Ethnomathematics batik design Bali island

A Irawan¹, M Lestari¹, W Rahayu¹ and R Wulan¹

¹Program Studi Informatika, Universitas Indraprasta PGRI, Jl. Raya Tengah No. 80, Kel. Gedong, Kec. Pasar Rebo, Jakarta Timur 13760, Indonesia

E-mail: ari_irawan@unindra.ac.id

Abstract. Aims of this study is to make an application to detect Balinese batik that has an etnomathematics elements using backpropagation method and to observe etnomathematics elements on Balinese batik. This study using qualitative descriptive methods with ethnographical approach, literature study, and expert study on etnomatematics issues. This paper shows that in typical Balinese batik there are several elements in the transformation of mathematics that are translation, reflection, rotation, while in other batik shows dilation elements In addition from the ethnography there are elements of spiritual and distinctiveness of the Balinese society that upholds local culture values.

1. Introduction

Batik are characteristic Indonesian’s. It is been registered in batik UNESCO that were inherited the world. Batik is one of Indonesian heritages[1]. Batik has a long history, which began before the era of Raden Wijaya (1294 - 1309), the first King of Majapahit. During its development, style, motif, and color of batik is also influenced by the culture from outside, such as Hinduism, Islam, Netherlands, China, and Japan [2]. The batik industry needs serious attention and a strategic development plan [3]. Batik is very popular in Indonesia; even Malaysians once claimed it to be theirs. Batik has gained recognition worldwide, and it has been continuously developed to reach its current state [4]. Batik is also one thing that is mingled with other cultural. The fact that batik had been part of cultural exchange of international trade has allowed the transfer of batik techniques and applications to other countries in the Southeast Asia [5]. But batik that is in Indonesia at special Bali had design and characteristics of the very distinctive and sometimes have a fragrant odor that is contains elements of religious for some communities in Bali.

Ethnomathematics is a variety of the mathematical activity owned or flourish in the community, Covering mathematical concepts as in cultural heritage of a temple and inscriptions, Pottery and equipment traditional , A unit of local, Designs batik cloth and embroidery, traditional games, As well as settlement pattern[6]. Ethnomathematics is a concept, knowledge, study, or approaches that associate mathematics with culture [7]. Symbols and language they were using to communicate mathematically were different, the phenomenon they were dealing with was the same mathematics as we do [8]. Ethno-mathematics is one of math-elements which is exist inside of the surrounding society[9]. Ethnomathematics is a the science which used to understand how to mathematics adapted from a culture applicable to outside the class and Ethnomathematics may also be regarded as a program that aims to study how to students to understand , articulating process;, And finally use idea’s of mathematics, conceps, And practices that can solve problems with the activity of their daily[10]. One of the primary goals of ethnomathematics is to recognize the fact that there are different points of
view and to respect everyone’s right to choose their own. In other words, mathematics can assist in promoting tolerance in an era of abundance that lacks it [11]. D’Ambrosio looks at the cultural elements such as language, codes, symbols, values, and attitudes which characterise a particular practice [12].

Based on the above analysis cases the authors is aimed to preserve Indonesia culture heritage, Analyze ethnomatematika element which is found in each batik Bali design. In this time authors focus only on batik’s that have ethnomathematics element in the extent of design. The research was conducted in that culture in particular that is in Bali province can be collected and made the detection tools as introducing batik culture in Bali province that is one way to preserve cultural batik especially in Indonesia Bali to domestic and international tourists.

2. Method
In this study, data collection is done by using the ethnography principles that is observation, interviews, documentation, and field notes [13]. The methodology this is the qualitative description ethnography. An instrument used is a picture batik analyzed the ethnomathematics, Image processing on cloth batik made into a picture the point that is going to be in convert into computerized by using java netbeans.

![Flow chart](image)

**Figure 1. Flow chart**

3. Result and discussion
These findings authors there are some a batik typical Bali, But in a design not all his is ethnomathematics elements. Focus of this reasearch it is presenting what design batik Bali there was indeed ethnomathematics elements. Authors presenting various kinds of a batik typical that is in Bali province as seen in figure 1 that has been in imaging to see typical each design after in the extraction.
Figure 2. Design batik Bali and extracting

Of a great variety of a batik that was to become the samples to this research, hence authors do one of the examples was to analyze and extraction a picture or a design that is added to it’s batik cloth to be seen how etnomathematics element there are on design the batik is.Any fabric batik some have a design that contains elements of ethnomathematics there are also that does not contain ethnomathematics element, this is a normal since any design especially in Bali having the unique characteristics of in the form of natural shades, culture and religious which highly viscous at cultures the community Bali.

Figure 3. Ulamsari mas design

Design Ulamsari Mas itself is a coastal batik designs is on the island of Bali by a coalescence pictures fish and rice are the symbol of welfare.In terms of colour and pattern that is added to it’s batik set of Ulamsari Mas batik design it is not there is only on the island of Bali it will involve a at the region that have other forms likenesses and the pattern a picture of batik design.Ethnomathematics element that you can see from the batik is that element in the transformation.

Figure 4. Image cire design batik

Figure 5. Reflection and dilatation

Batik fabrics typical Bali had the characteristics of seen in various forms and a kind of cloth used the cloth Mori namely cloth used different than any type of batik fabrics other with weights heavier.Handmade batik design typical Bali having diversity designs and residents, in a batik Bali having more a predominant colour gold or a yellow colour.

Processing of thresholding image began the extraction and then it would be, through the extraction and the last step is executed is the introduction of batik design comparison will also be in various other batik design.From our analysis to the design of Bali etnomatematics batik when seen in the
extraction and seen the likenesses of each design. Having seen the resemblance will be determined names of each batik design.

Batik in Bali province has many design that there are several factors ethnematematics of the geometry. In this case so much design that is because of authors then authors just give designs that there is a ethnomathematics course, The application will be done testing using java Netbeans in doing extraction to obtain the introduction of a batik typical Bali by use application computer based.

4. Conclusion
Batik is a cultural heritage not because of the batik itself but because of the art in making the batik. The occurrence of the problem in claiming the batik culture is partly caused by the lack of arawareness of our nation on the importance of the batik culture preservation [14]. It is hoped the program the result of this research became one of the receptacle in preserve and introduce batik that are characteristic of and belonging to the people of Indonesia.

Acknowledgments
Thanks for DRPM Kemenristek Dikti. This research founded contract number 032/ KM/ TNT/ 2018, March 6th, LLDikti III, LPPM Universitas Indraprasta PGRI, Balidepartment of tourismand the province of Bali.

References
[1] Anugraha R A, Sutan W and Mufidah I 2015 The design of batik stamp tool scraping working table using ergonomics principles Procedia Manuf. 4 pp 543–551
[2] Putra R E, Suciati N and Wijaya A Y 2011 Implementing content based image retrieval for batik using rotated wavelet transform and canberra distance in Bali International Seminar on Science and Technology pp 1–5
[3] Novani S, Putro U S and Hermawan P 2014 An application of soft system methodology in batik industrial cluster Solo by using service system science perspective Procedia - Soc. Behav. Sci. 115 pp 324–331
[4] Rukayah R S, Adhi A and Hartuti S 2015 Asia pacific international conference on environment-behaviour studies public participation in branding road corridor as shopping window or batik industry at Pekalongan Procedia - Soc. Behav. Sci. 168 pp 76–86
[5] Sharifah I S S, Nurul A T B S T and Khairusshima M K N 2017 Thermal modelling and analysis of batik canting design Procedia Eng. 184 pp 326–333
[6] Zayyadi M and Subaïd M 2017 Eksporasi etnomatematika pada masyarakat Madura J. Sigma 2 2 pp 1–4
[7] Kusuma D A, Dewanto S P and Nurani B 2016 The role of ethnomathematics in West Java (a preliminary analysis of case study in Cipatujah ) Journal of Physics: Conference Series pp 1–8.
[8] Cimen O A 2014 Discussing ethnomathematics: Is mathematics culturally dependent? Procedia-Soc. Behav. Sci. 152 pp 523–528
[9] Lestari M, Irawan A, Rahayu W and Parwati N W 2017 Ethnomathematics elements in Batik Bali using backpropagation method Ethnomathematics elements in Batik Bali using backpropagation method ICOSMEE pp 1–9
[10] Fitrianawati M 2016 Ethnomathematics studies: Conserving local wisdom and mathematics Java community Proc. of The Second International Conference on Education, Technology, and Sciences: Integrating Technology and Science into Early Childhood and Primary Education pp 187–196
[11] Fouze A Q and Amit M 2018 Development of mathematical thinking through integration of ethnomathematic folklore game in math instruction Eurasia J. Math. Sci. Technol. Educ. 14 2 pp 617–630
[12] Nkopodi N and Mosimege M 2009 Incorporating the indigenous game of morabaraba in the
learning of mathematics South African J. Educ. 29 2005 pp 377–392
[13] Septianawati T, Turmudi and Puspita E 2016 International conference on recent trends in physics 2016 (ICRTP2016) Journal of Physics: Conference Series 755 pp 1–7
[14] Rangkuti A H, Rasjid Z E and Santoso D J 2015 Batik image classification using treeval and treefit as decision tree function in optimizing content based batik image retrieval Procedia Comput. Sci. 59 pp 577–583