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Image Segmentation Using Haar Wavelet Transform and Artificial Network for Identification of Ant Nest Pattern

Nur Budi Nugraha

Jurusan Teknik Informatika, Politeknik Negeri Indramayu, Indramayu, Indonesia
Email: nurbudinugraha@polindra.ac.id
Email Penulis Korespondensi: nurbudinugraha@polindra.ac.id
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Abstract−Ant nest is a powerful medicinal plant to treat various diseases such as heart disease, tumors, cancer, hemorrhoids, tuberculosis, rheumatism, ulcers and prostate disorders. The many benefits generated cause the ant nest to have a selling value in the community, so it is not uncommon to trigger ant nest forgery. This study aims to identify the image of an ant nest by testing the accuracy of the backpropagation network and haar wavelet. Before the identification process with the backpropagation method is carried out, first the process of taking the characteristics of the ant nest is carried out which will later be used as test data input in the identification process. The output of the network will be compared with the target to get the error output. Then these errors are propagated again to increase the network weight to minimize errors. This research resulted in an ant nest identification application. The backpropagation ANN architecture for the training data used is 0.95 momentum, 0.01 target error with MSE criteria, the maximum number of training iterations (epochs) is set at 5000, the learning rate is 0.1 and the number of hidden layers is 20 by using wavelet haar feature extraction level 3 and the backpropagation momentum method can be used. used to identify ant nest images with 100% accuracy.

Keywords: Ant Nest; Backpropagation; Image; Haar Wavelet

1. INTRODUCTION

Forest is one of the natural resources and becomes a life buffer whose existence is irreplaceable because it can provide benefits in the form of goods and or services ecologically, economically and socially on an ongoing basis without causing negative impacts [1]. For this reason, a reliable and professional management system and institutions / institutions for forest management at the site level are needed so that forest resources can provide benefits according to their function, particularly through the forest management unit. Forest has potential forest resources, both timber, non-timber and environmental services [2]. One of the many potentials of non-timber forest products is a commodity ant nest that needs to be managed in a sustainable manner in order to provide benefits to the community and regional development [3].

The rapid development of technology brings changes in people's behavior in interacting with each other [4]. Over time there are also changes between the relationship between humans and their environment. many humans benefit from environmental products and their contents, one of which is insects. insects have many benefits including by providing food, supporting the decomposition of matter, controlling pests and by having cultural value [5]. Ants nest is well known by indigenous Papuans as a powerful medicinal plant for several types of diseases [6][7]. The result, empirically, boiled water (dekoktum) Ants Nest extract is believed to treat various diseases such as heart disease, tumors, cancer, hemorrhoids, tuberculosis, rheumatism, ulcers, gout, stroke, impaired kidney and prostate function [8].

Chemical analysis shows that the ant nest plant contains chemical compounds from the flavonoid, tannin, tocopherol, multimineral and polysaccharide groups. Several studies on ant nests say that ant nests have strong antioxidant activity so that they have anticancer activity that is effective in curing several diseases [9][10]. Various kinds of properties can be obtained from the Papuan Ant Nests, this causes the Papuan Ant Nests to have a selling value in the midst of society. So it is not uncommon to trigger acts of counterfeiting Papuan ant nests. Seeing this problem, the writer wants to contribute to introducing the Papuan ant nest through the development of an application to detect the image of the Papuan ant nest.

Ant nests were used as heterogeneous catalysts in CASO transesterification with methanol to produce FAME and were characterized to evaluate their physical and chemical properties. The effect of operational parameters affecting the catalytic reaction, reaction temperature, catalyst loading and methanol / oil molar ratio was evaluated with a central composite design at a fixed reaction time of 2 hours. The stability of the used catalysts was reused to be investigated. as well as physicochemical and fuel properties obtained from biodiesel samples prepared under optimum conditions [3] [11]. Swedish research on ethnographic descriptions resulted in the mound-building redwood ant, Formica rufa L., which is one of the species used in Sweden for their healing properties. There is a widespread belief that formic acid can be used to cure various ailments, especially gout and rheumatism. in addition to flavoring distilled liquor and treatment. Although the medicinal use of ants has disappeared, the custom of making homemade ants has an alcoholic taste persists in Sweden and becomes a delicious and attractive drink [5]. In previous studies, capacity building extension workers and farmers in the use of antill for crop production with micro doses to determine the need per hectare. This research focused on the factors which can foster the rapid development of ants which will be the key to enhancing plant development among the community Small holders are challenged by the cost of fertilizer input. The results can raise awareness of policy makers at all

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levels stimulating interest about how these resources can be integrated as one component of integrated soil fertility management in conservation agriculture technology [8][12].

Another study investigated the relative grain sizes of the base, center and near the summit of three anthills located 20 km west of Winneba near the Apam-Winneba highway in Ghana and correlated their elemental composition. The results showed a significant gradation of soil grain size ranging from <0.075 mm to 2 mm such that coarse grains occur at the base while fine shards are on the higher part of the ant nest. Major oxide (wt.%) Shows that SiO2 (51.70 - 60.24) is positively correlated with total FeO (12.22 - 15.24), Al2O3 (22.18 - 28.88), MnO (0.08 - 0.09), and K2O (0 , 4 - 0.61). However, as K2O decreased with increasing height in the ant nest, SiO2, the total FeO and Al2O3 increased. Maybe land These are used to build ant nests from different rock types and termites are selective in using silica or iron oxide rich soil [9]. Investigations into soil bacteria have been studied as an extraordinary reservoir of unique naturally occurring biologically active metabolites. This study aims to isolate, identify and biochemically characterize antibiotic-producing bacteria from the soil of the ant nest in the permanent location of Ibrahim Badamasi Babangida. the results showed that the production of an inhibitor was among several strains of bacteria isolated from the ant nest [13].

This study aims to identify the image of the ant nest. The method to be used is a backpropagation Neural Network implemented using momentum. Prior to the identification process, the process of taking the features / characteristics of the ant nest is first carried out which will be used as test data input in the identification process [14]. The backpropagation method is a systematic method in neural network multiplayer training [15][16]. Where the output from the network will be compared with the target in order to obtain an output error, then this error is propagated back to improve the network weight in order to minimize errors [17][18]. Momentum backpropagation processing is used to increase the speed in the recognition process, and in the end it is hoped that it will be able to recognize the Papuan ant nest pattern.

2. RESEARCH METHODOLOGY

The material used in this study was the dried image of the papua ant nest pieces. The number of images that will be used in this research is 60 images. The image to be researched was obtained from the results of taking 15 images from the smartphone camera media, while the rest of the researchers took from online sources. This research requires concrete data in the form of a collection of pictures of papuan ant nests from different sources to be used as samples. The research steps carried out in the research compilation process include the following stages:

1. The data collection method is done by collecting data from reference books and other sources related to image processing, pattern recognition, especially for pattern identification. The safeguarding of this method is so that it can be compared with related images so that the system can identify papua ant nests.
2. Software development methods
   a. Analysis, the stages carried out include analysis from the user side which includes who will use this application, what is the purpose, what data is needed and what benefits will be generated.
   b. Design, At this stage the software design process is carried out with the aim of describing the application design and developing the system structure which includes data design, architecture and interface design. This stage the process of detecting ant nest images is also designed for training and testing processes.
   c. Encoding, at this stage coding is carried out to realize the design stages that have been made through writing programs using programming languages. Each design is implemented with coding so that it can be used to carry out the process of training and testing the anthill image.
   d. Testing, this test is more focused on the functional requirements of the system. This test is used to produce an analysis that will later be needed to carry out all the functional requirements of the program. This test serves to find errors that occur in the system so that it is expected to produce an error-free system. In this application testing with the blackbox method focuses on the functionality of the existing system and its non-functional requirements

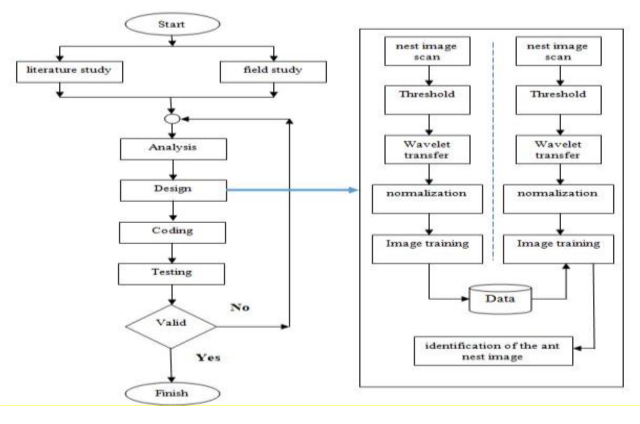

Figure 1. Research flow diagram

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3. RESULT AND DISCUSSION

This application is an application that will display the identification results of the papuan ant nests. The output of the application is in the form of program detection results, namely whether the tested image of the ant nest can be identified as an ant nest or not ant nest. The initial view of the application contains the training data process menu and the testing process menu. The process that is done first is to train the input image that has 60 jpeg and bmp formats, the image is trained one by one with the image input step first, then the process button will process the image by producing a level 3 wavelet extraction. displayed in the form of excel data.

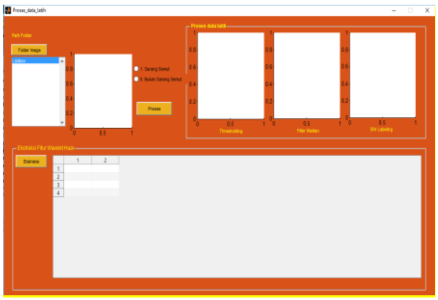

Figure 2. Training data process menu

In figure 2 is explain the test data menu is useful for identifying the results of the ant nest image. Similar to what is done in the training data process menu, this menu will also extract the test image with the haar wavelet. Then the data from the extraction results will be tested with existing input data with the momentum backpropagation method. Furthermore, by pressing the results button, the output of the test data will be obtained, the output will identify whether the test image is classified as an ant nest or not an ant nest

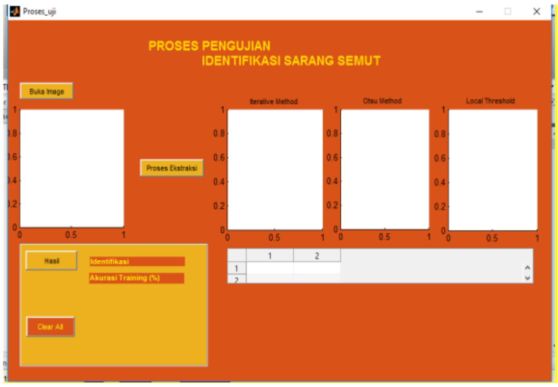

Figure 3. Testing process menu

Figure 3 explain in the training data menu and the test data menu, there is an image processing process for the ant nest. The input image in this research uses jpg and bmp format which consists of 60 training data images, 45 of which are ant nests, 15 are not ant nests. After feature extraction with Haar wavelet, it is continued with the process of storing vector data into xlsx files. From the coding program, it can be seen that the first process that the researcher does is the input image. First, the image processing is carried out in the form of an iterative thresholding method, the thresholding otsu method and the local threshold.

Figure 4. Display of image processing results

In figure 4 can see after image processing is carried out, the next step is to extract the wavelet haar level 3 features. In the first stage feature extraction is to perform image decomposition up to level 3, the second stage is to look for the image features used in feature extraction consisting of energy features in the coding program, Ea which is the energy from the approximated subband, Eh is the energy from the horizontal subband, each level

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consisting of 7 energies. Ev is the energy from the vertical subband which also at each level consists of 7 energies and the last energy is Ed which is the energy from the diagonal subband, each of which also consists of 7 energies. The next feature is the coefficient, where the coefficient feature consists of cv is the vertical subband coefficient, cd is the diagonal subband coefficient where the mean and standard deviation of each level will be searched and obtained ME11 to ME33 and ST11 to ST33. The next feature is the coefficient on the approximate subband and the last step is to find the mean and standard deviation of Mea and STa. After carrying out the feature extraction process, a feature vector (haar wavelet transform feature) is obtained which is 1 x 30 pixels in size which will be used as input for the backpropagation ANN.

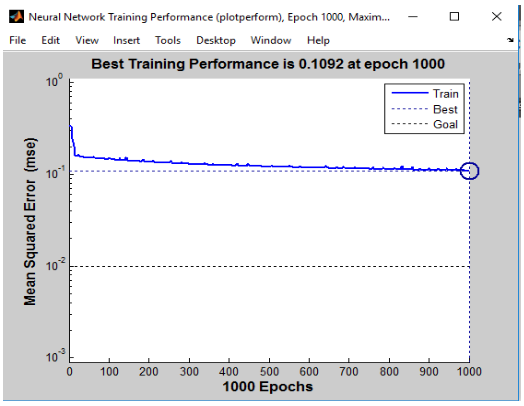

Figure 5. Graph Performance momentum = 0.25, epoch = 1000, hidden layer = 5

Figure 5 explain Momentum testing 0.25 will be carried out by varying the number of hidden layers by 5 and the number of epochs 1000. Constant momentum is 0.25 with a variation of the epoch with a value of 1000, and a hidden layer of 5, the MSE is 0.1092.

That momentum testing was carried out 3 times with constant 0.25, 0.65 and 0.95. Of all the tests with variations that have been carried out, the testing with variations in momentum is 0.95, epoch of 5000 and hidden layer of 20 is the MSE performance that is closest to the target error of 0.01, so in this research the network architecture used for the training process and The process of testing data testing is momentum 0.95, target error of 0.01, epoch of 5000, learning rate of 0.1 and hidden layer of 20.

Table 1. Comparison of Test Results

Testing			MSE	Accuracy
Momentum	**Hidden Layer**	**Epoch**		
	5	1000	0,1092	65,697%
0,25	10	5000	0,1875	26,126%
	20	5000	0,0706	79,729%
	5	1000	0,1117	63,551%
0,65	10	5000	0,1875	10,549%
	20	5000	0,0456	87,433%
	5	1000	0,1221	59,103%
0,95	10	5000	0,0748	77,868%
	20	5000	0,0345	90,786%

In table 1, it can be seen that the training process using 60 input images, consisting of 45 images of ant nests and 15 images of non-ant nests, has a high degree of accuracy and an MSE that is close to a target error of 0.01 and using a learning rate of 0.1 is shown in the momentum network architecture of 0.95, 20 hidden layers and 5000 iteration times.

The process of testing data on backpropagation ANN using ANN architecture is considered the best for accuracy and MSE in the data training process. As discussed above in the process of testing the research data using ANN architecture with a momentum of 0.95, a target error of 0.01, an epoch of 5000, a learning rate of close to 0.1 and a hidden layer of 20. The test data used in this study were 10 which consists of 7 data for ant nests (with a value of 1), 3 data for non-ant nests (with a value of 0). So the test target in this study is to be [1 1 1 1 1 1 1 0 0 0].

Table 2. Test Image Test Results

Test Image	Target	Test Result	Rounding	Identification
	1	0,755851636931216	1	Right

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Test Image	Target	Test Result	Rounding	Identification
	1	0,543756707892544	1	Right
	1	0,706622434951000	1	Right
	1	0,527964614520320	1	Right
	1	0,734277111244153	1	Right
	1	0,802421435504990	1	Right
	1	0,691136819197920	1	Right
	0	0,174183195957552	0	Right
	0	0,047925837902437	0	Right
	0	0,095931740350795	0	Right

Based on table 2, from 10 test images consisting of 7 images identified as ant nests and 3 images not ant nests. This is in accordance with the test targets given. Thus the backpropagation momentum method can identify Papuan ant nests with an accuracy level of 100%.

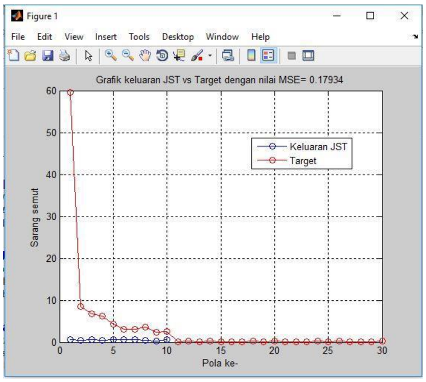

Figure 6. JST output graph with target

From figure 6, it is known that from 60 training images, 10 test images have the same output as the training image with an MSE value of 0,17934 from a target error of 0,01

4. CONCLUSION

The conclusions obtained from the research using local threshold image processing then feature extracted images with wavelet haar level 3. After the training and testing process using ANN backpropagation momentum can be implemented in an application design for identification of Papua ant nests. The backpropagation ANN architecture

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for data training used is a momentum of 0.95, a target error of 0.01 with MSE criteria, the maximum number of training iterations (epoch) is set at 5000, the learning rate is 0.1 and the number of hidden layers is 20. By using feature extraction Wavelet haar level 3 and the backpropagation momentum method can be used to identify images of Papuan ant nests with 100% accuracy.

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