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Image Processing Technology for Motif Recognition Mandar Silk Fabric Android Based

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ABSTRACT
People have used traditional equipment to produce silk fabrics. From generation to generation, various motifs have been created, and along with its development, the sarong motifs are becoming increasingly diverse and almost similar to one another. In order to be able to distinguish objectively, a technological approach will be taken, considering that the accessibility of using smartphones is getting easier. The system design is based on Android, considering that the younger generation of smartphone users needs to be familiar with silk fabric motifs as a form of cultural preservation. The purpose of this research is to design an image processing technology that is able to identify the motifs and patterns of each silk fabric. This technology will help identify the names of each silk motif or pattern. Furthermore, this technology will contribute to and become a new way of preserving culture and customs. This study does not classify but only detects batik motifs based on color patterns. A total of 13 samples of sarong motif data were collected, each having 3 tests, namely distance, lighting, and angle, so that 39 samples of data were successfully inventoried. The bounding box technique is used for detection, and accuracy with ROC is considered sufficient to give good results. After that, the user interface design of the application system will be built based on Android so that it is easy to use at any time. To ensure the consistency of the detection results, the system calibration is carried out with lighting techniques and identification distances. The results showed that the accuracy value was 97%, the precision was 91% and the recall 1%. This shows that the system has worked well and has successfully detected objects properly well but with a large amount of data.

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1. INTRODUCTION

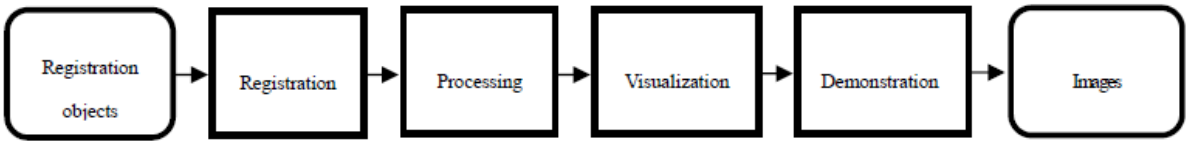
All regions in Indonesia have their own characteristics of batik motifs and silk fabrics with various meanings and their own unique history. Polewali Mandar Kapupaten is one of the areas that has a typical product of mandarin silk fabric. Several sub-districts in Polewali Mandar Regency are producers of silk fabrics, including Karama District, Tamangalle District, Tinambung District, and Pambusuang, which incidentally is done by women or housewives. People have used traditional equipment to produce silk for generations. As an original cultural heritage, which is a traditional wealth from various regions in Indonesia, silk cloth is a must and must be maintained and preserved [1]. One form of preservation is carried out by utilizing information technology as a cultural development strategy in the era of digital technology when it also poses a challenge to the existence of cultures in Indonesia [2]. Various technologies have been applied to culture, such as augmented reality technology used to preserve Papua's traditional culture [3]. In addition, there is also research on pattern

recognition in batik motifs by classifying them using the CNN method with the Resnet architecture [4]. In addition to preservation using information technology, strengthening knowledge among the community must also be carried out. The condition of the community makes it difficult to distinguish silk fabric motifs because of the similarity of patterns or motifs. On the other hand, human nature is limited in recognizing objects, so the many variations and innovations in motif designs by silk craftsmen result in frequent errors in identifying the type of pattern on batik motifs or silk fabrics. This is one of the existing problems and is closely related to the preservation of silk fabrics. Another problem is related to the identification of names and motifs of silk fabrics, namely that conventionally using manual observations with the senses of sight and touch, most laypeople make mistakes in naming fabrics. Some people who understand silk will have no difficulty identifying the motifs, but for people who don't understand silk, this method is certainly less informative. [5]. In addition, the development of texture patterns on silk fabrics is also progressing along with the increasing creativity of silk craftsmen [1]. This research will apply image processing technology to identify types and motifs of silk fabrics, bounding box techniques, and image conversion for pattern identification and ROC for accuracy of detection results.

Technology must be used as a tool to maintain culture. Image processing technology to recognize patterns in silk fabric motifs must be implemented and introduced to the community, especially the younger generation, so that it not only provides a new way for the younger generation to get to know culture but also contributes to the preservation of local customs and culture. The creation and use of digital content is a broad area of human activity, changing human mentality, culture, ways of education, and so on so that new ways of preserving culture are formed [5]. The application device can also be used as a learning medium in schools and as a tourist guide to help identify the types of silk fabric motifs.

The purpose of this study is to implement android-based image processing technology to identify the types and motifs of silk fabrics. The application will use the bounding box technique to identify patterns of silk fabric motifs while for detection accuracy, it will use ROC. The focus of this research is on the ability of the system to recognize a typical Mandar Sarong motif.

Various information technologies are used to preserve culture and, in general, are the creation of content by highlighting cultural material objects [5] One of the most widely used fields is image processing [6] or image processing, such as detecting fabric patterns using the Gabor filter method to help identify Sasirangan batik based on texture features [1]. Also, classification of batik motif recognition based on image retrieval with an accuracy of 44.44% An application of Trenggalek batik pattern recognition using Sobel edge detection and the Kmeans algorithm with 80% detection success [7], In addition, the results of feature extraction of grayscale images that have been enhanced with contrast then used the Canny edge detection technique to separate the batik motif from the background and obtain the pattern from the batik motif [8], An image processing approach to counting cells in microalgae culture [9], In addition, an image processing technology in computer vision has succeeded in detecting fish weight [10]. Several studies that have been described have shown that image processing technology is able to make the process of visual identification of woven fabrics faster and more accurate [11].



The ability to distinguish an object from other objects beyond human visual abilities is what a computer machine is trying to imitate, which is called computer vision, namely input in the form of an image of the object to be identified, processing the image, and providing output in the form of a description of the object in the image. Here we present the process and stages of detecting patterns in silk fabric motifs. To find out the name or type of silk fabric motif, the following steps are carried out:

1. Take a picture from the camera.
2. Transforming RGB images into grayscale images
3. Applying edge detection to grayscale images using the Canny method and the Contours and threshold features from Image Processing theory.
4. Elimination of contour that has a small area because it is only considered as noise.
5. Find the bounding box for each contour.
6. Match the detection results to the database image
7. Display the results on the Android mobile device interface.

Mandar silk fabrics (Lipa Saqbe Mandar) basically have similarities with silk fabrics in other regions, but each has special characteristics both in terms of patterns (sureq or flowers) and the method of

making silk fabrics. The pattern model has its own meaning, so it cannot be made arbitrarily because each has its own designation based on economic, socio-cultural, and religious standards, as well as one's social strata.

Currently, there are 2 types of Lipa Saqbe when viewed from the motif, namely "Sure" and "Flowers." The difference is, Sureq is lipa saqbe, which is the original motif of the mandarin silk sarong. Its characteristics are that it does not have decorations or flowers that make it stand out. Meanwhile, Bunga is a lipa saqbe that has motifs and decorations in the form of flowers or others that are derivatives of Sureq so that the lipa saqbe looks more beautiful. Some patterns of mandarin silk fabric can be seen in the following picture 2.


Corak Sureq 99


Corak Suerq Pangulu


Cora Surek Aropo


Corak Sureq Padada

Figure 2. Samples of Mandar Silk Sarong Motifs

The characteristic feature of mandar silk is the patterned motif (sureq) in the form of vertical and horizontal crosses of threads that cut each other to form squares of thread used, each color has been prepared according to the motif to be formed. Different areas of the box indicate different sureq, so making a silk sarong must be done with careful calculations and planning. For example, sureq pangulu in one box intersects between vertical and horizontal lines, there are 15 squares and they have filled with smoother squares [12] The use of color in each sureq will reflect the type of motif or sureq [13] and during the royal era, color became a determinant of social strata people using. The naming of sureq silk motifs is based on the social and cultural conditions of the mandar, as well as on the titles of nobility during the royal period [12]. There are 13 types of motifs or sureq mandar silk fabrics, including the following:

1. Sureq Pangngulu: The oldest and classic Sureq
2. Sureq Puang Lembang: used by royalty, distinctive colors are dark red, brown, purple black
3. Sureq Puang Limboro: used by the adat council
4. Sureq Maraqdia: Pattern of four squares filled with vertical and horizontal lines
5. Sureq Padzadza (parare): used by noble women
6. Sureq Penja: Name of fish species, used by coastal communities or coastal areas
7. Sureq Tembang: The name of a type of fish, widely used by fishing communities and families
8. Sureq Flag: Widely used among scholars.
9. Sureq Beruq-beruq: Fragrant Jasmine
10. Sureq Batu Dharma: Pomegranate with clear seeds
11. Sureq Gattung Layar: The sail of a hanging boat
12. Sureq Lowang Luas: The joy and joy of mandar land
13. Sureq Maranning: Small squares with thin lines

2. RESEARCH METHOD

2.1. Research Stages

The research stages as Figure 3.
Described Figure 3 in table 1.

Table 1. Methods and Indicators at the Research Stage

Research Implementation	Approach Method	Indicator
Preliminary Data Collection	Observation and Interview directly with silk fabric craftsmen	Data Inventory Type Silk fabric motif
Data analysis	13 Samples of silk fabric made into the database	My SQL databse Data Plan
1. Android Mobile Application 2. System Framework	Sketch method and usabiliy concept	- Prototype Desain User Interface - Information System Functionality
Compiling Program Algorithms	Pre-processing, processing (bounding box)	- Image result detected
Testing and Calibration	Blackbox as well as testing using light intensity at night and during the day	- System test results - Percentage of System Calibration Result

Research Implementation	Approach Method	Indicator
System Accuracy	ROC yaitu precicion, accuracy, recall	Percentage of the results of the accuracy of each indicator

2.2. Pseudocode Deep Leraning With Tensorflow

Image identification capability in this application uses tensorflow. The pseudocode for implementing Deep Learning with Tensorflow is as follows

```
import 'dart:async';
import 'dart:typed_data';
import 'dart:ui' show Color;
import 'package:meta/meta.dart';
import 'package:flutter/services.dart';
class Tflite {
static const MethodChannel _channel = const MethodChannel('tflite');
static Future<String> loadModel({
 @required String model,
 String labels = "",
 int numThreads = 1,
 }) async {
return await _channel.invokeMethod(
'loadModel',
{"model": model, "labels": labels, "numThreads": numThreads},
```

1. The processing of the data base is carried out in 3 stages, namely: the program will load the training data (Glove data taken through the camera).
2. The program will Training data according to the given parameters such as epoch, Learning Rate and Activation medhod.
3. If the training process is complete, the program will be tested using a testing image (taken via a ready-made android application camera) then compare the existing knowledge base.

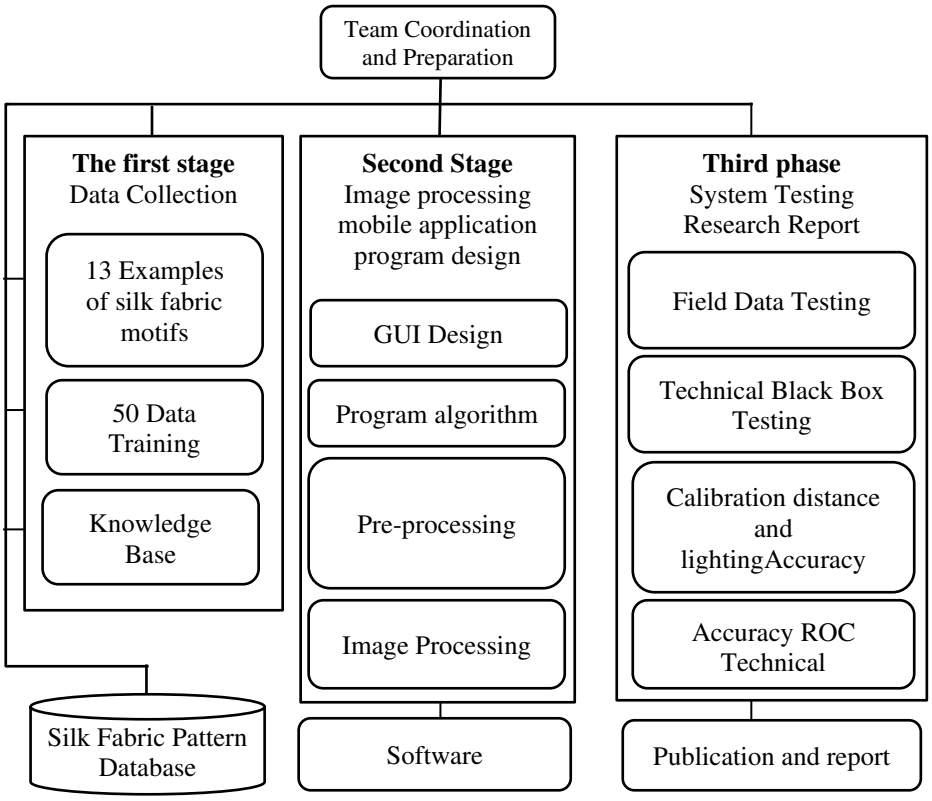


Figure 3. Research Stage

2.3. Data Collection

The data for this study, in the form of 10 samples of silk fabric motifs, was obtained directly from several silk fabric craftsmen in the weaving village of Tamangalle Village, Balanipa sub-district, Polewali Mandar Regency. Besides that, several references from previous research journals and supporting books were also used.

In order for the system that was built to easily identify the motifs of the cloth or silk sarong, 13 data points will be tested in 3 ways, namely based on lighting, distance, and angle, so that the total number of samples that have been successfully detected is 39 as training data. So that the system built can easily identify the motif of the silk cloth or sarong, the above data will be used as training data in the application. Besides that, a role base is also made according to the characteristics of the mandar silk fabric. The hallmark of mandarin silk is a patterned motif (sureq) in the form of vertical and horizontal crosses of threads that cut each other to form squares of thread. Each color has been prepared according to the motif to be formed. Different areas of the box indicate different sureq, so making a silk sarong must be done with careful calculations and planning. For example, sureq pangulu in one box intersects between vertical and horizontal lines, there are 15 squares, and it is filled again with finer squares [1]. The use of color in each sureq will reflect the type of motif or sureq [2] and during the royal era, color became a determinant of the social strata of the person using it

2.4. Detection and Accuracy

After making sure the research data is ready to be processed, the next step is to identify the glove object and convert the RGB image to Grayscale using the formula (1) as follows:

$$f_0(x) = \left(\frac{f^R(x,y)+f^G(x,y)+f^B(x,y)}{3}\right) \quad (1)$$

The identification results will be tested for accuracy to determine the application's ability to identify silk fabric objects and to find out what affects the application in identifying motifs [3]. The accuracy of the application using the ROC method. Accuracy is done by considering the smartphone camera device used to calculate accuracy and precision in a designed method or program. The matrix and the predicted value are based on table 2.

Table 2. Matrix of values and prediction results

Detection	Object Not Object	
Detected	TP (True Positive)	FP (False Positive)
Not Detected	FN (False Negative)	TN (True Negative)

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} \quad (2)$$

$$\text{Precision} = \frac{TP}{TP+FP} \quad (3)$$

From Table 2. there are several numbers that can be analyzed. The table consists of two data, namely class data generated from classifer (Detect) and original class data that have been known. There are four possible outcomes of the classifer. If the system accurately detects the number of objects according to the actual situation, it is called True Positive (TP), but if the system detects the object incorrectly, it is declared False Positive (FP), while False Negative (FN) is a situation that does not detect the desired object, while True Negative (TN) is a value when the system does not detect an unwanted object.

3. RESULTS AND ANALYSIS

3.1. Object Accuracy

Based on the results of testing using an application device with 39 data used as training data, it obtained 39 (True Positive). There are 4 data errors (False Positive), while the TN (True Negative) and FN (False Negative) values are 0.

Table 3. Testing Accuracy

True Value	
True	False
39	4
0	86

For the calculation of accuracy and precision using formulas (3) and (4). Form Scan fabric pattern 4128 x 3096 with Android 9 version with the formula:

$$\textit{Accuracy}\ \text{IMP} = \frac{TP+TN}{TP+FP+FN+TN}$$

$$= \frac{39+86}{39+4+0+86} = \frac{125}{129}$$

$$= 0{,}969$$

$$= 97\%$$

Then the results of the actual value accuracy of the production results on the ROC are 97% objects can be detected properly at a certain focus [4]. While the precision value shows a truly positive detection result or detects according to facts.

$$\textit{Precision} = \frac{\text{TP}}{\text{TP+FP}}$$

$$\textit{Precision} = \frac{39}{39+4} = \frac{39}{43} = 0{,}907 = 91\%$$

$$\textit{Recall} = \frac{\text{TP}}{\text{TP+FN}}$$

$$\textit{Recall} = \frac{39}{39+0} = \frac{39}{39}$$

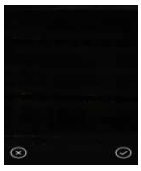
$$= 100\%$$

From the calculation results, the accuracy value is 97% and the preccion value is 91%, this shows that the system is working well and successfully detects objects well. but when viewed from the recall results obtained a value of 1 or 100%. This indicates that the system can only process very small amounts of data or cannot process large amounts of data.

3.2. System Testing and Calibration

The test is done by considering the level of brightness or light intensity that can affect the quality of image capture. At this stage the researcher will test the system in several conditions, namely bright, low light and dark with an accurate distance of 20 cm. As the test results from the distance that has been done. The table below shows the results of the condition test on the system.

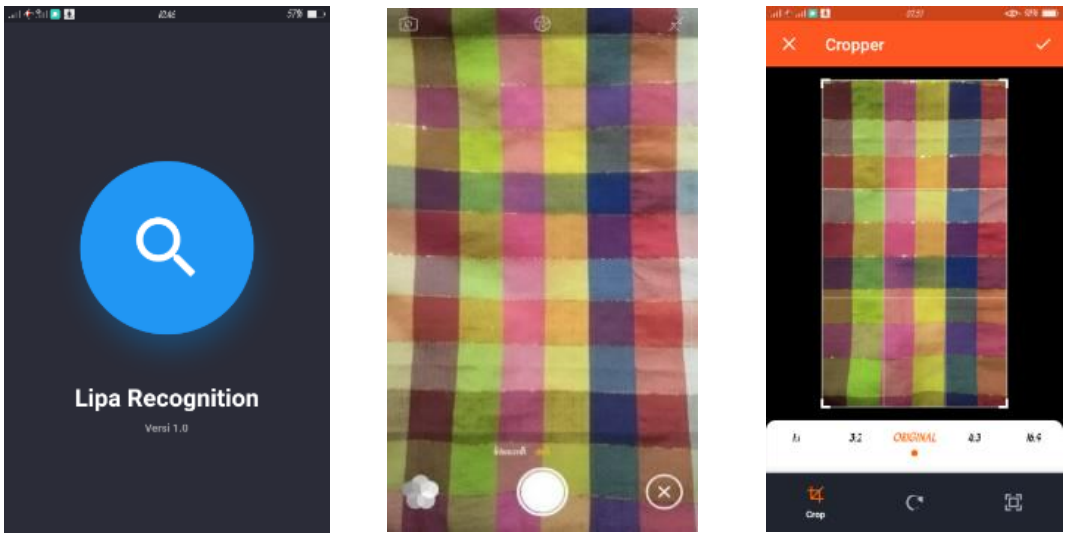
Table 4. Test Results Based on Light Intensitya

No	Condition			Persentage (%)		
	Bright	Low Light	Dark	Bright	Low Light	Dark
1				99%	91%	0%
2				99%	99%	0%
3				92%	99%	0%

No	Condition			Persentage (%)		
	Bright	Low Light	Dark	Bright	Low Light	Dark
4				99%	86%	0%
5				96%	81%	0%
6				95%	84%	0%
7				99%	85%	0%
8				99%	83%	0%
9				99%	84%	0%
10				99%	83%	0%

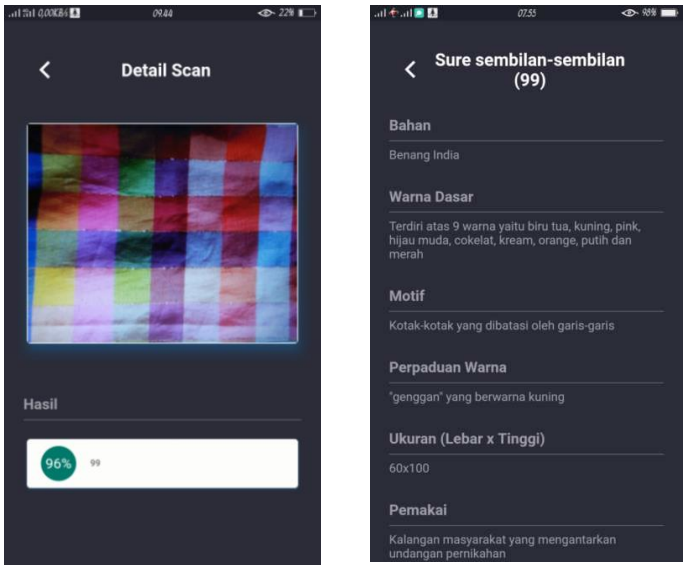
3.3. User Interface Design

The form in Figure a is used by the admin user to access the fabric pattern system, b is taking pictures of cloth, and picture c is the display of the results of the cloth image which is then cropped. In this form there are several options for setting the Image display, namely: Crop, Rotate, and, Full layer, to display the image in full screen mode, "X" to return to the previous menu and "√" to continue to the next menu.



(a) (b) (c)

Figure 4. Application User Interface



(a) (b)

Figure 5. Results of Application Identification

The form in Figure 4 is used to view the detailed results of the fabric pattern scan. This form displays the Fabric Image, and the Fabric Scan Process in the form of a percentage starting from 0% to 100%. Figure 5 (a). Shows a detection result of 96%. Sureq type silk fabric 99, and picture (b) is a detail of the identity of the sarong that was detected which contains information on the name of the pattern or suraq, material, basic color found on the fabric, the motif used, the size of the motif, and the circle. Wearers of cloth that have been in the form of a typical Mandar Sarong. To see accuracy, direct system testing was carried out, researchers tried to detect objects that were not gloves, in this case tables on paper to see the percentage results shown by the system built.

4. CONCLUSION

The designed Image processing technology has contributed and become a new way for the community to preserve culture and customs, objectively distinguishing various types of mandar silk fabrics that are increasingly creative and increasingly diverse. Based on the results of accuracy, the obtained value is 97% and the precision value is 91%. These results indicate that the system is feasible to use and has shown the best results, however, the system is still a simulation and can only detect a small amount, this is indicated by the

recall value of 1%. In order to optimize the performance of the image processing application, a camera with a high sensitivity level and a large amount of training data and other machine learning methods can be used. The results of the performance measurement of the designed system should use three parameters, namely accuracy, precision and recall to detect bias as in this study. This app can be a good idea for tourists or people who run cultural museums in Polewali Mandar. It can also be a good way for students to learn during a pandemic.

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