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Layout Classification of Red Onion Disease on Onion Leaf Image Using Artificial Neural Network

Layout Classification of Red Onion Disease on Onion Leaf Image Using Artificial Neural Network

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Abstract. Shallots are one of the main ingredients that are often found throughout Indonesia. The optimal yield of onion plants is influenced by several factors, one of which is disease. The purpose of this study is to classify the image of leeks to identify onion diseases using Artificial Neural Network (ANN). Disease classification on leeks is leaf rot (anthracnose) and purple spots. The steps taken in the classification of leek disease are data input, pre-processing, feature extraction, machine learning. Several steps are carried out on the leek image, among others, improving image contrast, conversion of sRGB to LAB, segmentation using clustering, grayscale images, and binary images. After pre-processing, the next step is extracting features based on colour features and texture features. The colour features consist of Standard Deviation, Kurtosis, Mean, and Skewness. While the texture features consist of Contrast, Correlation, Energy, Entropy, Variance, and IDM. The end result of this system will show whether the leeks are included in the class of leaf rot (anthracnose) or purple spots or healthy leaves.

1. Introduction

Shallots are one of the best horticultural commodities in Indonesia. Shallot plants can be seen whether or not healthy through leeks. Diseases of green onions include purple spots and leaf rot (Anthracnose). Purple spot disease is caused by a fungus named *Alternaria Porri (Ell Cif)*, while leaf rot is caused by a fungus named *Collectotrichmm Gloeosprorioides Penz / Collectotrichmm Circinans (Berk) Vogl.* In purple spots the symptoms that can be seen are the presence of small white and grey spots and in the middle there is a black dot and surrounded by yellow colour[1], these patches widen and become purple. While leaf rot looks at the base of the leaves that begin to shrink and yellowish. The process of manually identifying leeks is in the form of visual analysis by taking into account the physical shape and color of the leaves. The physical shape and colour of the leaves affected by the disease can be recognized by the human eye. Although it takes special care and experience to visually analysis the leek disease[2]. In order to improve the efficiency of visual identification of leaf diseases through a digital image processing approach. Image processing was also developed to be able to classify plants based on diseases that attack plants[3]. Application of Leaf Recognition for Plant Classification with Probabilistic Neural Network Method is used to recognize various types of leaves in plants[4]. Image processing approach can be developed in order to help onion farmers classify diseases onions based on the image of leeks, moreover farmers can minimize losses during harvest. The research objective is to propose an onion disease identification system through the classification of leaf images using the Artificial Neural Network algorithm.

2. Related Work

Research of onion quality classification based machine vision has made by [5] to detect disease by digital image processing using deep learning algorithm. An Analysis of Leaf Chlorophyll Measurement Method using Chlorophyll Meter and Image Processing Technique, This study compared the image work in image processing with atLEAF + meter to measure the betel leaf chlorophyll turned out to be accurate and faster[6]. Feature extraction milkfish classification with a tendency for low image variation is implemented by a combination of GLCM and HSI[7]. Varying illumination conditions in outdoor images would significantly affect the classification accuracy. Thus, V component which represents intensity in HSV and L component which represents luminance in L*a*b* colour space were not considered for fruit detection, because V and L component directly reflected varying illumination of experimental environment[8]. Evaluate non-destructive methods for measuring canopy cover in onion plants using unmanned aerial vehicles (UAVs). Several data sampling activities were carried out to determine leaf area in eight experimental plots, this research result Estimation of leaf area index in onion (Allium cepa L.) using an unmanned aerial vehicle[9]. Some investigations about the use and the design of artificial neural networks in the area of plant classification were carried out. For this purpose leaves of 13 different de-cidous trees were scanned and selected features were evaluated with backpropagation net-works, Kohonen feature maps and Hopfield networks[10]. Neural Network uses feedforward in order to estimate grass biomass from roadside image data. DWCGP calculates the length of grass pixels that are connected continuously along the vertical orientation in each column of the image, and then weighs the length by the density of grass in the area around the column[11].

3. Method

Onion disease identification system through the classification of leaf images using the Artificial Neural Network algorithm developed in our research has several stages; they are pre-processing, feature extraction, and classification. The proposed schema has shown in figure 1. Data in the form of images of scallions were obtained in Beji District, Pasuruan Regency. The picture is taken using a digital camera. With a size of 500 x 200 pixels. With data on 60 leaves attacked by purple spots (trotol), 60 attacked by leaf rot (Anthracnose), and 60 healthy leaves. Before shooting using a camera, the leaves are placed in a black box first with the light of two 8 watt T5 lamps so that the picture gets good light.

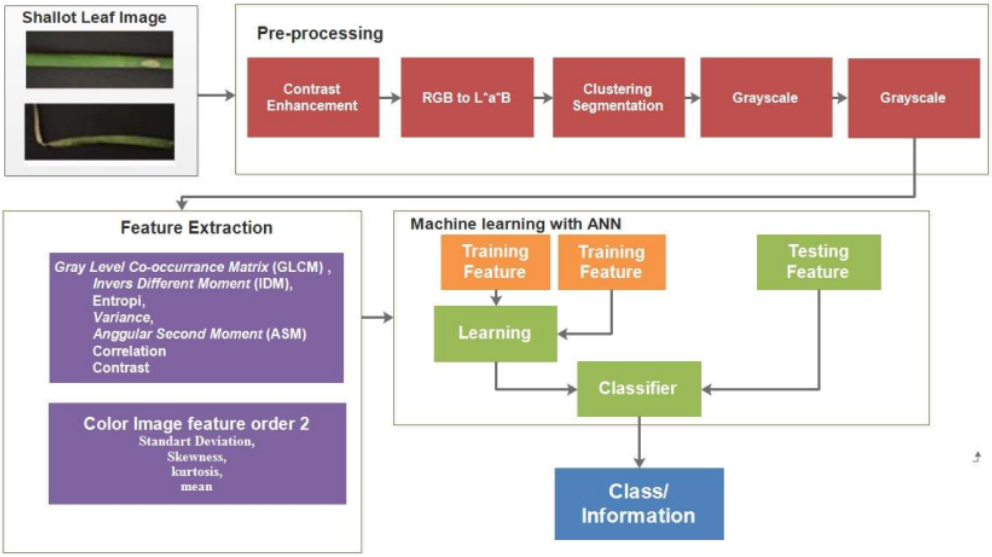

Figure 1. Proposed Method Schema of Onion Leaf Clasification using Artificial Neural Network

The analysis will be used in the design and manufacture of this image processing application as a classification of leaf diseases using Artificial Neural Network (ANN). From Figure 1 it is explained that the flow of the system starts from the input image data that has been taken previously. Then it will be processed at the preprocessing stage, namely improving image contrast, converting sRGB to LAB, segmenting using clustering, grayscale images, and binary images. The next step is extraction of features, namely color features and texture features. After that the data will be tested where there are 2 stages, namely training and testing. In training there are 2 stages, namely training features and training classes. Whereas in testing there are also 2 stages, namely the testing feature and the model / rule. Then the last stage is displaying the results of a trial in the form of information.

4. Result

The data used were 90 training data images and 90 test data images, which consisted of 3 classes, namely purple spotting, leaf rot, and healthy leaves. aims to improve the quality of the image so that it is more easily processed at a later stage. The initial process is that the original image's contrast is improved, resulting in an image with optimal contrast. After the contrast is corrected the image will be converted into an L * a * b image through the transformation of color components. Then the clustering approach will be carried out which aims to find areas of leaves that have indications of disease. After selecting the cluster to get the area indicated by the disease, image segmentation will be obtained. The segmentation process aims to simplify the representation of images so that they are easier to recognize. The results of this segmentation will then be represented into values using feature extraction. After the segmentation process is converted to grayscale and binary images. Feature extraction is calculating the value of the object's own characteristics in several calculations so as to produce data values that distinguish the image itself from other images. The features used are texture features and color features possessed by the image of leeks. This texture feature uses GLCM (Gray Level Cooccurance Matrices) calculations. GLCM is divided into several types, namely contrast, correlation, energy, entropy, varriance, IDM (Inverse Difference Movement). While the colour features are obtained from the statistical characteristics of the two-order RGB values that indicate the image itself. Colour features are divided into a number of counts, namely Standard deviation, kurtosis, mean, and skewness. the learning and classification process implements the Artificial Neural Network algorithm with a backpropagation model. Backpropagation has strong and objective mathematics. So that it can form an equation and coefficient value in the formula by minimizing the number of errors in the system. Backpropagation itself is a multilayer network architecture on ANN. In this model there are several neuron units called the input layer, several neuron units as the hidden layer, and several neuron units as the output layer. After testing each test data image, the results will be calculated using the formula:

$$\frac{Number\ of\ Correct\ Testing\ Data}{Number\ of\ testing\ data} \times 100\% \quad (1)$$

The end result of this system will show whether the leeks are included in the class of leaf rot (anthracnose) or purple spots or healthy leaves. Table 1 shows the testing of 3 classes with accuracy obtained. On the results of the testing accuracy of 90 scallion images, it can be calculated that the accuracy of the test image values for 90 scallion images obtained an accuracy value of 91.1%.

Table 1. Testing Accuracy Result

Data	Total Data	Accuracy
Detected	82	91,1111 %
Not Detected	8	8,89 %

5. Conclusion

The optimal yield of onion plants is influenced by several factors, one of which is disease. Shallot plants can be seen whether or not healthy through leeks. Diseases of green onions include purple spots and leaf

rot (Anthracnose). Purple spot disease is caused by a fungus named *Alternaria Porri (Ell Cif)*, while leaf rot is caused by a fungus named *Collectotrichmm Gloeosprorioides Penz / Collectotrichmm Circinans* (Berk) *Vogl.* The physical shape and colour of the leaves affected by the disease can be recognized by the human eye. Although it takes special care and experience to visually analysis the leek disease. To be able to improve the efficiency of visual identification of leaf diseases through a digital image processing approach. The initial process is that the original image's contrast is improved, resulting in an image with optimal contrast. After the contrast is corrected the image will be converted into an L * a * b image through the transformation of colour components. Then the clustering approach will be carried out which aims to find areas of leaves that have indications of disease. After selecting the cluster to get the area indicated by the disease, image segmentation will be obtained. The segmentation process aims to simplify the representation of images so that they are easier to recognize. The results of this segmentation will then be represented into values using feature extraction. After the segmentation process is converted to grayscale and binary images. On the results of the testing accuracy of 90 scallion images, it can be calculated that the accuracy of the test image values for 90 scallion images obtained an accuracy value of 91.1%. Future studies are expected to have more features in order to optimize the accuracy of disease detection. Disease detection is expected to be even more data variations with disease conditions that can be detected.

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