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Research Paper

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Texture Analysis of Lombok Songket Fabric Image Using Feature Extraction Method

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Abstract— Songket cloth is a culture that must be preserved, Lombok is one area that has a center for songket craftsmen, songket fabrics in Lombok have various types, motifs and textures according to their respective regions. In this study, texture analysis was carried out to obtain the value between one songket cloth and another. The method used in this research is the feature extraction method of GLCM and Correlation Coefficient. The results of this study were the songket from Sade produced the same results between songket keker - songket pengginang = 0.987, songket keker - songket rarang = 0.96 and songket keker -ongket subhanale = 0.977. Whereas for the songket cloth originating from Pringgasela, the value between songket anteng - songket sempara rarely = -0.817, songket anteng -songket blue line = 0.959 and anteng songket - songket antique = 0.441. The Sukarara songket cloth produces the display value between the Sukarara songket keker - subhanale songket = -0.706, the songket keker voluntary - songket wayang = -0.892. The conclusion is that the proposed method can provide good feature extraction results.

Keywords— GLCM; Texture analysis; Correlation coefficient; songket Lombok cloth; Analysis

I. INTRODUCTION

Woven cloth is an Indonesian cultural heritage that is still developing today and should be preserved. Preserving woven fabrics is one of Indonesia's cultural heritage that can be done through the introduction of songket styles in Indonesia. The preservation of woven fabrics can be done in various ways, one of which is by preserving the very diverse patterns of woven fabrics. Woven cloth is an Indonesian cultural heritage that has been recognized by UNESCO as an international cultural heritage on October 2, 2009. The songket craftsmen center in Indonesia can be said that each region has its own characteristics. The patterns and motifs of each region have their own uniqueness, which makes tourists always interested in buying them.

Lombok woven fabrics come from the original Sasak tribe who lived in Lombok for many years. So it is not surprising that the typical Lombok weaving motifs are the philosophy of the Sasak culture. One of the centers for songket cloth in the Lombok area is Pringgasela District, East Lombok Regency. Songket fabrics in Lombok have many names and textures that vary from one songket name to another. However, when viewed, the texture of each songket has the same texture. In this case, it is necessary to analyze the texture of the songket cloth in Lombok. To distinguish various kinds of songket patterns automatically can be done with the help of a computer (computer-aided). This is based on taking the right characteristic of the songket, namely the texture characteristic [1]. To get the feature extraction value of the songket cloth, we first need to take a picture of the songket cloth.

In this research, the method used is the Gray Level Co-occurrence Matrix (GLCM). The reason for using the GLCM method for feature extraction method is because the GLCM method is better than other feature extraction methods [2]. GLCM is a statistical analysis for feature extraction in an image [3]. Research on the analysis and classification of textures on songket fabrics has been carried out by various methods and with different analysis results, even the classification of songket fabrics has been carried out using various methods such as Support Vector Machine (SVM) [4], Chain Code Algorithm [5], Content-Based Image Retrieval (CBIR) [6] and Backpropagation Neural Network [7]. Not only the texture is analyzed to get the classification value, but the motif on the songket cloth using Neural Network Backpropagation has also been done [8].

In this study, the analysis was carried out to obtain the extraction value on songket cloth using GLCM. Before the feature extraction stage was carried out, image acquisition, pre-processing, normalization, GLCM feature extraction, and correlation coefficients were carried out. The angle of the GLCM used is 0^0, the reason for using the angle 0^0 is that it gives good results [9], [10]. While the features used in this study are Energy, Correlation, Homogeneity, and Contrast. Correlation Coefficient is used to find the closest

value of an extracted image. The results of this study are, provide the results of the analysis of one songket cloth with another. The difference between this study and previous research is that it lies in the object, processing, and the combination of methods between GLCM and the correlation coefficient.

II. RELATED WORK

Based on observations during the design, implementation, testing, and system analysis processes, it is concluded that the batik image classification system is built through several stages of the process that converts RGB images into grayscale images, feature extraction uses BOF and SIFT and the classification method uses SVM. The system built has been able to carry out the process of identifying image type batik very well. Based on the results of the analysis obtained, the amount of accuracy is determined by the number of clusters or the number of appropriate vocabulary, because the appropriate number of clusters can describe the image well [4].

This research was conducted by processing the image by separating one songket motif from the other so that it can be obtained so that it becomes easily recognized and read by a computer. The mechanism used in this study utilizes existing algorithms that are well-known in image processing such as color image segmentation, binarization, cutting, object detection with mathematical morphology, contour tracking with more algorithms, and developing algorithm chain codes [5].

This study describes a combination method between local and global feature extraction methods. The feature extraction method for CBIR is MSCD. MSCD combines EMSD and GLCM as local and global feature extraction methods. According to the experimental results, the combination of local and global feature extraction methods can increase the precision effectively and significantly. Several checks have been carried out to determine the appropriate features that should be used to retrieve batik images, to achieve optimal performance [6].

The proposed extraction and classification methods can generate database chain code features. Showing the probability because the texture pattern does not depend on the size of the motif and the efficiency is used for texture-based motifs in the songket cloth pattern recognition process. The test results on 40 songket motifs show a good level of accuracy with a precision value of 98% and a recall value of 99% [8].

III. METHODOLOGY

A. Research Stages

The stages of this research can be seen in Figure 1, which includes: 1) Data Image Songket, 2) Image Acquisition, 3) Pre-processing, 4) Data Normalization, 5) GLCM Implementation, 6) Implementation of correlation coefficients.

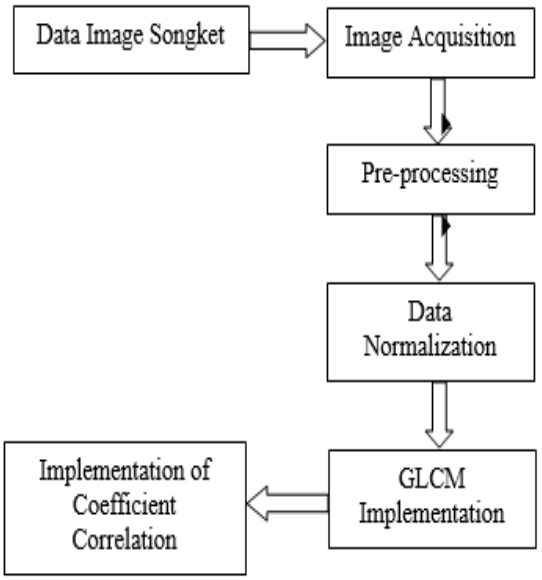

Figure 1. Research Stages

Here are the detailed stages of this research:

- Songket Image Data
  In this study, the data used were image data from songket cloth in Lombok. Songket image data was taken using a Cannon 600 D camera. The data used in this study used 11 types of songket cloth. Songket cloth is taken from 3 centers for craftsmen of Lombok's typical songket chains, including in the Pringgasela, Sade, and Sukarara areas.
- Image Acquisition
  Afterimage retrieval is carried out, it is then continued at the image acquisition stage. Image acquisition is carried out to distinguish each songket image that has been taken by giving a name to each songket.
- Pre-processing
  Pre-processing is done to change the original size of the songket image. The original size of the songket cloth image at the time of capture was 3456x2304 pixels, then converted to 800x800 pixels. Figure 2, Figure 3, and Figure 4 are examples of processed songket fabric images.

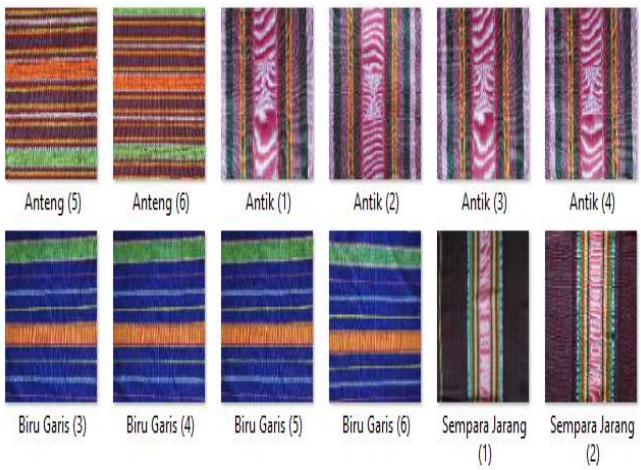

Figure 2. Pringgasela Songket cloth

Figure 3. Sade Songket cloth

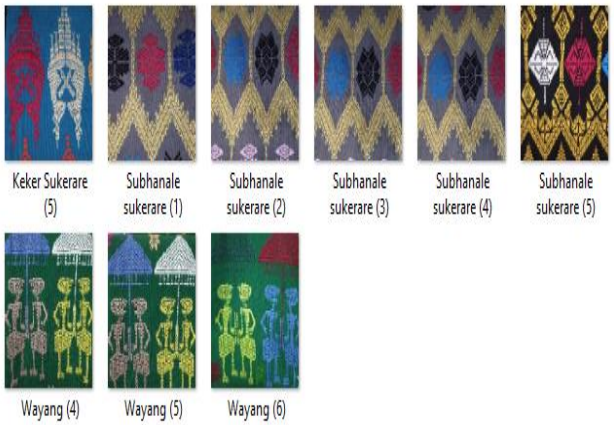

Figure 4. Sukarara Songket cloth

- Implementation of the GLCM

In this study, the method used in feature extraction from songket images is GLCM. The GLCM angle used in the study is 00, and the features used are Contrast, Energy, Homogeneity, and Correlation. Figure 5 is the direction of co-occurrence in a GLCM [9].

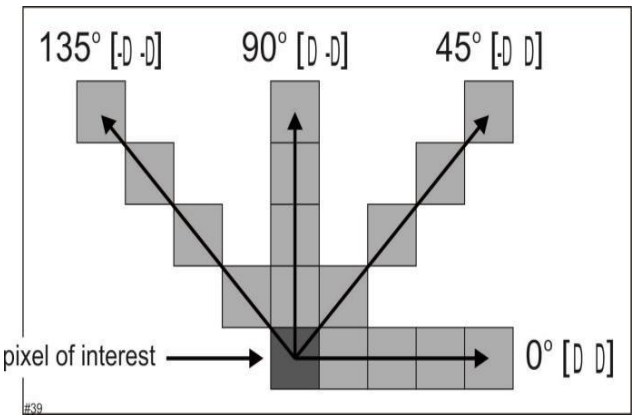

Figure 5. The direction of the GLCM

- Data Normalization

Normalization is done, namely to get the normal value of the feature extraction that is performed. From this normalized data, we will use it to determine the correlation distance between one image and another.

- Implementation of Coefficient Correlation

After all songket images were extracted using GLCM, then the value of the extraction was entered into the coefficient correlation method to get the closest value from one image to another.

B. Proposed Method

In this study, using the feature extraction method from GLCM, while to find the closest value using the coefficient correlation method. The results of this study, whether the songket images in Lombok have the same texture based on the images or not. The GLCM angle used is 00, and the GLCM features used are Energy, Contrast, Homogeneity, and Correlation.

Correlation $$\sum_{i}^{k}=1\sum_{j}^{k}=1\frac{(i-m_r)(j-m_c)\,p_{ij}}{\vartheta_r\,\delta_c} \quad (1)$$

Contrast $$\sum_{i}^{k}=1\sum_{j}^{k}=1(i-j)^2P_{ij} \quad (2)$$

Homogeneity $$\sum_{i}^{k}=1\sum_{j}^{k}=1P_{ij}^2 \quad (3)$$

Energy $$\sum_{i}^{k}=1\sum_{j}^{k}=1\frac{P_{ij}}{1+[i-j]} \quad (3)$$

IV. RESULTS AND DISCUSSION

In this study, the data used were 11 types of data in the form of images of songket cloth taken at the center of songket craftsmen in the Lombok area. Of the 11 types of image data the songket cloth used is different songket cloth and from different regions. The details are, 4 types of songket cloth in Pringgasela are called Anteng, Sempara Rare, Biru Lines and Antik, then 3 types of songket cloth in Sukarara with the names Keker Sukarara, Subhanale Sukarara and Wayang, while 4 types of songket cloth are taken from Sade with the names Keker, Pengginang, Rarang and Subhanale. All data were collected and then processed, then extracted using the GLCM method. Table 1 is the result of feature extraction on the songket cloth image.

Table 1. Implementation of the GLCM.

Songket name	Correlation	Homogeneity	Energy	Contranst
Anteng	0.9767	0.16011	0.00039	118.824
Sempara Jarang	0.86613	0.06916	0.00012	1025.64
Biru Garis	0.75045	0.04034	0.00015	1282.45
Antik	0.77972	0.04317	4.66425	1532.45
Keker Sukarara	0.93192	0.18549	0.00151	732.611
Subhanale Sukarara	0.89347	0.09672	0.00018	426.138
Wayang	0.88865	0.08374	0.00024	878.504
Keker	0.93956	0.12565	0.00024	376.127
Pengginang	0.94797	0.15142	0.00022	286.379

Rarang	0.7861	0.1491	0.00036	530.775
Subhanale	0.97522	0.18829	0.00025	87.9057

The extracted data is then normalized to get the normal value from the extraction. The results of the extraction produce data that is not normal, so the data needs to be normalized. Table 2 shows the normalization of the extracted data using GLCM.

Table 2. Data Normalization.

Songket name	Correlation	Homogeneity	Energy	Contrast
Anteng	1	0.80953	5.78886	0.02140
Sempara Jarang	0.51129	0.19479	0	0.64915
Biru Garis	0	0	6.43207	0.82693
Antik	0.12937	0.01912	1	1
Keker Sukarara	0.80207	0.98107	0.00029	0.44630
Subhanale Sukarara	0.63213	0.38107	1.28641	0.23414
Wayang	0.61082	0.29334	2.57283	0.54729
Keker	0.83584	0.57661	2.57283	0.19952
Pengginang	0.87301	0.75079	2.14402	0.13739
Rarang	0.15756	0.73511	5.14565	0.30658
Subhanale	0.99345	1	2.78723	0

After the data is extracted and normalized, then the coefficient correlation method is applied to find the closeness value between one songket image and another songket image. Table 3 is the result of the correlation coefficient that has been done.

Table 3. Correlation Coefficient

Songket name 1	Songket name 2	Correlation
Anteng	Sempara Jarang	-0.817
Anteng	Biru Garis	0.959
Anteng	Antik	0.441
Keker Sukarara	Subhanale	-0.706
Keker Sukarara	Wayang	-0.892
Keker	Pengginang	0.987
Keker	Rarang	0.96
Keker	Subhanale	0.977

V. CONCLUSION AND FUTURE SCOPE

In this study, the process of data collection, image acquisition, preprocessing, implementation of the GLCM method, data normalization, and implementation of coefficient correlation. Based on the analysis that has been carried out on 11 images of the songket cloth used, the GLCM method using angle 00 and 4 features of GLCM, namely Correlation, Homogeneity, Energy and Contras, is able to provide good feature extraction results, so it can give results that 11 images are used. have a close correlation value and even produce the same correlation value. In this case, the songket from Sade produced the same correlation between songket keker and songket pengginang = 0.987, songket keker and songket rarang = 0.96 and songket keker and songket subhanale = 0.977. Whereas for the songket cloth originating from Pringgasela, the correlation value for songket anteng and songket sempara rarely = -0.817, songket anteng and songket blue line = 0.959 and songket anteng and anteng songket = 0.441. As for the songket cloth in Sukarara, the correlation value between the songket keker Sukarara and the songket subhanale = -0.706 and songket keker voluntar and songket wayang = -0.892.

In further research, it is hoped that it can provide significant results related to the texture analysis of the typical Lombok songket, by applying other methods such as machine learning, artificial intelligence and others.

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REFERENCES

[1] I. Amalia, "Ekstraksi Fitur Citra Songket Berdasarkan Tekstur Menggunakan Metode Gray Level Co-occurrence Matrix (GLCM)," *J. Infomedia*, **vol. 3, no. 2, pp. 64–68, 2018**, doi: 10.30811/jim.v3i2.715.

[2] B. Pathak and D. Barooah, "Texture analysis based on the Gray-level co-occurrence Matrix considering possible Orientations," *Int. J. Adv. Res. Electr. Electron. Instrum. Eng.*, **vol. 2, no. 9, pp. 4206–4212, 2013.**

[3] P. Mohanaiah, P. Sathyanarayana, and L. Gurukumar, "Image Texture Feature Extraction Using GLCM Approach," *Int. J. Sci. Res. Publ.*, **vol. 3, no. 5, pp. 1–5, 2013**.

[4] R. Azhar, D. Tuwohingide, D. Kamudi, Sarimuddin, and N. Suciati, "Batik Image Classification Using SIFT Feature Extraction, Bag of Features and Support Vector Machine," *Procedia Comput. Sci.*, **vol. 72, pp. 24–30, 2015**, doi: 10.1016/j.procs.2015.12.101.

[5] Yuhandri, S. Madenda, E. P. Wibowo, and karmila@staff gunadarma ac id Karmilasari, "Object feature extraction of songket image using chain code algorithm," *Int. J. Adv. Sci. Eng. Inf. Technol.*, **vol. 7, no. 1, pp. 235–241, 2017**, doi: 10.18517/ijaseit.7.1.1479.

[6] A. E. Minarno, A. Kurniawardhani, and F. Bimantoro, "Image retrieval based on multi structure co-occurrence descriptor," *Telkomnika (Telecommunication Comput. Electron. Control.*, **vol. 14, no. 3, pp. 1175–1182, 2016,** doi: 10.12928/TELKOMNIKA.v14i3.3292.

[7] B. Imran and M. M. Efendi, "THE IMPLEMENTATION OF EXTRACTION FEATURE USING GLCM AND BACK-PROPAGATION ARTIFICIAL NEURAL NETWORK TO CLASIFY LOMBOK SONGKET WOVEN CLOTH," *J. Techno Nusa Mandiri*, **vol. 17, no. 2, pp. 131–136, 2020**.

[8] Yuhandri, S. Madenda, E. P. Wibowo, and Karmilasari, "Pattern recognition and classification using backpropagation neural network algorithm for songket motifs image retrieval," *Int. J.*

Adv. Sci. Eng. Inf. Technol., **vol. 7, no. 6, pp. 2343–2349, 2017**, doi: 10.18517/ijaseit.7.6.2200.

[9] B. Imran, K. Gunawan, M. Zohri, and L. D. Bakti, "Fingerprint pattern of matching family with GLCM feature," *Telkomnika (Telecommunication Comput. Electron. Control.*, **vol. 16, no. 4, 2018**, doi: 10.12928/TELKOMNIKA.v16i4.8534.

[10] Suharjito, B. Imran, and A. S. Girsang, "Family relationship identification by using extract feature of gray level co-zoccurrence matrix (GLCM) based on parents and children fingerprint," *Int. J. Electr. Comput. Eng.*, **vol. 7, no. 5, 2017,** doi: 10.11591/ijece.v7i5.pp2738-2745.

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