Journal of Software Engineering, Information and Communication Technology (SEICT)

Journal homepage: https://ejournal.upi.edu/index.php/SEICT

Image Extraction in OpenCV Using the Local Binary Pattern Method

Nani Sarah Hapsari[1], Yenni Fatman[2], Bambang Sugiarto[3]*

[1,2]Program Studi Teknk Informatika, Universitas Islam Nusantara, Indonesia

[3]Badan Riset dan Inovasi Nasional, Indonesia

Correspondence: E-mail: yennifatmandosen@gmail.com

ABSTRACT

This research aims to implement the Local Binary Pattern (LBP) method for image extraction in OpenCV software. This method separates the objects' characteristics in the image to be recognized accurately. The research process involves stages of device configuration, image data preprocessing, and implementation and evaluation of extraction results. The research results show that the LBP method produces images with various patterns, such as grayscale, the original LBP shape, and other variations. This study also discusses the application of edge detection, histogram, thresholding, and equalization for image processing. Implementation of this method opens up opportunities for further development in various areas, including object identification, video, and wood imagery.

ARTICLE INFO

Article History:
Submitted/Received
20 October 2024
First Revised 01 November 2024
Accepted 15 November 2024
First Available online
26 December 2024
Publication Date
26 December 2024

Keyword:
Image Extraction,
Local Binary Pattern,
OpenCV,
Image Processing.

1. INTRODUCTION

Imaging engines can work with images from unsuitable sources or cannot be captured by direct human vision. In other words, digital image processing comprehensively depicts components and uses.

Image processing technology makes it easier to enter fields such as industry, medicine, agriculture, geology, marine, and so on, providing extraordinary progress. In the future, the application of digital image processing technology will continue to expand, challenging practitioners and researchers in this field (Rivan 2020).

Developing technologies such as computer vision and image processing enable computers to detect and recognize digital images (Abdi, Kusrini and Kurniawan 2022). One example of the digital image detection process is feature extraction. Feature extraction is the stage of the process of separating characteristics from objects in an image that you want to recognize from other objects (Mutaqin 2018).

Many extraction methods can be implemented into image pattern recognition (Azwar 2017). In its implementation, this research uses feature extraction using the Local Binary Pattern method. Local Binary Pattern is a binary code that describes an image texture pattern that is built with a boundary environment with gray values from the center (Amat, Sari and Ningrum 2017).

An image combines points, lines, planes, and colors that are useful for depicting something. Images have various characteristics, each of which they have (Magdalena, et al. 2021). One way to identify an image is through the pattern depicting the target object.

However, the facts from this explanation are sufficient for the author's needs. Therefore, the author is interested in experimenting with images to obtain specific data and information. By title, "Image Extraction in OpenCV Using the Local Binary Pattern Method."

2. METHODS

The method used in this practical work report is as follows:

2.1. Research Methods

The method used to complete this research was qualitative research. According to Bogdan and Biklen, S. (1992:21-22), qualitative research produces descriptive data in speech or writing and the behavior of the people being observed. Qualitative research aims to understand social reality from the participant's perspective (Malahati, et al. 2023). This understanding is not determined in advance but is obtained after analyzing the social reality that is the focus of the research. These are the stages:

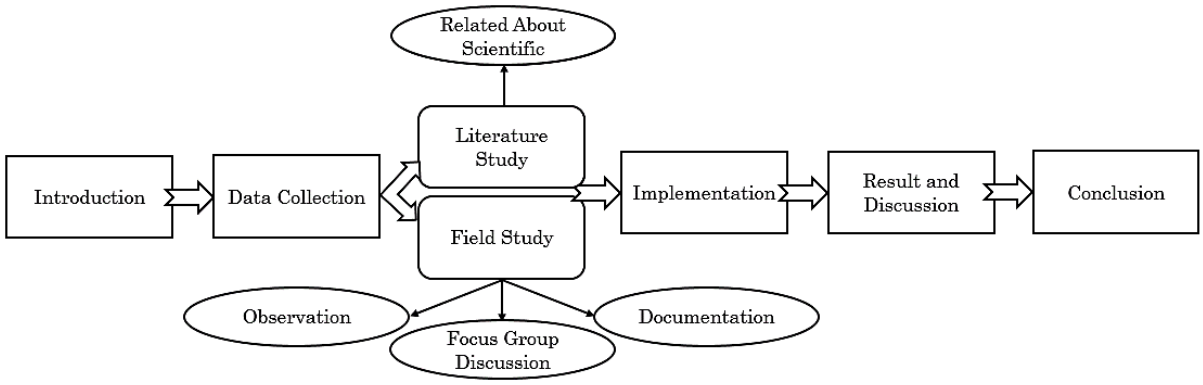

Figure 1. Qualitative Method Research Stages

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

1. Introduction. The introduction to this research explains the background of a topic discussed, including an overview, problems, limitations that need to be applied, and efforts that must be made.
2. Data Collection. This data collection aims to obtain relevant information or facts to answer research questions, and the data collected is qualitative.
3. Implementation. Implementation at this stage is a form of applying the information that has been obtained so that it provides a real solution or plan in its implementation.
4. Results and Discussion. The results of this research are in the form of other image objects that are different from the original image, which are used as findings to present. This discussion interprets, analyzes, and explains the research results that have been found.
5. Conclusion. This conclusion contains an overall picture and the main things discussed and improvements that need to be made from the discussion to provide answers to the problems that occur.

2.2 Data Collection

To obtain accurate and reliable data and information in research, the author must carry out an appropriate method. The data collection methods collected by the author include: (I. W. Ramdan 2018):

1. Literature study is a data collection technique carried out by the author studying books, scientific works, library collections, scientific journals, scientific articles, and internet sources that are closely related to the problem studied in this writing, associated with OpenCV, extraction, local binary patterns, images, visual studio, and others.
2. Field study is a data collection technique by the author that directly examines the object being studied. This method is divided into 3: observation, focus group discussion, and documentation.

2.3 Image Extraction Implementation

The implementation of image extraction consists of several results, namely four different image forms from each extraction, implementation of the method used in a series of programs on a device, and use of the method using the built-in open computer vision (OpenCV) library (Bradski, G 2000), (OpenCV 2019).

3. RESULTS AND DISCUSSION

3.1 OpenCV Configuration in Microsoft Visual Studio

In this open computer vision configuration, there are several stages, including (Pamungkas 2017):

a. Initial Configuration Preparation

In the initial preparation for configuration, the activities carried out are collecting the materials needed to carry out the configuration, starting from hardware, and software, to image extraction requirements.

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

b. Device Configuration

Device configuration, namely downloading the OpenCV library with version 2.4.10 and the media interface using Microsoft Visual Studio 2013, installing OpenCV and Microsoft Visual Studio 2013 on the laptop, and placing the OpenCV version 2.4.10 file in a directory that is easily accessible.

c. Setting Library and Path

Setting the library and path is by calling the library and moving the focus to the Linker, browsing the storage directory to find the library, entering the library supporting OpenCV and Microsoft Visual Studio 2013 in the Linker, entering the library names, setting the path by searching on the laptop namely using the keywords "System Environment." Then go to Environment Variables, look for the path, and enter the library call storage directory on that path.

d. Software Interface Implementation

This interface is implemented by displaying the Microsoft Visual Studio worksheet first, adjusting the project file storage to make it easier to search and use the directory, adding worksheets, and then entering coding or codes for the initial display interface to ensure the project has been completed. Operated, compile shows that the coding has no errors, and a console will appear. This console processes the information to be displayed (loading) and ends the displayed image process.

Figure 2. Software Interface Experiment Results(Source: Instagram,2018)

3.2 Image Ekstraction Process

Several stages must be followed in extracting image features, namely as follows :

1. System Overview

The Local Binary Pattern extraction process based on Microsoft Visual Studio is limited to image extraction and displays the resulting images in different shapes. A general overview of the system being built is in the following picture:

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

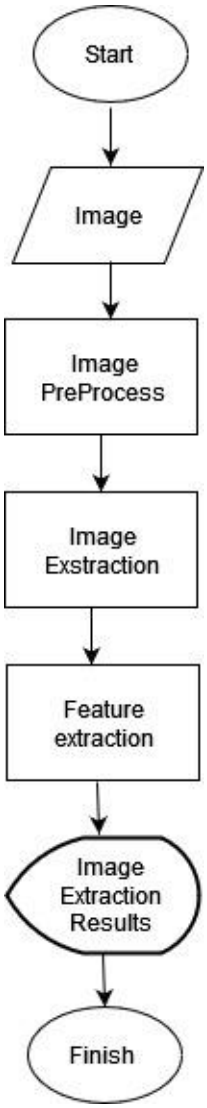

Figure 3. *Flowchart* Image Extraction

2. Image Capture

The data used are images from images using the joint photographic experts' format (.jpg or jpeg). The image comes from taking pictures using an SLR camera assisted by a computer device as an interface display medium with a magnification of 100 and less than 50 magnification. The following is an enlarged image, namely (OpenCV 2019):

Figure 4. Magnification 50 Times

Figure 5. Magnification 100 Times

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

Microsoft Paint is an imaging program used as a digital image processor known as Paintbrush for Windows, and it can be found bundled with Microsoft Windows. The imaging process can be carried out with a mixture of colors, making capturing three colors simultaneously possible. Therefore, it is a process of image digitization using a camera and Microsoft Paint on the image. The digitization process was not carried out comprehensively and only occurred in certain parts. This process can be seen in the following image:

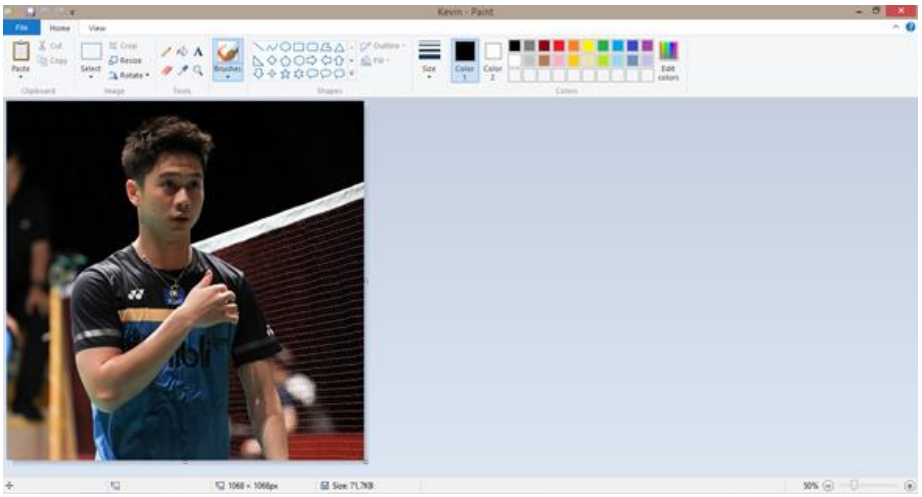

Figure 6. Illustration of the Image Digitization Process

The following are several examples of different types of images of objects whose images are taken, among others:

Figure 7. Example of Image Capture Results

3. Image Feature Extraction Process

In the image feature extraction process there are 3 stages, including::

a. Read Data

In this first step, the image or image of the object comes from the captured image of the SLR camera and is read from the gallery by calling the code IplImage* img = cvLoadImage(); contained in Visual Studio with the open computer vision (opencv) library. Reading the image in joint photographic experts format (.jpg or jpeg) and converting it into an 8-bit scale matrix in Visual Studio. Matrix data produces colored image data with three layers: Red, Green, and Blue.

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

b. Changing the Color Image to Grayscale

After the image reading process, the next step is to preprocess the image. In this step, you only change the color of the object image so that the image becomes new and has a gray scale.

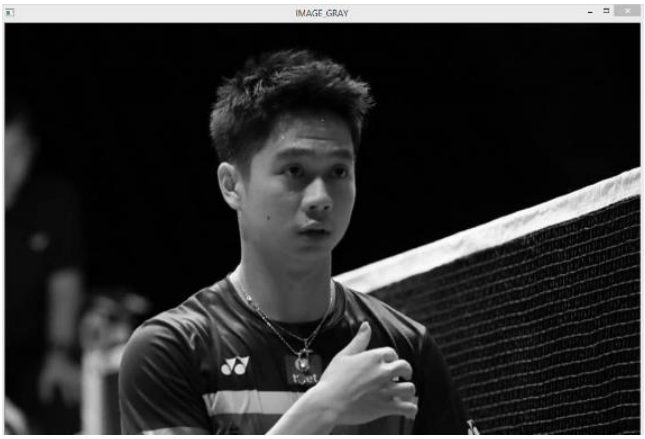

Figure 8. Grayscale Image Image

Based on the image, it is explained that the preprocessing process is carried out using the function IplImage* img = cvLoadImage(); in OpenCV, the next step is the Local Binary Pattern feature extraction process.

c. Local Binary Pattern Characteristic Extraction

After grayscaling, the next step is to perform the feature extraction process. The feature extraction used is feature extraction with Local Binary Pattern. This extraction process produces a new grayscale image matrix. The Local Binary Pattern operator compares values originating from neighboring pixels, and the basic operator is 3x3, which uses 8 neighboring pixels from a central pixel.

3.3 Results of the Image Extraction Process

1. Standard Local Binary Pattern Image Extraction Results

The type of image or object used is a human image where the differences and shape of the object are more visible in the pattern created when the image is taken. The results of the standard extraction process for object image characteristics originating from human images are based on the Local Binary Pattern method.

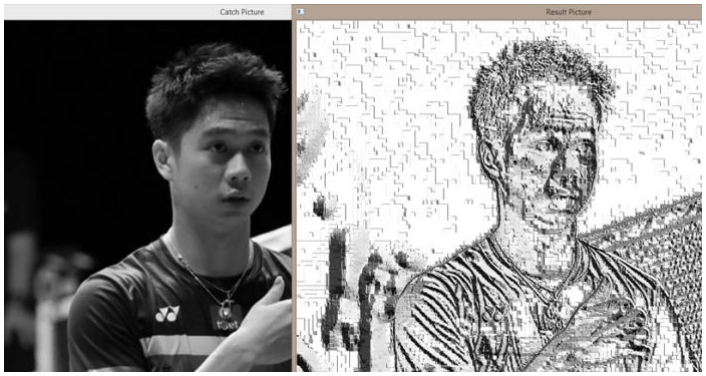

Figure 9. Standard Results of Local Binary Pattern Extraction

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

2. Local Binary Pattern Image Extraction Form

There are 4 forms of image extraction results, including:

Figure 10. Pure Camera Results

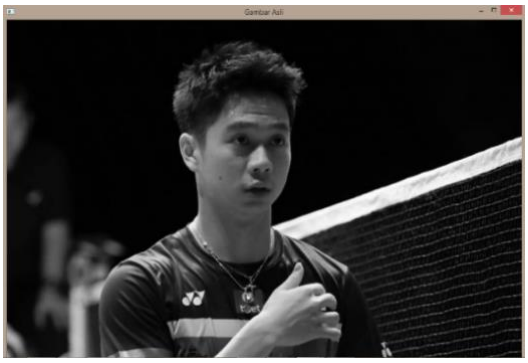

Figure 11. Grayscale Results

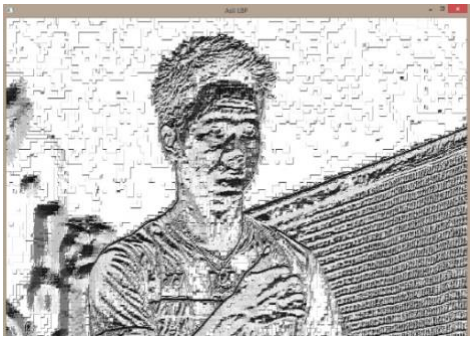

Figure 12. Process Results LBP Original Extraction

Figure 13. Results of the LBP Round Shape Extraction Process

Pure camera results are images obtained from direct SLR camera shots without any changes being made, and grayscale results are the process before the LBP extraction process occurs, namely by changing the color of the object image so that the image becomes new and has a grayish scale.

The original LBP results show that after the grayscale results, it enters the original image extraction process. The round results are another shape produced from the original LBP image extraction results, combining neighboring binaries to create another shape.

Likewise, the rotation and uniform extraction process results from combining local binary pattern binaries by slightly changing the pattern and lighting of the image extraction results.

3. General Image Results

Apart from the image extraction results produced by the Local Binary Pattern method, there are also general image results as follows:

a. Edge Detection

Edge detection functions to identify the boundary lines of an object in the image. The edge detection method using Sobel aims to reduce noise (unimportant objects) before calculating edge detection.

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

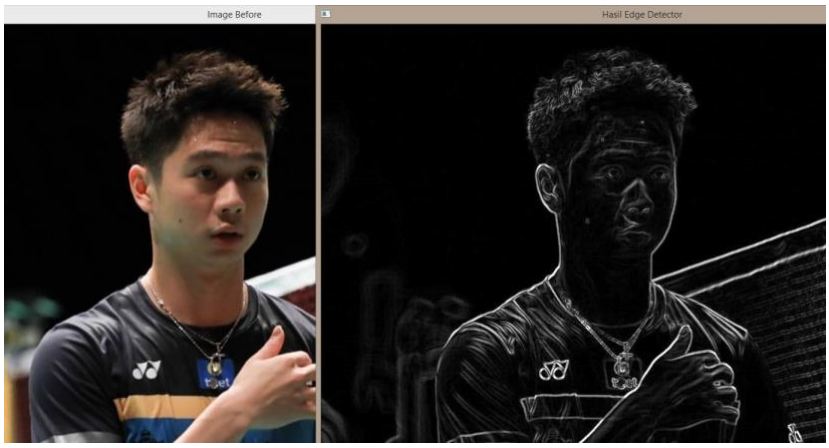

Figure 14. Sobel Shape Image Image Results

b. Histogram

The histogram form is the result of an image that shows the graphic appearance of an image, usually in the form of an up and down line that shows a specific frequency (Lamasigi, Hasan and Lasena 2020).

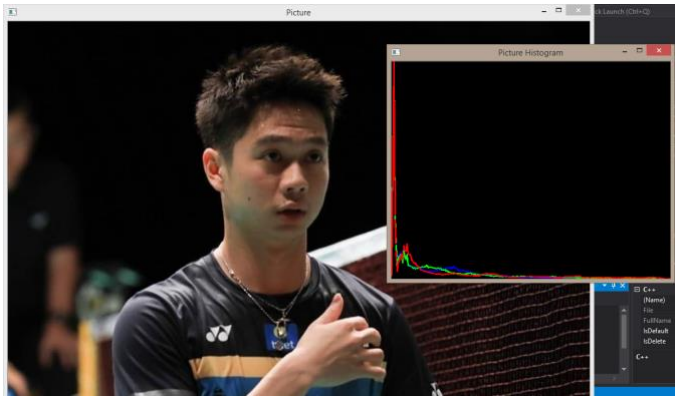

Figure 15. Image Results in Histogram Form

c. Thresholding

Thresholding is an image segmentation method that separates objects from the background in an image based on their level of brightness or darkness. Image regions that tend to be dark will be made darker (perfect black with an intensity value of 0) while image regions that tend to be bright (perfect white have an intensity value of 1).

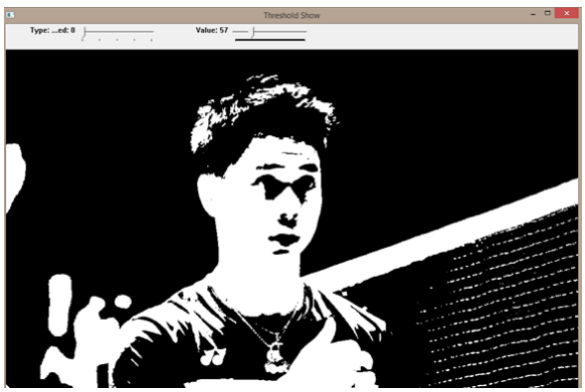

Figure 16. Image Results: Thresholding Form Images

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

d. Blur Objects

Object blur is the level of opacity of an object that affects the clarity of the image.

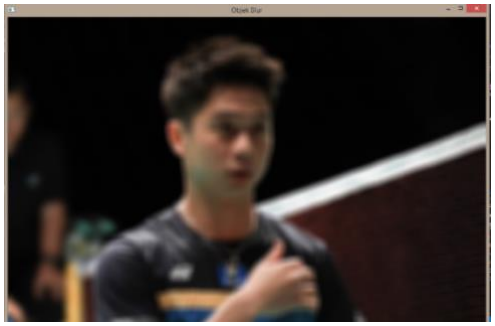

Figure 17. Homogeneous Blur

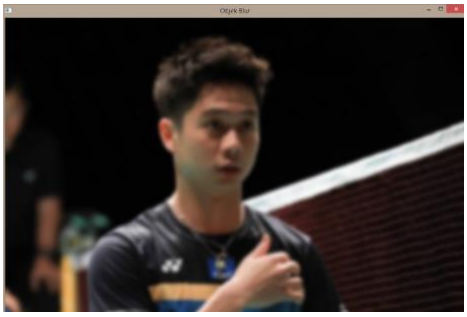

Figure 18. Gaussian Blur

e. Histogram Equalization

Histogram equalization is a process that changes the distribution of degree values in an image to become uniform.

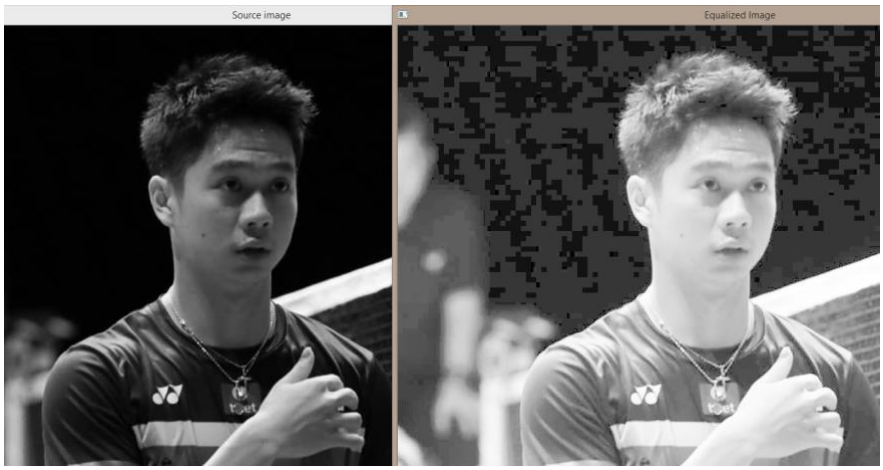

Figure 19. Image Results in Histogram Equalization Form

4. CONCLUSION

Based on the discussion that has been explained, the author can draw conclusions where this image extraction uses SLR media as an image shot, uses human images as the extraction object, and produces 5 different image shapes, including grayscale, original shape from LBP, round shape, round shape. Rotation and uniformity. This is also supported by other image results, such as edge detection using the Sobel method, histogram, thresholding, object blur, and histogram equalization.

This makes the extraction results follow the desired goal, namely producing image patterns and shapes that are different from the original object based on using binary numbers by multiplying neighboring binary numbers. Image extraction is also used for images, wood images, videos, etc. The image extraction process can also be used as one of the stages of identifying images using the Local Binary Pattern Method.

In this paper, several things need to be improved, as shown in the following report. The results of image extraction should be able to provide value, but due to limited knowledge, the author only reaches various forms. Secondly, there is a need for in-depth research into image extraction or image extraction. Other image. It is hoped that future authors will be able to

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699

overcome the problems faced by previous authors and look for more accurate references regarding matters relating to the image extraction process.

5. ACKNOWLEDGMENT

Praise and gratitude the author prays to the presence of Allah S.W.T, for His blessings and mercy. So far, the author has always been given smoothness and ease in completing the preparation of a report on the results of research activities carried out entitled "Image Extraction in OpenCV using the Local Binary Pattern Method" with two supervisors named Mrs. Yenni Fatman, S.T., M.T and Mr. Bambang Sugiarto, S.T., M.T.

6. REFERENCES

Abdi, Muhammad Firdaus, Kusrini Kusrini, and Mei P. Kurniawan. 2022. "Local Binary Pattern Untuk Ektraksi Tekstur Gambar Wajah Menggunakan Masker dan Tanpa Masker." *Technologia* 13 (2): 108-114.

Amat, Rabiuldien, Jayanti Yusmah Sari, and Ika Purwanti Ningrum. 2017. "Implementasi Metode Local Binary Patterns untuk Pengenalan Pola Huruf Hiragana dan Katakana Pada Smartphone." *Jurnal Ilmiah Teknologi Informasi* (Institute Teknologi Sepuluh November) 15 (2): 162-172.

Azwar, Azwar. 2017. "Integrasi Ekstraksi Fitur Local Binary Pattern dan Gray-Level Cooccurence Metrix untuk Pengenalan Ekspresi Mulut Pembelajar." *Jurnal Ilmiah ILKOM* 09 (1): 17-24.

Lamasigi, Zulfrianto Y., Maryam Hasan, and Yulianti Lasena. 2020. "Local Binary Pattern untuk Pengenalan Jenis Daun Tanaman." *ILKOM Jurnal Ilmiah* 12 (3): 208-218.

Magdalena, Ina, Roshita Roshita, Sri Pratiwi, Alfiana Pertiwi, and Anisa Putri Damayanti. 2021. "Penggunaan Media Gambar dalam Meningkatkan Minat Belajar Siswa Kelas IV di SD Negeri 09 Kamal Pagi." *PENSA : Jurnal Pendidikan dan Ilmu Sosial* 3 (2): 334-246.

Malahati, Fildza, Anelda Ultavia, Putri Jannati, Qathrunnada Qathrunnada, and Shaleh Shaleh. 2023. "Memahami Karakteristik Penelitian Sebagai Metodologi." *Jurnal Pendidikan Dasar* 11 (2): 341-348.

Microsofania R, Rechtifano, M. Mukhlish Nurrahman S.A, and Alvin Ardiansyah. 2024. "Implementasi Local Binary Pattern Histogram dalam Multiple Face." *Prosiding Seminar Nasional Teknologi Dan Sains Tahun 2024.* Kediri: Program Studi Teknik Informatika, Universitas Nusantara PGRI Kediri. 245-250.

Mutaqin, Ihsan M. 2018. *Proses Ekstraksi Ciri Citra Kayu dengan Metode Local Binary Pattern Berbasis Android.* Program Studi Teknik Informatika, Bandung: Universitas Islam Nusantara.

OpenCV. 2019. *Documentation.* November. https://docs.opencv.org/2.4/doc/tutorials/imgproc/table_of_content_imgproc/table_of_content_imgproc.html.

Bradski, G., and Kaehler, A. (2000). OpenCV. *Dr. Dobb's journal of software tools*, *3*(2).

Pamungkas, Adi. 2017. *Pemograman Matlab.* Januari. Accessed 2017. https://pemrogramanmatlab.com/2017/07/26/ekstraksi-ciri-bentuk-dan-ukuran/.

Pusat Penelitian Informatika. 2019. Januari. http://www.informatika.lipi.go.id/organisasi/struktur-organisasi.

Putri, Elke Cahya, Bayu Priyambadha, and Fajar Pradana. 2019. "Penerapan Local Binary

Pattern Untuk Mengukur Tingkat Kepuasan Pengunjung Secara Otomatis." *Jurnal Teknologi Informasi dan Ilmu Komputer (JTIIK)* 6 (4): 363-368.

Ramdan, Indra Wulida. 2018. *Laporan Kerja Praktek: Perancangan Website Dinsosnakertrans Menggunakan Bahasa Pemograman PHP denngan Framework Laravel pada Fitur User PT. Affinity Digital Asia.* Program Studi Teknik Informatika, Bandung: Universitas Islam Nusantara.

Ramdan, Muhamad. 2018. *Laporan Kerja Praktek: Pengenalan Objek Berbasis OpenCV pada Perangkat Mobile.* Program Studi Teknik Informatika, Bandung: Universitas Islam Nusantara.

Rivan, Muhammad Ezar Al. 2020. "Pengenalan Iris Menggunakan Fitur Local Binary Pattern dan RBF Classifier." *Jurnal SIMETRIS* 11 (1): 97-106.

DOI: https://doi.org/10.17509/seict.v5i2.76251
p-ISSN 2774-1656 | e-ISSN 2774-1699