Paddy Disease Identification System Using Image Processing

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Abstract- *Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. The studies of the plant diseases mean the studies of visually observable patterns seen on the plant. Health monitoring and disease detection on plant is very critical for sustainable agriculture. It is very difficult to monitor the plant diseases manually. It require stremendous amount of work, expertise in the plant diseases, and also require the excessive processing time. Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. This paper discussed the methods used for the detection of plant diseases using their leaves images. This paper also discussed some segmentation and feature extraction algorithm used in the plant disease detection.*

Keywords- Image acquisition, Segmentation, feature extraction

I. INTRODUCTION

A product quality control is fundamentally required in order to gain more value- added products. Many studies show that quality of agricultural products can be reduced from many causes. One of the most important factors of such quality is plant diseases. Consequently, minimizing plant diseases allows substantially improving quality of the products.

Rice known as Oryza Sativa (specific name), is one of the most utilized food plants and widely grown originated in ASIA. Rice is an important crop worldwide and over half of the world population relies on it for food. Many people in the world including Malaysia eat rice as staple food. However, there are many factors that make paddy rice production become slow and less productive. One of the main factors is paddy disease.

An abnormal condition that injures the plant or leads it to function improperly is called as a disease. Diseases are readily recognized by their symptoms. There are a lot of paddy disease types which are Bakanae, red disease virus, brown spot disease and many more. Image processing and computer vision technology are very beneficial to the agricultural industry. They are more potential and more important to many areas in agricultural technology.

Paddy Disease Detection System is one of the very beneficial systems. It can help the paddy farmer detect the disease faster. This study aims to develop a prototype system to automatically detect and classify the paddy diseases by using image processing technique as an alternative or supplemental to the traditional manual method.

II.PROBLEM STATEMENT

Paddy will be harvest twice in a year. Most of paddy farmer faces many problems to harvest their paddy because they had been attack by snail, worm and fungi. Furthermore, when the paddy had been infected or attacked, the others areas had been exposed to be infected. Thus, it will decrease paddy farmers income and lead to significance losses to farmer. Currently, the paddy farmer determines the type of disease manually. The errors might occur in order to determine the type of diseases. Paddy farmer also have to spend a lot of time to detect the type of disease. It also takes a time as the paddy farmers manually check the disease since the paddy field is in wide area.

III. DIFFERENT KINDS OF PADDY DISEASE

A .Paddy Blast

I. Disease can infect paddy a tall growth stages and allaerial parts of plant (Leaf, neck and node).
II. Among the three leaves and neck infections are more severe.
III. Small specks originate on leaves-subsequently enlarge into spindle shaped spots (0.5 to 1.5 cm length, 0.3 to 0.5 cm width) with as hycenter.
IV. Several spots coalesce ->big irregular patches

B. Paddy Brown Spot Disease

I. Initial lesions are water-soaked to green is h gray and later become gray is h white with brown margin
II. Lesions on leaf sheaths near waterline

III. Presence of sclerotia
IV. Lesions may coalesce death of the whole leaf
V. Partially filled or empty grains

C. Narrow Brown Spot Disease

I. Short, narrow, elliptical to linear brown lesions usuallyon leaf blades but may also occur onleaf sheaths, pedicels, and glumes or rice hulls
II. Lesions about 2-10 mm long and 1 mm wide
III. Lesions narrower, shorter, and darker brown on resistant varieties
IV. Lesions wider and lighter brown with gray necrotic centers on susceptible varieties
V. Leaf necrosis may also occur on susceptible varieties
VI. Lesions occur in large numbers during the later growth stages

Narrow Brown Spot Disease

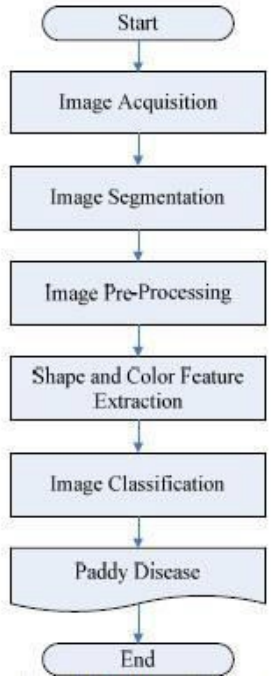
Paddy Brown Spot Disease

Paddy Blast Disease

IV. EXISTING METHOD FOR IDENTIFY THE DISEASE

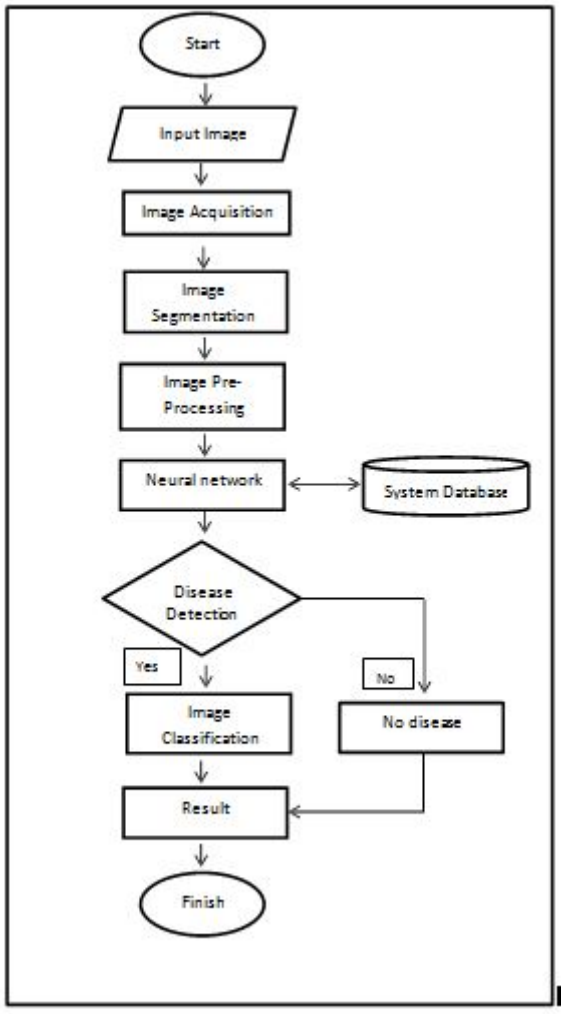
The methodology for diagnosing paddy diseases can be simplified in bellow. This process involves several tasks, such as image acquisition and collection, image segmentation and pre-processing, shape feature extraction and color feature extraction, and paddy diseases classification based on lesion type, boundary color, spot color, and broken paddy leaf color.

Cunhaused recognition technique to analyze the pathological stress conditions and characterization of the fruits or plant leafs. Runtz and Dave[19,20] applied image processing technique for classification and identifying of the plant species.



V. PROPOSED METHOD

There is agrowing demand of image processing in diverse application areas, such as multimedia computing, secure dim age data communication, biomedical imaging, biometrics, remote sensing, texture understanding, pattern recognition, content-based image retrieval, compression and soon. To improve the quality of paddy, there must be a system that can accurately detect the disease so that the paddy farmer can cure it as soon as possible. The methodology consists of the pre-processing and segmentation of paddy disease and classification of the disease. The techniques that will be applied for the classification of paddy disease in this system are feed-forward neural network technique.



VI. EXPERMANTAL RESULTS

A. Image Acquisition

In this process, it is a preparation process to obtain paddy leaf images. The RGB color images of paddy leaf are captured using Olympus*fe*-4050digital camera with pixel resolution 2048x1024. Those image are crop ped in to smaller image. Images are stored in BMP format. The proto type uses Matlab image processing library.

Paddy Blast Disease

Paddy Brown Spot Disease

Narrow Brown Spot Disease

B. Image Segmentation And Imagepre-Processing

i. Converting RGB to gray scale image

The segmentation and pre-processing task are the initial stage before the image is used for the next process. The main objective of this process is to obtain the binary image with Otsu method. The Otsu method is based on selecting the lowest point between two classes of the histogram by considering the between-class variance.

RGB Image | Binary Image With Noise | Binary Image with with Noise free

ii. Filtering

Averaging filter is implemented in this process. The average filter computes the mean(average) of the gray-scale values with in a rectangular filter window surrounding each pixel. This has the effect of smoothing the image (eliminating noise). The filtered pixel will be calculated by:

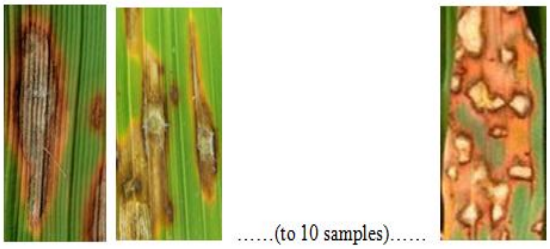
$$r = (a1 + a2 + \ldots + a9)/9$$

C. Feed Forward Neural Network

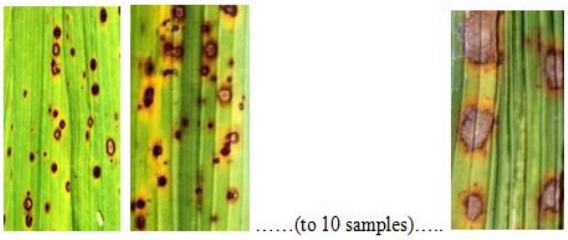
The neural network is applied to pattern recognition, system identification and system control. The feed forward neural network was the first and arguably simplest type of artificial neural network devised. In this network, the information moves in only one direction, forward, from the input nodes, through the hidden nodes (if any)and to the output nodes. There are no cycles or loops in the network.

i. Training and testing of neural network

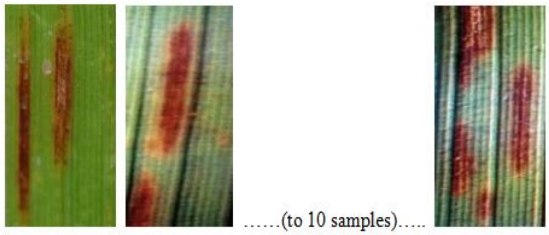
In this stage, there is training database, initialize neural network layer, train network. 10 samples of Blast Disease image, 10 samples of Brown Spot Disease image and 10 samples of Narrow-Brown Spot Disease image is used as training image.



Sample of Blast Disease



Sample of Brown Spot Disease



Sample of Narrow Brown Spot Disease

D. Image Classification

Based on above training and testing of neural network, the image will be classify weather it is paddy blast, brown spot disease and narrow brown spot disease with the feed forward neural network.

VII. CONCLUSION

A system for diagnosis the paddy disease has been developed using the Matlab application. The image processing techniques is applied to improve and enhance the image to a better quality. Besides, the neural network is used to classify the paddy diseases which are paddy blast, brown spot disease, narrow brown spot disease and normal paddy leaf. The methodology involves image acquisition, pre-processing and segmentation, analysis and classification of the paddy disease. All the paddy sample will be passing through the RGB calculation before it proceed to the binary conversion. If the sample is in the range of normal paddy RGB, then it is automatically classify as type 4 which is Normal. Then, all the segmented paddy disease sample will be convert into the binary data in excel file before proceed through the neural network for training and testing. Consequently, by employing the neural network technique, the paddy diseases are recognized about 92.5 percent accuracy rates. This prototype has a very great potential to be further improved in the future.

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