THE IMPLEMENTATION OF EXTRACTION FEATURE USING GLCM AND BACK-PROPAGATION ARTIFICIAL NEURAL NETWORK TO CLASSIFY LOMBOK SONGKET WOVEN CLOTH

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Abstract— The aimed of this study was to apply the feature extraction method of GLCM and Back-propagation Artificial Neural Network (ANN) to classify Lombok's typical Songket woven cloth by classifying based on the texture of the Songket woven cloth. Songket woven cloth in Lombok in terms of weaving and texture are vary from region to region. For example the songket woven cloth in Pringgasela Village, Sukarara Village and Sade Village has differences in texture and motifs. For this reason, this study focuses on classifying Lombok's typical Songket woven cloth by performing feature extraction on woven cloth using the GLCM method and the classification method uses Back-propagation Artificial Neural Network (ANN). For data collection, the data was taken directly from the Songket weaving centers in Pringgasela, Sade, and Sukarara. In the classification stage, the training data used were 64 data and 11 test data. Then the epoch used was 41 iterations with a time of 0:00:04, with neurons 80 and 100. The use of neurons 80 generated 18% which was successful in the classification. While using 100 neurons generated 100% successful which was can be classified. Based on the classification results obtained, the use of 100 neurons gained good classification results.

Keyword: GLCM, feature Extraction, backpropagation neural network

INTRODUCTION

Indonesia has many cultural heritages that must be preserved in the form of traditional clothes, such as songket, batik, and weaving. One area that has a variety of motifs, shapes, and textures of the songket is Lombok. Lombok is not only the center of the world’s attention for its natural beauty. However, the woven cloth which is produced by the societies has also become one of the centers of attention for tourists visiting Lombok. Lombok woven cloth comes from the original Sasak tribe who lived in Lombok for many years ago. So it is not surprising that the typical Lombok weaving motifs are the philosophy of the Sasak culture. Songket centers in the Lombok area such as Pringgasela, Sukarara, and Sade Village have different textures and motifs according to the characteristics of each region. Because there are various textures and motifs related to songket

Kata Kunci: GLCM, ekstraksi fitur, jaringan syaraf tiruan backpropagation.
Songket is a type of woven cloth known throughout Indonesia. The method of weaving and Songket motifs differs from region to region. People do not know much information about Songket motifs. This is because there is no good computerized data collection (Amalia, 2018), that distinguishes various types of Songket patterns automatically can be done with the assistance of a computer (computer-aided). This is based on taking the right characteristics of the Songket, which is texture characteristics (Soesanti, 2015). Classification of an object can be done indirectly by classifying the object's image based on its features. Some of the features that can be extracted from an image are color, shape, and texture (Setiohardjo, 2013). Texture in images can also be interpreted as images with natural textures (Imran, 2019).

Many methods are used to obtain accurate feature extraction results one of them is the GLCM method. Many studies have concluded that the GLCM method is better than other feature extraction methods (Pathak, B., & Barooah, 2013). GLCM is a statistical analysis for feature extraction in an image (Mohaniah et al., 2013). Various studies related to the classification of songket cloth have been carried out with various methods and objects used. Even the feature extraction of songket cloth using GLCM has been carried out using songket cloth objects from other areas by classifying the motifs of the songket cloth (Setiohardjo, 2013). Not only Indonesian songket cloth that has been objectified using the GLCM method, however, the Malay songket cloth has also been done by obtaining the GLCM results and PCM provides good recognition results (Gressiva., and Chandra, 2018). Not only textures and motifs that can be researched, but the pattern of songket cloth using the wavelet method also gets good segmentation results (Mauko, I., C., and Lukmetablaf, N., M, 2016).

Currently, the classification of songket motifs has been widely applied by various methods. In this study, the researcher tried to implement the feature extraction for the classification of Lombok songket motifs. The feature extraction method used is the Gray Level Co-occurrence Matix (GLCM) while the classification method used is the Back-propagation Neural Network, as for the features that will be used are 4 features, such as correlation, energy, homogeneity, and contrast. While the angle used is 0o, because angle 00 provides better extraction results (Imran et al., 2018). Data collection from this research is taken directly from the center of Lombok Songket cloth centers in Pringgasela, Sukarara, and Sade Village. The training data used in this study were 64 image data of Songket cloth that had been cropped according to the proposed size, 800x800 pixels. While the test data used in this study were 11 image data of Songket cloth.

**MATERIALS AND METHODS**

A. **Data Retrieval**

In this study, data collection was carried out in 3 areas of the Lombok Songket craft center. Places were used for data collection include Pringgasela District, East Lombok Regency, Sukarara Village, Jonggat District, Central Lombok Regency and Sade, Pujut District, Central Lombok Regency. From these three areas of Lombok songket craft centers, the three of them have different songket motifs and names that make the songket cloth of each region have its charm for tourists.

B. **Image Acquisition**

Image acquisition is carried out to classify the image data of the songket cloth that has been taken from various areas of the songket craft center. At the time the data was collected, the data was still random and the officers who carried out the data collection were also different. In this case, image acquisition is necessary. The grouping is done to facilitate the training process and testing process. Pre-processing

C. **Pre-processing**

Pre-processing is done to reduce the size of the image so that it is easier to extract the image. The initial image at the time of data collection is 3456x2304 pixels, so that from this size requires a long extraction time, therefore, in this stage, the initial image size is cropped to 800x800 pixels. This cropping step also needs to be done to find the best position of an image, because when data collection is not always at a perfect angle. In this process, the name of each songket is given in each region. This is because the names of the songket in each area of the craft center are different. Example: the songket cloth "Anteng" from Pringgasela and the songket cloth "Penginang" from Sade. Figure 1 is an example of a pre-processed songket.
The implementation of GLCM is carried out to obtain the value of the songket feature extraction results. GLCM is a method that can provide good extraction results (Suharjito et al., 2017). GLCM is a feature extraction method that uses texture calculations in the second-order, which takes into account two pixels of the original image, in Figure 4 in the direction of co-occurrence in GLCM (Surya, R. A., Fadlil, A., & Yudhana, 2017).

In this study, the GLCM method was used to extract the texture of the songket cloth as the object of research. The features used in this study are Contrast, Correlation, Energy, and Homogeneity (Suharjito et al., 2017).

GLCM has features that are used in providing extraction on images. Some of the features that can be extracted in GLCM are Contrast, Correlation, Energy, and Homogeneity. Energy calculates the total of each element squared. Contrast calculates the local variation of the GLCM gray-level. Contrast calculates the local variation of the GLCM gray-level. Correlation calculates the probability of concurrently occurred a pair of pixels. Homogeneity shows the distance distribution of the elements in GLCM. In a texture, there is usually repeated homogeneity, so this feature is most suitable for texture classification (Sari, 2018).

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Contrast
\[ \sum_{i=1}^{k} \sum_{j=1}^{k} (i-m_c)(j-m_c)P_{ij} \]  

Homogeneity
\[ \sum_{i=1}^{k} \sum_{j=1}^{k} P_{ij}^{2} \]  

Energy
\[ \sum_{i=1}^{k} \sum_{j=1}^{k} P_{ij}^{1} \]  

E. The Implementation of Back-propagation Neural Networks

The Implementation of Back-propagation Neural Network is used as a method in the image classification of songket cloth. Before the classification stage, songket images were extracted using the GLCM method. The classification method using the Backpropagation Artificial Neural Network is considered capable of providing a good classification of images (A. Kasim & Harjoko, 2014). In this study, the classification of the songket image cloth using the Back-propagation Neural Network. The implementation of the Back-propagation Neural Network can be seen in Figure 3.
Network. In the picture before doing the application, first, the image of the songket cloth must be extracted using GLCM, after that there is button testing to perform classification.

RESULTS AND DISCUSSIONS

A. The Implementation of GLCM

The implementation of GLCM was carried out to obtain the extraction value on the songket cloth which was used as the object. The features used are Correlation, Contrast, Homogeneity and Energy, while the angle used is angle 0°. Table 1 is the extraction result from the image of the songket cloth used.

| Nama Songket | Fitur GLCM       | Value  |
|--------------|------------------|--------|
| Anteng       | Correlation      | 0.9767 |
|              | Homogeneity      | 0.16011|
|              | Energy           | 0.00039|
|              | Contrast         | 118.824|
| Sempara Jarang| Correlation     | 0.86613|
|              | Homogeneity      | 0.06916|
|              | Energy           | 0.00012|
|              | Contrast         | 1025.644|
| Biru Garis   | Correlation      | 0.75045|
|              | Homogeneity      | 0.04034|
|              | Energy           | 0.00015|
|              | Contrast         | 1282.45|
| Antik        | Correlation      | 0.77972|
|              | Homogeneity      | 0.04317|
|              | Energy           | 4.66425|
|              | Contrast         | 1532.45|
| Keker Sukarara| Correlation   | 0.93192|
|               | Homogeneity      | 0.18549|
|               | Energy           | 0.00151|
|               | Contrast         | 732.611|
| Subhanale Sukarara| Correlation    | 0.93947|
|                   | Homogeneity      | 0.09672|
|                   | Energy           | 0.00018|
|                   | Contrast         | 426.138|
| Wayang        | Correlation      | 0.88865|
|              | Homogeneity      | 0.08374|
|              | Energy           | 0.00024|
|              | Contrast         | 878.504|
| Keker         | Correlation      | 0.93956|
|              | Homogeneity      | 0.12565|
|              | Energy           | 0.00024|
|              | Contrast         | 376.127|
| Pengginang    | Correlation      | 0.94797|
|              | Homogeneity      | 0.15142|
|              | Energy           | 0.00022|
|              | Contrast         | 286.379|
| Rarang        | Correlation      | 0.7861|
|              | Homogeneity      | 0.1491|
|              | Energy           | 0.00036|
|              | Contrast         | 530.775|
| Subhanale     | Correlation      | 0.97522|
|              | Homogeneity      | 0.18829|
|              | Energy           | 0.00025|
|              | Contrast         | 87.9057|

Source: (Imran & Efendi, 2020)

B. The Implementation of JST Classification

At this stage, the implementation of the Back-propagation Neural Network is carried out to classify the songket cloth used as an object. In the application used, Back-propagation JST performs a classification based on the results of the extraction using GLCM. At this stage, two stages will be carried out. Those are the training stage and the trial phase and using neurons 80 and 100. Figure 4 shows the training process using Epoch 41 iterations with a time of 0:00:04.

Whereas in Figure 5 is a graph of the process of back-propagation JST classification trials carried out, the data used at this trial stage are 11 pictures of songket cloth.

Table 2 is the result of the classification of trials conducted using neurons 80.
Table 2. JST Classification neuron 80

| Songket Name    | JST Classification Results |
|-----------------|----------------------------|
| Anteng          | Succeed                    |
| Sempara Jarang  | Failed                     |
| Biru Garis      | Succeed                    |
| Antik           | Failed                     |
| Keker Sukarara  | Failed                     |
| Subhanale Sukarara | Failed                |
| Wayang          | Failed                     |
| Keker           | Failed                     |
| Pengginang      | Failed                     |
| Rarang          | Failed                     |
| Subhanale       | Failed                     |

Source: (Imran & Efendi, 2020)

Whereas in Table 3 shows the results of trials using 100 neurons.

Table 3. JST Classification neuron 100

| Songket Name    | JST Classification Results |
|-----------------|----------------------------|
| Anteng          | Succeed                    |
| Sempara Jarang  | Succeed                    |
| Biru Garis      | Succeed                    |
| Antik           | Succeed                    |
| Keker Sukarara  | Succeed                    |
| Subhanale Sukarara | Succeed              |
| Wayang          | Succeed                    |
| Keker           | Succeed                    |
| Pengginang      | Succeed                    |
| Rarang          | Succeed                    |
| Subhanale       | Succeed                    |

Source: (Imran & Efendi, 2020)

CONCLUSION

In this study, 64 training data were used in the form of songket images taken from the pringgasela, sade and Sukarara areas. The test data used in this study were 11 data in the form of images of songket cloth. In the extraction process, GLCM uses angle 00 and uses 4 features, namely Correlation, Energy, Contrast and Homogeneity. In the classification stage using Artificial Neural Networks, the epoch used is 41 iterations with a time of 0:00:04, with neurons 80 and 100. After going through the classification stage using neurons 80, from the test data used were 11 test data, resulting in 18% that were successfully classified. While using neuron 100, from the test data used as many as 11 test data, getting 100% success can be classified. Based on the classification results that are obtained from the study, it can be concluded that the use of neurons 100 gets good classification results.

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