

02_LSystem_Ulos_Raeic_New

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Generating Ulos Pattern by Using L-System

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Ulos is a traditional woven from the tribe of Batak in the form of scarves. It is commonly used in the Batak traditional ceremonies. Ulos, such as other Indonesian traditional woven, yet rapidly developed in the industry because the production is still traditional and manual. Besides, the design of their motifs is still particularly aimed for ceremonial purpose only. Accordingly, we conduct a study to develop software, called **JTenun** that is able to generate new motifs of Ulos but still have specific characteristics of Ulos. The development is based on existing software called **JBatik** that has been successfully developed and widely used to generate a new motif of Batiks. **JBatik** was developed using L-System, a programming language which is able to create a pattern by making use of the iteration concept. Due to the same repetition characteristics of Batik and Ulos, L-System is also applicable to generate new pattern of Ulos. Hence, it is also used in this study. The result shows that **JTenun** is able to generate new patterns of Ulos, as confirmed by some Ulos' experts in the evaluation phase of this study.

Keywords: Pattern, Ulos, L-System, Repetition

1. INTRODUCTION

Weaving is a heritage of skills handed down from generation to generation in many tribes of Indonesia [1]. The motifs of woven in Indonesia are very diverse. However, they have not been rapidly developed in the industry because the production is still traditional and manual. Besides, the design of their motifs is mostly still particularly aimed for ceremonial purpose only.

This research is expected to develop new and more attractive motifs of woven particularly Ulos as a case study. Ulos is a traditional woven from the tribe of Batak in the form of scarves and commonly used in the Batak traditional ceremonies [2].

Similar research has been conducted by PT Pikel Indonesia on Batik cloth and produce software called **JBatik** that has been popular and widely used by Batik craftsmen [3]. **JBatik** is developed by applying the theory of fractals to identify the relationship between fractals and Batik and using L-System programming language [4, 5, 6]. Similar as Batik, Ulos is also assumed to have the concept of fractal patterns.

For that, we conduct a study to develop similar software that is able to generate new motifs of Ulos. L-System is a programming language which creates a pattern by making use of the looping concept. Therefore, L-System is used in this study to generate new patterns of Ulos as Ulos is proven to have repetition on its motifs.

This paper is organized as follows. In section 2, concept

of L-System and description of Ulos is given. In section 3, analysis and design of the software are explained. The implementation and experimental results using the software are presented in section 4. Finally, our work of this paper is summarized in the last section.

2. LITERATURE STUDY

2.1 L-System

L-System is a simple programming language that works on repeated substitution, used to produce an image of a pattern [7]. The programming language used is easy to learn and understand. L-System consists of several parts, namely an initiator or axiom, generator or detail, variable and symbols.

Axiom or initiator is a string containing symbols or variable is used as an opening initials. Variable is a compilation of some of the symbols to which the symbol contains elements can be replaced by other variables. The symbol has a constant nature that cannot be replaced with another variable. Production rules explains the rules used in changing the variables and symbols.

For example, there are two symbols A and F. A is set as an axiom with $A = FA$. As mentioned, L-System is a programming language that works with the substitution of repetition. Given the iteration number is 3, in the iteration-0, A will be the first initial. In the iteration-1, the first initial will be substituted so that the result will be FA. In the next iteration, A is also replaced so that the result of

the second iteration is FFA. Similarly, the result of the third iteration will be FFFA.

2.2 Ulos

Ulos is a traditional Batak woven scarf with certain dimensions of length and width [10]. The dimension is adjusted to its placement in the body: wrapped in the head (dililithon), laid on the shoulder (sampe-sampe or dihadang), or wrapped in the waist (diabithon). He classified Ulos as Batak traditional symbol in the form of artefacts (concrete).

Pardosi [8] defines Ulos as religious cloth with a mystical value. Hence, there exists some requirements and restrictions that are advised to be followed in the process of weaving. Details such as length and width have to be adjusted accordingly to bring peace and blessings; otherwise it might bring to death or bad luck.

Sihombing [9] also explains that Ulos contains religious values. Weaving process are begun with prayers, hope, imagination, knowledge, skills, and patience so that Ulos can be used as a medium to deliver prayers and wishes to God.

Most of the time, beside in Batak traditional ceremony, Ulos has also been used as gift to special people or guest to show the feelings of respect, care, or love, not restricted to Batak people only but for other ethics in Indonesia and also foreigners. Esthetic values are reflected from the beauty of Ulos patterns. Furthermore, nowadays, Ulos has also been initiated to be used in fashion in the form of dresses, shirts, and accessories.

In Fig 1, we can see the structure of Ulos, which consists of sides, centre, border between sides and centre, weft border and warp border [11].

According to Niessen [11], there are two principals of Ulos which is symmetric and tri-partition. Symmetric can be identified through vertical or horizontal layout of Ulos. Trip-artition can be identified through three different areas of Ulos which are: right side, centre dan left side, as shown in Fig 2.

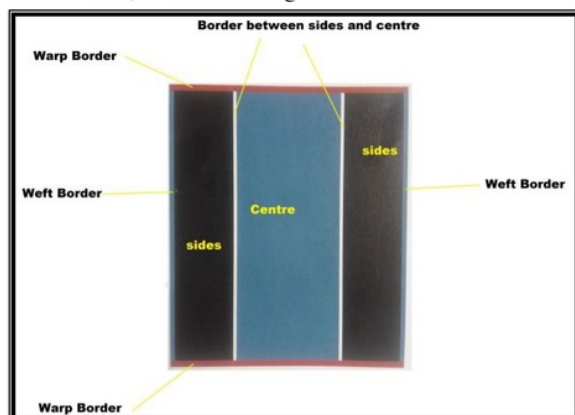


Fig 1. Structure of Ulos

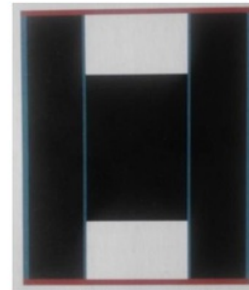


Fig 2. Layout of Ulos

Fig 3 shows the example of the application of both principals in Ulos. These principals contribute in designing the work-area of new pattern generation of Ulos.

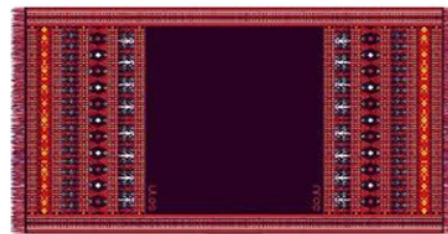


Fig 3 Example of Ulos with Symmetric and Tri-partition layout

2.3 JBatik

jBatik is a generative art software, aiming to generate new pattern of Batik [12]. jBatik is an innovation and addition to assist Batik craft-men to create various patterns of Batik.

It is developed based on the Batic Fractal algorithm, proposed by Lukman et.al. [6]. In their study, they apply Fourier Transformation and prove that Batik has a fractal characteristic, with dimension between 1 and 2. Fractal in batik shows the presence of complexity in traditional art. The presence of fractal in batik becomes the foundation for them to create a new algorithm to generate new patterns, which is called Batik Fractal. The method used for creating the pattern is L-System and Fractal Dimension. L-System is used to create pattern, while Fractal Dimension is used as a measurement tool for Batik Fractal to compare with traditional batik.

3. ANALYSIS, DESIGN, AND IMPLEMENTATION

3.1. Comparison of Batik and Ulos

Both Batik and Ulos are traditional clothes of Indonesia heritage. Both of them have various beautiful patterns that contain repetition concept. From this perspective, they can be considered similar. However, the production approaches are totally different. The patterns of Batik are drawn or printed on a piece of plain cloth. The printing can be implemented by a special traditional Batik drawing tool, called Canting, or can be printed either using Batik stamp or machine printing. However, Ulos is a woven cloth. It is woven by a weaving tool. Weaving is a method in which two distinct sets of yarns or threads are interlaced at right angles to form a fabric or

cloth [13]. The longitudinal threads are called the *warp* and the later threads are the *weft* or *filling*. Ulos, like other woven cloth, is usually woven on a *loom*, a device that holds the warp threads in place while filling threads are woven through them.

3.2. Customizing JBatik Into JTenu

As mentioned, Batik and Ulos share similar characteristics which is having repetitive patterns. Intuitively, JBatik is expected to be able to generate new patterns of Ulos. However, Ulos is produced differently to Batik. This leads to the customization of JBatik to be JTenu. The output of JTenu should be able to be translated on a *loom*, as set of yarns or threads interlaced at right angles, as *warp* and *weft* or *filling*, as explained in Section 3.1. Therefore, JTenu is expected to be able to generate new motifs of not only Ulos, but other Indonesian traditional cloth.

Accordingly, JBatik is modified to be JTenu by customizing following features:

1. Workarea

This part works as a screen to place the newly created motif. In JBatik, workarea is an empty/blank area. In JTenu, workarea is modified to have three rows and columns according to the tripartition concept that has been explained in Section 2.2. The layout of workarea can be seen in Fig 4.

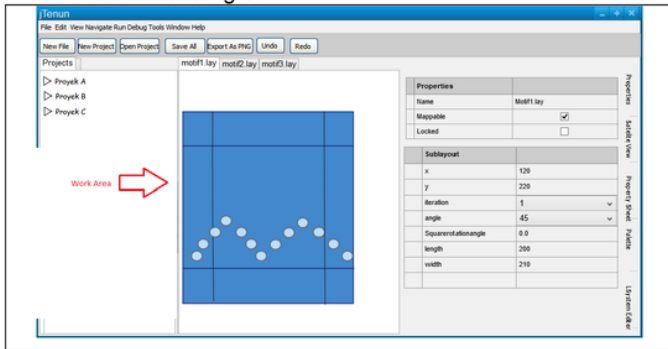


Fig 4. Workarea of JTenu

2. Property sheet

This feature aims to receive parameters from users or display the default parameters to create the new pattern. In property sheet, field text of iteration and angle are changed into combo box. The values of the iteration parameter are restricted to 1 up to 10. This is due to the result of pre-observation that Ulos patterns can only be created up to 10 iterations only. The angle values are restricted to special and regular angle values, such as 30, 45, 60, 90, 120, 150, 180, etc. This is due to the nature of how Ulos is woven so that the angle cannot be randomly and irregularly chosen. The layout of property sheet can be seen in Fig 5.

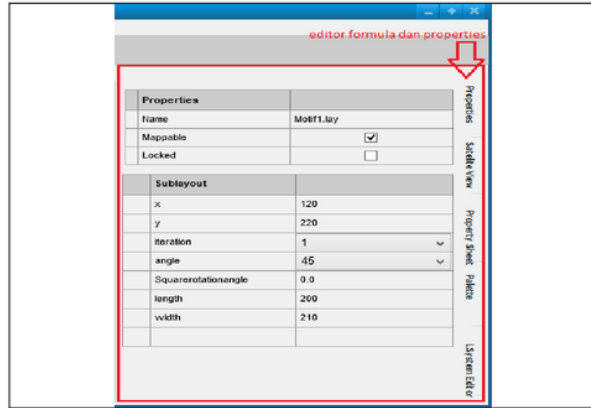


Fig 5. Property sheet of JTenu

Similar to JBatik, JTenu accepts parameters as inputs from users, as:

a. Iteration

This determines the number of iteration to generate the new pattern. As mentioned, the possible values for this parameter are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

b. Angle

Angle is a parameter to determine the angle of squares that will be filled with the patterns.

c. Length

This parameter determines the distance between the squares.

d. Width

This determines the width of the squares.

e. Axioma

Axioma is the first symbol that will be used by the JTenu.

f. Detail

Detail is used to replace the initial symbol (Axioma).

The generation of new pattern starts with the initialization of the parameters mentioned before. The formula of L-System is implemented in *LSystem Editor*. JTenu creates new pattern based on the formula of L-System.

JTenu is designed simple so that the user can freely enter the parameters and formulas. This allows the variation of new pattern generated. However, as mentioned, not all new pattern can be implemented as a woven cloth motif. Therefore, we give restriction to the parameters, as explained earlier. Table 1 shows some patterns generated by JTenu with various combinations Axioms, Details, Angles, Number of Iterations, Length, and Width.

Image	Axiom	Detail	Angle	Iteration	Length	width
	A	A=F- AF	2	8	330	330
	A	A=FA+ FFFFF F+FA	12	5	100	100




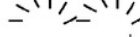


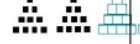
Image	Axiom	Detail	Angle	Iteration	Length	width
	A	A=FA+ FFFFF FFFFF F	117	10	300	200
	A	A=FA+ F+++F FF-- FFFF	70	5	350	300
	+(90)F	F=FF	90	2	100	100
	S	S=30F +F+F+ F+F+	30	1	100	100
	AX A X	A=F[F B]+A	30 90	10	100	100
	XW	W=F+(30)FX F X=F+(30)FX F	45	9	100	100
	F	F=FF	90	1	100	100

Table 1. Sample of Patterns Created by JTenun

4. EXPERIMENTAL RESULT

Based on the implemented patterns, the result can be combined in the workarea to be a whole cloth of Ulos. There are many patterns of Ulos as presented in [14], however motifs that can be generated by Jtenun at this stage, are Ulos Sadum, ulos Bintang Maratur, and ulos Ragidup. Followings explain several of our experiment results..

- Ulos Sadum



Fig 6 Newly Generated Ulos Sadum

Fig 6 shows one example of the newly generated of Ulos Sadum. Followings (shown by Fig 7) are evaluation result of new Ulos Sadum by some Ulos experts. Higher level reflects higher similarity.

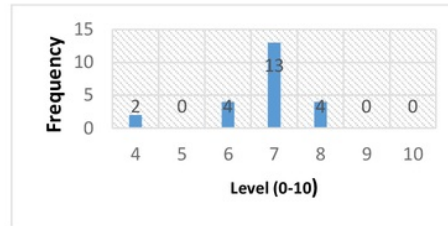


Fig 7. Evaluation result of Ulos Sadum

From Fig 7 we can see that most of experts value the results in the level of 7.

- Ulos Bintang Maratur

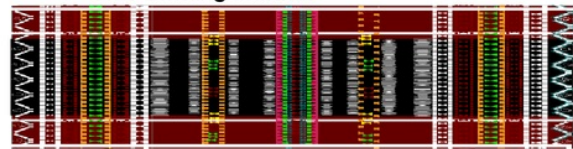


Fig 8 Newly Generated Ulos Bintang Maratur

Fig 8 shows one example of the newly generated of Ulos Bintang Maratur. Followings are evaluation result of new Ulos Bintang Maratur by some Ulos experts.

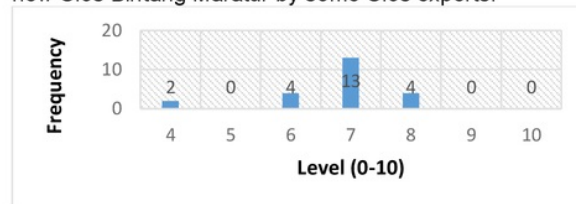


Fig 9. Evaluation result of Ulos Bintang Maratur

From Fig 9 we can see that most of experts value the results in the level of 7.

- Ulos Ragidup



Fig 10 Newly Generated Ulos Ragidup

Fig 10 shows one example of the newly generated of Ulos Ragidup. Followings are evaluation result of new Ulos Ragidup by some Ulos experts

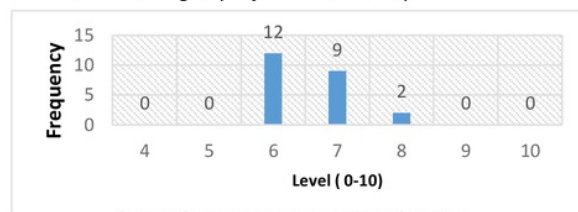


Fig 11. Evaluation result of Ulos Ragidup

From Fig 11 we can see that most of experts value the results in the scale of 6.

From the three groups of evaluation, we can see that most of experts give the value of 6 to 7 to the newly

created motif of Ulos. We consider that as a good initial result of JTenun with Ulos has a pilot case study.

5. CONCLUSION

In this study, we have customized JBatik to be Jtenun, to generate new patterns of woven clothes, with Ulos as a case study. The modifications have been made by:

- Restricting parameters angles and iterations to control the newly patterns to shape new patterns of Ulos.
- Changing the layout of workarea using the tri-partition concept so that the new pattern can be translated in loom, to be woven as Ulos.

As future work, it is worth to do more investigation on different combination of parameters to generate new patterns with higher similarity with the original pattern of Ulos. Further study and improvement of JTenun are also definitely necessary to expand the scope of JTenun's input to other Indonesian traditional woven clothes as other case studies.

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REFERENCES

- [1] Hengky, S. H, Image Analysis: Textile Industry in Indonesia. *World Journal of Business and Management*, 1 (1) (2015).
- [2] Ratna Panggabean. Sadum: Traditional and Contemporary. *ITB Journal Visual Art and Design*, 3 (2) (2009),167-174.
- [3] Muhammad Lukman, Dimas Yusuf Danurwenda. Parametric Software for Architecture: Creating Tools to Create Objects based on Traditional Patterns. *Proceeding Arte-Polis 5 International Conference on Creative Collaboration and the Making of Place*, Institut Teknologi Bandung, Indonesia, 2014.
- [4] Nancy Margried. Batik Fractal Community Creative Engagement Through Technology. *Proceeding Arte-Polis 5 International Conference on Creative Collaboration and the Making of Place*, Institut Teknologi Bandung, Indonesia, 2014.
- [5] Muhammad Lukman, Yun Hariadi, A. H Destiarmand. Batik Fractal: Traditional Art to Modern Complexity. *Proceedings of International Conference of Generative Art*, 2007.
- [6] Hariadi, Lukman Muhamad, Destiarmand Achmad Haldani. 2013. Batik Fractal: Marriage Of Art and Science. *Journal of Visual Art and Design*, 4(1) (2013).
- [7] Grzegorz Rozenberg, Arto Salomaa. *Lindenmayer System.: Impacts on Theoretical Computer Science, Computer Graphics, and Developmental Biology*, ISBN 978-3-540-55320-5.
- [8] Jhonson Pardos. Makna Simbolik Umpasa, Sinamot dan Ulos Pada Adat Perkawinan Batak Toba. *Jurnal Ilmiah Bahasa dan Sastra*, 4 (2) (2008).
- [9] T.M. Sihombing. *Jambar Hata Dongan Tu Ulaon Adat*. Tulus Jaya (1997).
- [10] Sumardjo. *Arkeologi Budaya Indonesia*. Yogyakarta: Qalam. (2002).
- [11] Sandra Niessen, *Legacy Of Cloth*, KITLV PRESS LEIDEN, 2009.
- [12] <http://www.jbatik.com>
- [13] William H. Dooley., *Textiles* (Project Gutenberg ed.), Boston, USA: D.C. Heath and Co. (1914), retrieved 30 October 2011.
- [14] Arlinta C. Barus, Anna Simanjuntak, Frans Panjaitan. Cultural Innovation of Ulos Pattern Heritage : Creative Campaign to Promote Tourism in Toba Highland. *Proceeding Arte-Polis 6 International Conference on Creative Collaboration and the Making of Place*, Institut Teknologi Bandung, Indonesia, 2016.

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