Segmentation of Palm Oil Leaf Disease using Zoning Feature Extraction

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Abstract: Oil palm (Elaeis) is an industrial plant that produces large profits, especially in Indonesia. One of the factors that can affect the yield of this plant is destructive pests including Limacodidae and Psychidae. Delay in dealing with pest problems can cause poor results. This study uses the help of digital image processing to inentify two types of pests found on palm oil leaves of pests. Segmentation will be carried out to determine the characteristics of Limacodidae and Psychidae pests. The image processing method used is the zoning feature ecstasy. It is expected that knowing the types of pests suffered by oil palm trees can accelerate the recovery of oil palm trees so as to produce good quality of fruit.

1 INTRODUCTION

Indonesia is the world's largest Palm Oil producer. It is spread out from Aceh region, the East Coast of Sumatra, Java, Kalimantan and all the way to Sulawesi (Ermawati and Saptia, 2013). One of the factors that can affect the yield of palm oil is destructive pests.

(Pribadi and Anggraeni, 2011) states that if plants are in low humidity environment conditions, they will be easily attacked by pests and diseases. This is suspected due to saponin compounds found in plants (which act as self-defense from insect attacks) will decrease qualitatively and quantitatively so that the plants will easily be harmed by pests.

Some of the destructive pests that attack the oil palm plantations are Limacodidae and Psychidae. The potential loss of yield caused by these two pests can reach 35% (Wood et al., 1973). Limacodidae is a palm-leaf-eating pest that often harms oil palm plantations in North Sumatra.

The attack of the caterpillar pest which is a palm-leaf-eating caterpillar has caused many problems. This causes the loss of leaves of the plants which has a direct impact on the decrease in production so this indicates how serious the caterpillar attack is (Pahan, 2008).

To overcome this problem, computer system assistance is needed by utilizing image processing knowledge to identify these two types of pests. (Harahap et al., 2018) identified oil palm leaf disease using the Support Vector Machine method with an accuracy of 90% and (Aji et al., 2013) did the same thing using artificial neural networks and produced an accuracy value of 87.75%. Feature extraction for finding disease in leaves was carried out by (Arivazhagan et al., 2013). The use of a deep convolution neural network was carried out by (Sladojevic et al., 2016) to identify 13 leaf diseases with a precision level of 91% to 98%. Detecting and classifying the plant leaf diseases based by using GLCM and SVM on the Apple leaf has been conducted by Sivakamasundari, G., & Seenivasagam (Sivakamasundari and Seenivasagam, 2018) with accuracy level about 92%. Our research is preliminary research by identifying the image of palm oil leaves and has not entered the classification stage.

2 RESEARCH METHODOLOGY

The steps in this study are shown in Figure 1. The image acquisition process is carried out by taking pictures of leaves attacked by destructive pests. The image will be processed from the original image to the re-measurement stage by shrinking the pixel size to 600x250 pixels and followed by binery processing.

Zoning Feature Extraction will divide the leaf image into several regions or zones of the same size, the value of the features obtained from the method will be used to determine the results of the image value of palm oil leaves affected by Limacodidae and Psychi-

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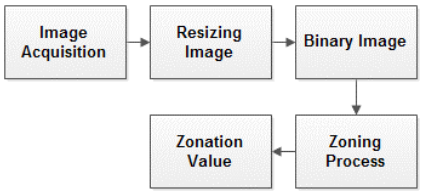

Figure 1: Research Scheme

dae pests. Zoning is one of the most popular methods used for optical character document characterization (Hegadi, 2012). The zoning calculation process is as follows:

- Counting the number of black pixels per zone.
- Counting the zone that has the highest number of pixels. Figure 2 and 3 is the number of Black Pixels in Each Zone affected by Limacodidae Image and Psychidae

Z1 = 1	Z2 = 0
Z3 = 3	Z4 = 0

Figure 2: The Number of Each Zone for Limacodidae

Z1 = 4	Z2 = 0
Z3 = 4	Z4 = 3

Figure 3: The Number of Each Zone for Psychidae

- Calculating the feature value of each zone. The feature values of each zone in the Limacodidae affected are:

$$z1 = \frac{z1}{z3} = \frac{1}{3} = 0,3 \quad (1)$$

$$z2 = \frac{z2}{z3} = \frac{0}{3} = 0 \quad (2)$$

$$z3 = \frac{z3}{z3} = \frac{3}{3} = 1 \quad (3)$$

$$z4 = \frac{z4}{z3} = \frac{0}{3} = 0 \quad (4)$$

While the feature values of each zone in the Psychidae affected are:

$$z1 = \frac{z1}{z1} = \frac{4}{4} = 1 \quad (5)$$

$$z2 = \frac{z2}{z1} = \frac{0}{4} = 0 \quad (6)$$

$$z3 = \frac{z3}{z1} = \frac{4}{4} = 1 \quad (7)$$

$$z4 = \frac{z4}{z1} = \frac{3}{4} = 0,75 \quad (8)$$

Figure 4: Image Causes by Limacodidae Pest

Figure 5: Image Causes by Psychidae Pest

Figure 6: Image from the Resizing process Caused by Limacodidae Pests

Figure 7: Image from the Resizing process Caused by Psychidae Pests

Figure 4 is an image caused by the Limacodidae Pest and figure 5 by the Psychidae Pest. The resizing process is shown in Figures 6 and 7. The next stage, the image of the leaf is changed to a grayscale image. Then that grayscale image will undergo a process of conversion to binaries using a threshold value. In this technique, digital images will be classified into two parts, namely objects and background.

The solution to the matrix of caterpillar impact reference image with a threshold value is 122 for Limacodidae (Formula 9) and 88.5 for Psychidae (Formula 10)

$$f(x,y) = \begin{cases} 255, \; if \; f(x,y) \geq 122 \\ 0, \; if \; f(x,y) < 122 \end{cases} \quad (9)$$

$$f(x,y) = \begin{cases} 255, \; if \; f(x,y) \geq 88,5 \\ 0, \; if \; f(x,y) < 88,5 \end{cases} \quad (10)$$

Figure 8 is the image of the impact of Limacodidae binary process and Figure 9 is the image of the impact of Psychidae binary process.

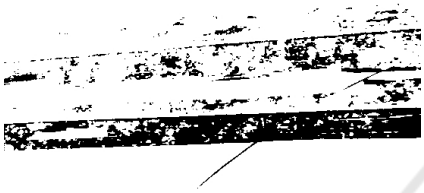

Figure 8: Result of Binary Process by Limacodidae Pests

Figure 9: Result of Binary Process by Psychidae Pestss

The next step is to use the zone extraction feature where the image of the leaf will be divided into several regions or zones of the same size. The feature values obtained from the method will be used to determine the results of the image values of palm oil leaves affected by Limacodidae and Psychidae. Zoning is one of the most popular methods used for document optical characterization (Hegadi, 2012). The calculation process in the zoning method is as follows:

- Count the number of black pixels per zone.
- Calculates zones that have the highest number of pixels.
- Calculates the feature value of each zone from the feature value

3 RESULT AND DISCUSSION

Figure 10 is the result of zoning. Image 1 and 2 are the images of Caterpillar Pests and image 3 and 4 are

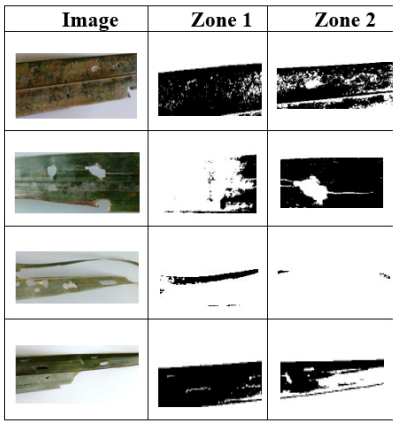

Figure 10: Zoning Images

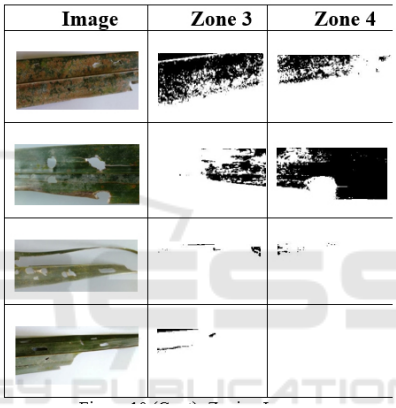

Figure 11: (Cont.) Zoning Images

images of Psychidae Pests. Each image will produce 4 regions.

Table 1 is the value data for Figure 10. The zonation values of Figure 1 are 1, 0.40, 016, and 0. It can be seen in Table 1 that there are significant differences in zones 2 and 3.

Table 1: This caption has one line so it is centered.

Images	Value				Class
	Zone 1	Zone 2	Zone 3	Zone 4	
Image 1	1	0,40	0,16	0	Lima codidae
Image 2	0,92	0,96	0,28	1	Lima codidae
Image 3	0,33	0,16	1	0	Psy chidae
Image 4	1	0,17	0	0	Psy chidae

4 CONCLUSION

In research that has been done by using zoning feature extraction, values can be taken from each zone in the image. The results of zoning can be developed into the classification stage using k-NN, SVM, or artificial neural networks. The brightness, contrast, and background of the image greatly affect the results that will be processed by the zoning feature extraction.

REFERENCES

Aji, A. F., Munajat, Q., Pratama, A. P., Kalamullah, H., Setiyawan, J., and Arymurthy, A. M. (2013). Detection of palm oil leaf disease with image processing and neural network classification on mobile device. *International Journal of Computer Theory and Engineering*, 5(3):528.

Arivazhagan, S., Shebiah, R. N., Ananthi, S., and Varthini, S. V. (2013). Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features. *Agricultural Engineering International: CIGR Journal*, 15(1):211–217.

Ermawati, T. and Saptia, Y. (2013). Kinerja ekspor minyak kelapa sawit indonesia the export performance of indonesia's palm oil. *Buletin Ilmiah Litbang Perdagangan*, 7(2):129–148.

Harahap, L. A., Fajri, R. I., Syahputra, M. F., Rahmat, R. F., and Nababan, E. B. (2018). Identifikasi penyakit daun tanaman kelapa sawit dengan teknologi image processing menggunakan aplikasi support vector machine. In *Talenta Conference Series: Agricultural and Natural Resources (ANR)*, volume 1, pages 53–59.

Hegadi, R. S. (2012). Recognition of printed kannada numerals based on zoning method. *International Journal of Computer Applications*, 975:8878.

Pahan, I. (2008). *Paduan Lengkap Kelapa Sawit*. Niaga Swadaya.

Pribadi, A. and Anggraeni, I. (2011). Pengaruh temperatur dan kelembaban terhadap tingkat kerusakan daun jabon (anthocephalus cadamba) oleh arthrochista hilaralis. *Jurnal Penelitian Hutan Tanaman*, 8(1):1–7.

Sivakamasundari, G. and Seenivasagam, V. (2018). Classification of leaf diseases in apple using support vector machine. *International Journal of Advanced Research in Computer Science*, 9(1).

Sladojevic, S., Arsenovic, M., Anderla, A., Culibrk, D., and Stefanovic, D. (2016). Deep neural networks based recognition of plant diseases by leaf image classification. *Computational intelligence and neuroscience*, 2016.

Wood, B., Corley, R., Goh, K., et al. (1973). Studies on the effect of pest damage on oil palm yield. *Studies on the effect of pest damage on oil palm yield.*, (58).