. For examples, the techniques are binding dip technique, *shibori* and *smock* technique, natural dyeing uses, fractal, and using the surrounding waste from the local community. The acceleration strategy of batik MSME development has been done by batik MSME empowerment with specific-creative techniques. The other strategy is by providing mentoring for the entrepreneurs and creating cyber marketing (Tjahjaningsih et al, 2017). The reinventing effor of *Semarang Wastra Batik* has been done via re-engineering process by providing the knowledge-based development system of classic batik motif. It is useful to recover the original essence that batik has value or meaning (Tjahjaningsih et al, 2020). The *Semarang batik* acceleration strategy is done with specific-creative technique development in the motif design and the dyeing process. It is to create entrepreneurship marketing mindset and to provide mentoring for covering the customers. The mentoring is done developing product innovation, process innovation, and communication lines with the users of cyber marketing application. The domain used by the cybermarketing application user is *http://www.selasarkaryakriya.com* (Tjahjaningsih et al, 2015; 2016).

The batik motif design training with Fractal software includes a basic level for the MSME doers. It could provide the economic benefits for them (Tjahjaningsih et al, 2018). Then, the training with advanced Fractal level is done for batik MSME doers. Thus, they can develop their creativity. The batik training is continued with fractal software to produce coastal motif. This motif has specific color, natural blue color taken from tom leaf or Indigofera. Tjahjaningsih et al (2019) explains that the software is easy to study and quick to use by the entrepreneurs. Then, in the current research, the applied strategy to accelerate *Semarang batik motifs* was realized into digitalization of the motif. The motif has historical values based on the record of coastal batik without removing the essential culture of Semarang batik.

Batik has cultural value and is a commodity. This research used technology as the enabler to adapt motif design technology assisted with fractal software to design the batik. The batik motif creation was done by documenting figures or objects to be an innovative work of contemporary batik motif. It was done without losing the cultural essence. It kept the batik survivability as the

National heritage (Laretna, 2003).

Review of Related Studies

The researchers started the research with digital documentation by modeling the data of cultural heritage in the form of accessible, readable, and online digital matter (Handayani et al, 2012). It used cloud computing technology to store the documents containing ancient and historic cultural blocks as the foundation of Central Java's culture big data with geo-space (Handayani et al, 2013). It coud locate each tourism destination in the form of webgis (Handayani et al, 2014). The use of L algorithm system to establish the batik motif reference was based on the developmental concept form. It went alongside with the extra form during the operation to manipulate objects based on the intention of developing batik motif (Tiwana, A. 2019, 2020). Margried (2014) investigated the Fractal batik community in Dago Pojok region, Bandung, Indonesia. The result was a designed program by Pixel Indonesia, Inc, to involve the the lower economic community to use advanced technology and fractal batik software.
Most batik MSMEs, during this COVID-19 pandemic, must change their marketing patterns and using both marketing digitalization and motif digitalization acceleration. The information and communication technology evidently become the booster of entrepreneurs, especially women (Ericsson, 2015). The adoption of information and communication technology with fractal batik leads to innovation. The adoption of intention becomes the entrepreneurship-oriented encouragement to facilitate and advance their entrepreneurship (Stam, 2007; Chatterjea, 2020). The researchers hope significant batik market increase will demand the batik industries to innovate (Hariadi, 2007; Margaret, 2014).

Objectives of the Study

- Most people that wear batik do not realize the essence of batik, including the philosophical values and the original places of batik.
- The craftsmen still use classic motif. It actually could be developed into contemporary motifs based on the market trend without neglecting the local culture by developing the fractal batik motif.

Method

The production pattern of fractal batik used Leidemayer algorithm system to develop an object based on the motif reference. It is turned into various motif with the initial stored features of the objects. Fractal batik is a batik that its designs, motifs, and variety are made with mathematics formulas and computer technology (Couros, G. 2015, Florida, 2002). They are realized into repeated geometrical pattern, started from the smaller scales to create irregular forms. The fractal form is easy to model with the L-system method (Indraprasta, 2013). The research objects were batik MSME doers in Semarang. The researchers took respondents from a business unit, Karya Kriya Batik, Semarang. The reason is - the business unit has developed batik motifs from iconic issues and philosophical values with natural dye (Figure 1.4).

The Pattern Production Model with L-System Algorithm in Batik Fractal

In terms of format, the L-system is a set of letters, formal parameters, axioms, and production rules. They are G = {v, s, ω, p}
Given:
v : vocabulary that describes the differences of module classes
s : a set of parameters that represent the modules' properties.
ω : axiom that describes the initial state of an organism.
p : a set of production rules to explain the organism development.
The uses of ':' and '→' to separate three components of production, predecessors, and successors.

The Production of Leadermayer-System

The symbol of 'peg'
The set of production rules into single rule: 'e=i'
AXIOM: peg
Rules: e=i
Every symbol 'e' turns into 'pig' as a new string during the implementation into the axiom. It is a called as 1 dr. L-System. The second generation of L-system is the result of the rule implementation for the first generation because it does not have symbol of 'e'. Thus, there is no rule to replace so that the second generation has 'pig' as the string.

Axiom: peg
Rule : e=i
Menjadi L-System
Generasi 1: pig
Generasi 2: pig
Generasi 3: pig

L-System will be more mechanic when it applies recursive rule. The recursive rule replaces the symbols with the symbol copies with addition of an extra.The recursive rule, → 'e=eie' with the first-three generation of L-system uses this recursive rule.
Recursive L-System

axiom : peg
rules : e=eie
generasi 1: peieg
generasi 2: p eie i eie g
generasi 3: p eie i eie i eie i eie g

The fractal pattern with L-system is produced by two parameters. They are initiator and generator. The initiator refers to original state to establish a pattern that will be iterated and generated based on the compositions of various rules to modify the initiator. Generator produces new products.

The Data Analysis and Interpretation

The definition stage, at this level, refers to accurate object selection as the foundation to design batik motifs, such as the symbol of Semarang. The symbol embodies into an iconic animal, *Warak Ngendog* (Figure 1.1). *Warak Ngendog* symoblizes the community acculturation that takes form as animated animal of unity from various ethnics in Semarang. They are Chinese, Arabic, and Javanese. Literally, *Warak Ngendog* is defined as anyone that keeps his or her purity during Ramadhan month. Thus, in the end of the month, they will get merit on Eid Al-Fitr day. The software, Fractal batik, is a technological enabler to accelerate and renew the business process in designing the object into batik motif based on the historical record or coastal batik philosophy. The patterns are made with computer-assisted mathematics formulas that are stored in digital directory (Figure 1.2).

Figure 1.1
The Symbol of *Warak Ngendog* as the Fractal Batik Motif Foundation (source: the author, 2020).

The researchers used fractal algorithm on the defining stage by grouping the motif, *Warak Ngendog,* into some parts. They are the body of a dragon, in the form of circle with a central point, the first scale of a dragon, the second scale of a dragon, and the head of the dragon. The fractal implementation in batik motif facilitates other motif development. It has the main function as reference to explore various motifs without neglecting the main motif elements (Figure 1.2)

The Head of a Dragon The body of a dragon The first scale of a dragon The second scale of a dragon

Figure 1.2 the Warak Ngendog Motif Literature (source: Jbatik Pixel Indonesia)

The Definition Of S To Create The Body Of A Dragon Requires The Following Stages:

Draw the body of a dragon = S
Definition of S = F F F F F read from left to right ⟶

The defining stage refers to figure groups of the dragon body and combine the body with the following orders:

0. S
1. F F F F F
Command to Draw the Dragon Body = S

The definition of the dragon's body and Commands → Of Five Dragon's Body To Be Iterated Or Repeated Five Times.

Writing the Definition of S by iterating:
DEFINITION OF **S** = iterated five times

The definition of S can be written:
DEFINITION OF **S** = F S

DEFINITION OF S means to command
The figure of a Dragon's Body is moved upward.
The figure of a Dragon's Body is moved upward.
The figure of a Dragon's Body is moved upward.
The figure of a Dragon's Body is moved upward.
The figure of a Dragon's Body is moved upward.

Five forms of a dragon's head, F, is basically an atomic form of a dragon's head that is iterated five times. Then, the next stage is repetition that could be represented as iteration function.

Iteration

The stage to define the completion and to proceed the following stage, simplification of the iteration function by activating the iteration function.

Iteration = 5 times
Definition Of S = F S
Definiiton Of S = 5 Times Iterated F

Definition is read from left to right. S refers to drawing the Dragon's Body Form. Then, S means drawing the form and is moved upward. The definition is always read from left to right and repeated based on the intention. For example, the iterations are five times.

Iteration = 5 times

The iteration function is represented by F F FF F or the numbers of F's repetitions. They can be shortened by activating the iteration on the application's property to adjust with the demanded value input.

Substitution

Stage 1:

- Write "S" from stage 0
- **S**
- **In line with Definition, S is replaced by FS**
- **FS** →

The figure of a dragon's body is defined S.

Explanation: the creation of the dragon's body is by defining S. It is the same with the previous stage, such as the definition stage. The main differences of this stage deal with replacing S with FS as the substitution stage that represents S, the dragon's body into FS.

Stage 2:
- **Write "F S" from stage 1**
- **F S** →
- **In line with DEFINITION, S is replaced with FS**
- **F FS** →

Explanation: This stage consists of drawing the form of the dragon's body and turns the form into S.

Stage 3:
- **Write "F F S' of the second stage**
- **F F S** →
- **In line with DEFINITION, S is replaced with FS**
- **F F FS** →

Explanation: This stage shows the substitution or chaging function due to the simplification of syntaxes. The real stages are: Draw the Dragon's Body Form, draw the Dragon's Body Form, draw the Dragon's Body Form, and creates S.

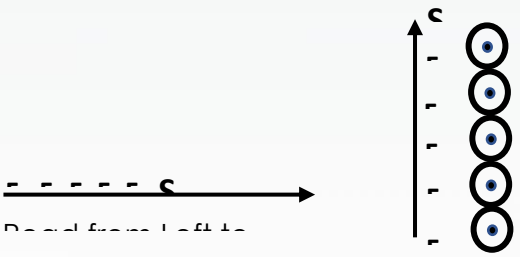
Stage 4:

- **Write "F F F S" from the first stage**
- **F F F S**
- **In line with DEFINITION, S is replaced with FS**
- **F F F FS**

Draw the Dragon's Body Form, draw the Dragon's Body Form, draw the Dragon's Body Form

By iterating, the users can obtain five same dragon's bodies briefly. Look at the fifth stage of iteration:

- ***F F F FS***



The fourth stage deals with drawing the five forms of dragon's body based on 5 letters of F.

Letter "F", in terms of fractal, commands to "DRAW THE DRAGON'S BODY." The concept on the third stage will draw three dragon's bodies. "S" is a "COMMAND." This alphabet does not produce figure. Only "F" refers to "DRAW THE DRAGON'S BODY."The final stage from all stages, such as definition, iteration, and substitution is complemented with the uses of mathematical function. It facilitates the implementation of L-System to create batik with **"Warak Ngendok"** motif. The addition of function + [plus] and - [minus] maximize the duplication, iteration, and shiftiness processes to produce an animal figure motif completely (Figure 1.4) based on the demanded algorithm.

Figure 1.4 the Result of L-System algorithm uses to draw Warak Ngendok motif.

The Test Result

The test of literature-based motif creation that is formed from the main data to create *Warak Ngendok* motif could produce various contemporary motifs. They can be applied on batik garment products (figure 1.5). The produced motifs were varied and unique.

Figure 1.5 the Result of Fractal batik Motif in Written Batik Garment Commodity with Natural Dyes.

Recommendations

The fractal implementation on batik facilitated the other motif developments. It used the primary motif as the reference to explore various motifs without neglecting the element of the primary motif as the master file. It needs some operators to lose the monotonous matters and develop the object development concept into various forms and combine various motif into a batik with various motifs from one reference.

Conclusion

The acceleration strategy is important to establish the batik MSMEs' management so they can survive the Batik existence as national cultural heritage. It is grouped into some stages, started from the initial state needs, developing the system with technology as a classic batik motif developer. It was to reproduce current trending batik motifs on market without losing the historical essence that was the parts of coastal batik, assisted by Fractal batik. A business unit cannot produce research result commodity on market. However, it can accompany the craftsmen of Karya Kirya Batik to develop vastly. The business unit, Karya Kriya Batik, is not only a site of the *Research & Development* but also as a business development site with local wisdom so that the products can be widely recognized.

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