Detection of Paddy leaf Disease Using Image Processing (Nuro-Fuzzy Classifier)

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***ABSTRACT**: Agricultural productivity is that issue on that Indian Economy extremely depends. The main objectives of this research is to develop a prototype system for detect the paddy disease which are Paddy Blast Disease, Brown Spot Disease, Narrow Brown Spot Disease. This concentrate on the image processing techniques used to enhance the quality of the image and neural network technique to classify the paddy disease. 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.*

Keywords: Agricultural leaf , paddy disease, Image Processing, Image segmentation, neural network

INTRODUCTION

Paddy also known as rice is the starchy seeds of an annual Southeast Asian cereal grass (Oryza sativa) that are cooked and used for food. This cereal grass that is widely cultivated in warm climates for its seeds and by-products [1]. Rice 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.

There are many factors that make paddy rice production become slow and less productive. One of the main factors is paddy disease. The table below will show you type of paddy disease, the symptom of paddy disease and the management of

paddy disease. This researches focus on three types of diseases, which are paddy blast, brown spot disease and narrow brown spot disease [2]

The following paddy diseases are shown below:

No	Disease	Disease Symptoms
1	Paddy Blast	Disease can infect paddy at all growth stages and all aerial parts of plant (Leaf, neck and node). □□Among the three leaves and neck infections are more severe. □□Small specks originate on leaves -subsequently enlarge into spindle shaped spots (0.5 to 1.5cm length, 0.3 to 0.5cm width) with ashy center. □□Several spots coalesce -> big irregular patches
2	Paddy Brown Spot Disease	Initial lesions are water-soaked to greenish gray and later become grayish white with brown margin □□Lesions on leaf sheaths near waterline □□Presence of sclerotic □□Lesions may coalesce death of the whole leaf Partially filled or empty grains
3	Narrow Brown Spot Disease	□□Short, narrow, elliptical to linear brown lesions usually on leaf blades but may also occur on leaf sheaths, pedicels, and glumes or rice hulls □□Lesions about 2-10 mm long and 1 mm wide □□Lesions narrower, shorter, and darker brown on resistant varieties □□Lesions wider and lighter brown with gray necrotic centers on susceptible varieties □□Leaf necrosis may also occur on susceptible varieties □□Lesions occur in large numbers during the later growth stages

Image Processing Techniques

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. Cunha [3] used recognition technique to analyze the pathological stress conditions and characterization of the fruits or plant leafs.

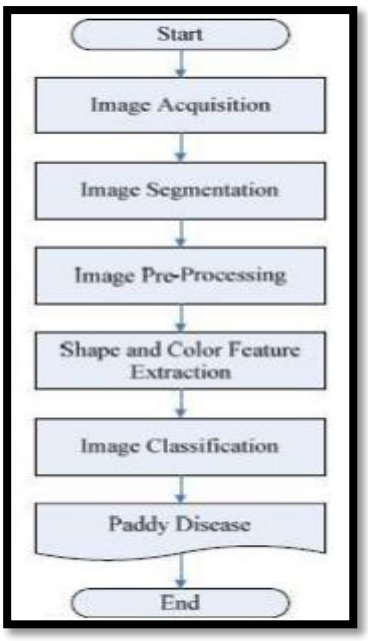

Figure 1 Image processing technique

A) **Image Acquisition:-** The RGB colour images of paddy leaf are captured using a Canon PowerShot G2 digital camera, with pixel resolution 768x1024. The digitized images are about 225 KB size each. Those images are cropped into a smaller image with dimension of 109 x 310 pixels. There have collected about 94 data sample.

B) **Image Segmentation and Pre-Processing:-** The main objective of this process is to obtain the binary image with less noise or noise free. In order to achieve high accuracy, an appropriate silhouette should be obtained. The RGB image is converted into a binary image using threshold method. They used local entropy threshold methods of Eliza and Chang [4] and Otsu method. A morphological algorithm is used to remove noises by using region filling technique.

C) **Feature Extraction using Texture Analysis**: - The image analysis focused on the shape feature extraction and color based segmentation.

D) **Image Classification:-** The production rules have been developed through serial interviews with agricultural expert based on above characteristics, such as lesion type, boundary color, spot color, and broken paddy leaf color, paddy diseases is recognized using production rule method with forward-chaining method.

LITERATURE REVIEWS

Nunik Noviana Kurniawati, et all from Universiti Kebangsaan Malaysia aims to develop a prototype system to automatically and correctly detect and classify the paddy diseases with Blast Disease (BD), Brown Spot Disease (BSD), and Narrow Brown Spot Disease (NBSD) using image processing technique as an alternative or supplemental to the traditional manual method.[5]

A. Meunkaewjinda et all on Grape Leaf Disease Detection from Color Imagery using Hybrid Intelligent System. Vegetable and fruits are the most important export agricultural products of Thailand [6].

Sachin D. Khirade & et al Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. It requires tremendous amount of work, expertize 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.[7]

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 farmer‟s 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.

OBJECTIVE

There are three objectives to achieve in this project:

i. to develop the prototype of paddy disease detection system

ii. To detect the paddy disease by using image processing

iii. To apply image processing technique to analyze the pattern of paddy disease

PROPOSED SYSTEM

There is a growing demand of image processing in diverse application areas, such as multimedia computing, secured image data communication, biomedical imaging, biometrics, remote sensing, texture understanding, pattern recognition, content-based image retrieval, compression and so on. 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.

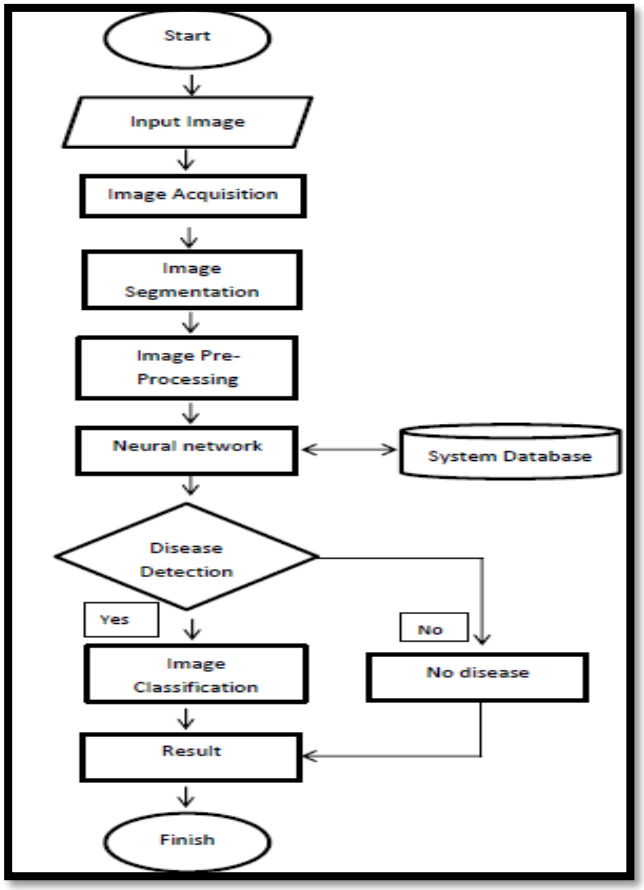

Figure 2 Flow chart of Paddy Disease Detection System

IMPLEMENTATION

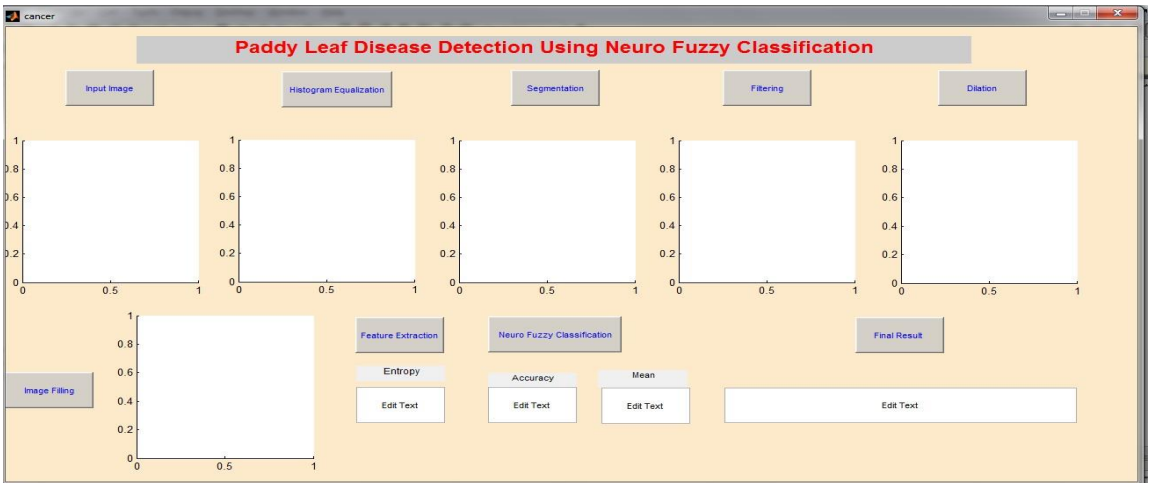

Figure3 Front view of Paddy Leaf disease detection system

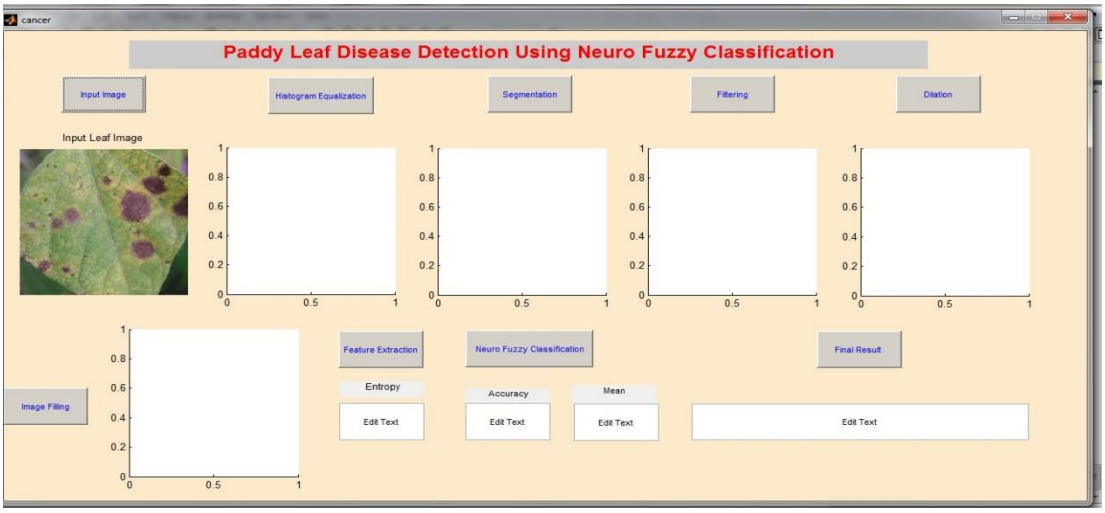

Figure 4 Uploading image in system

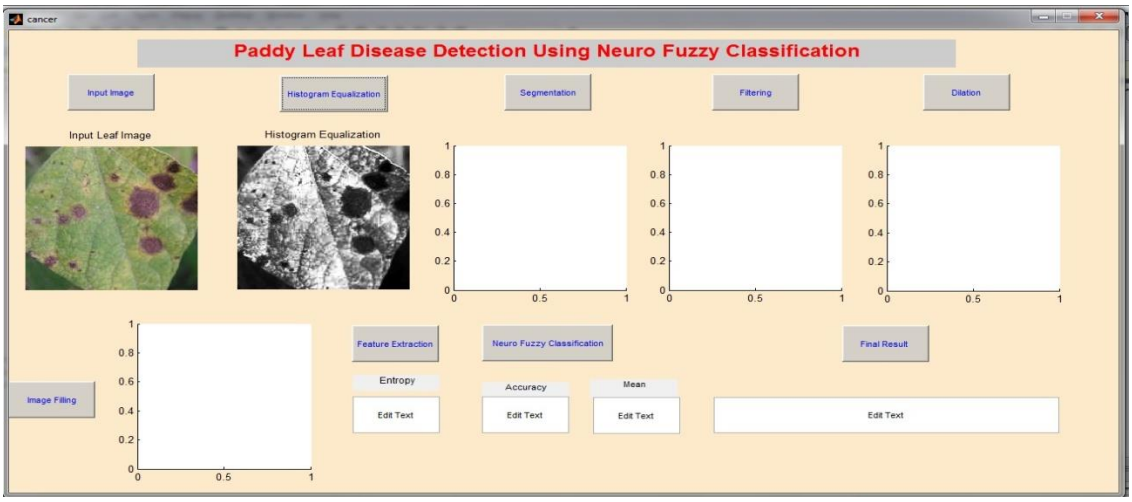

Figure 5 Image Histogram Equalizer

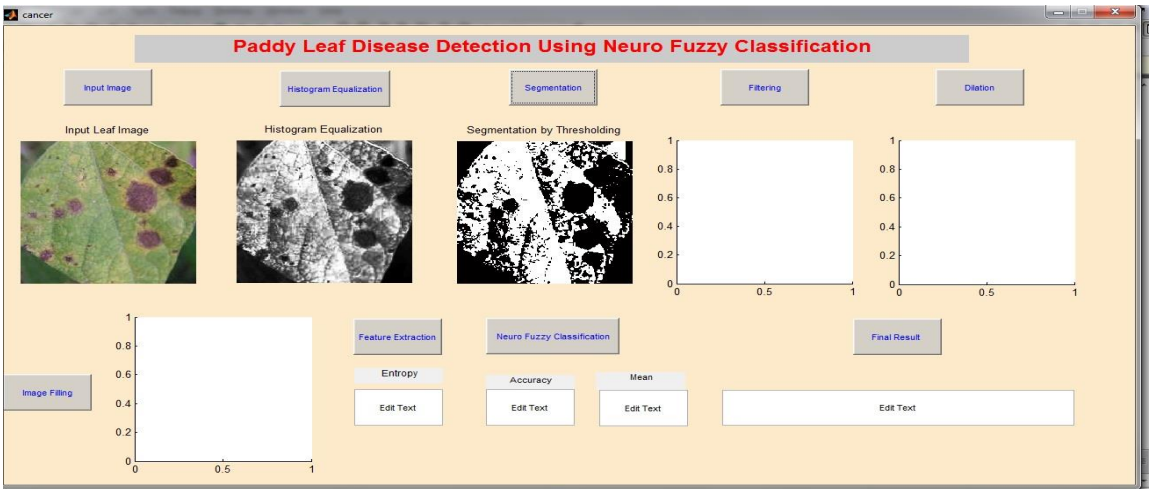

Figure 6 Image segmentation

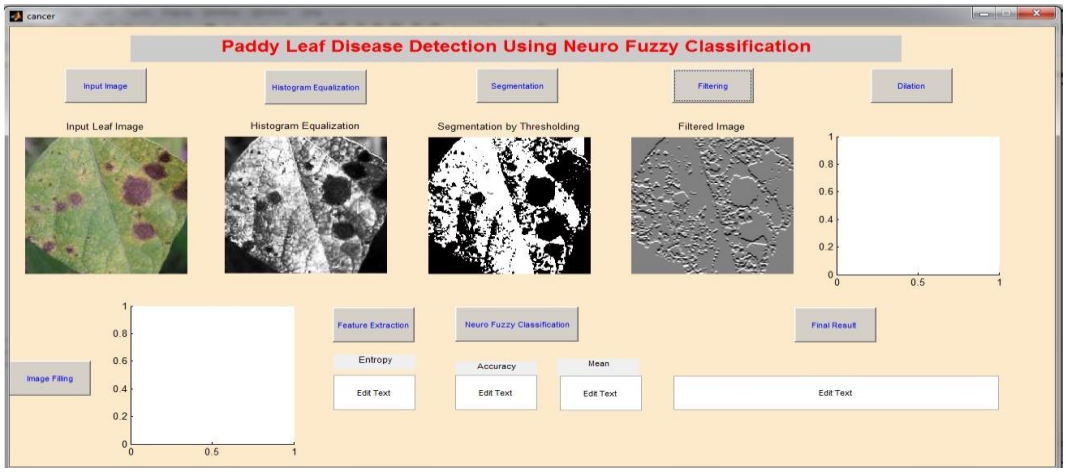

Figure 7 Image Filtering

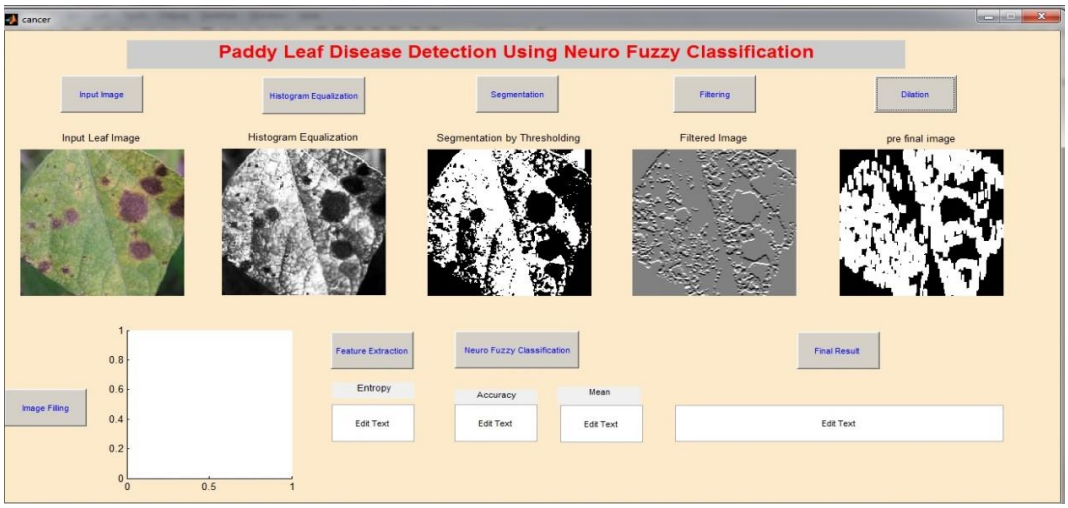

Figure 8 Image Dilations

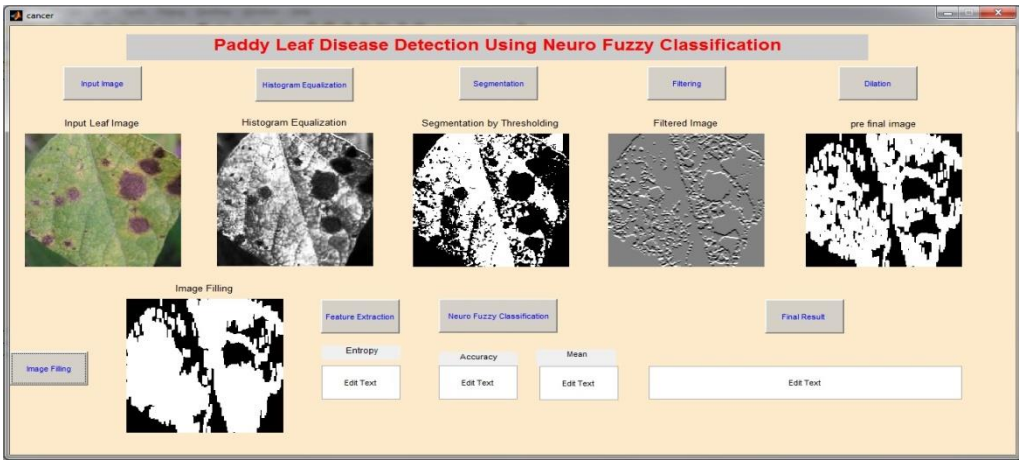

Figure 9 Final Image filing

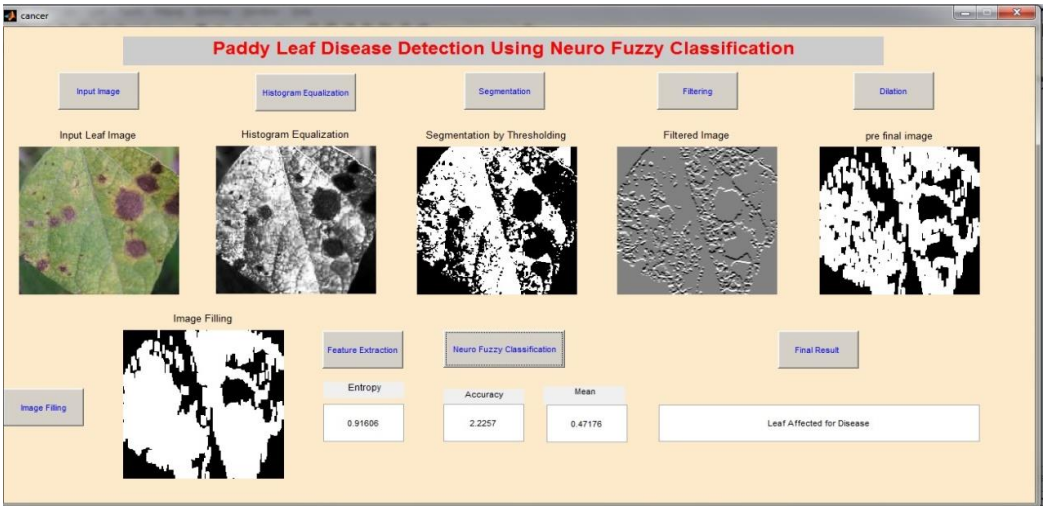

Figure 10 Final Result

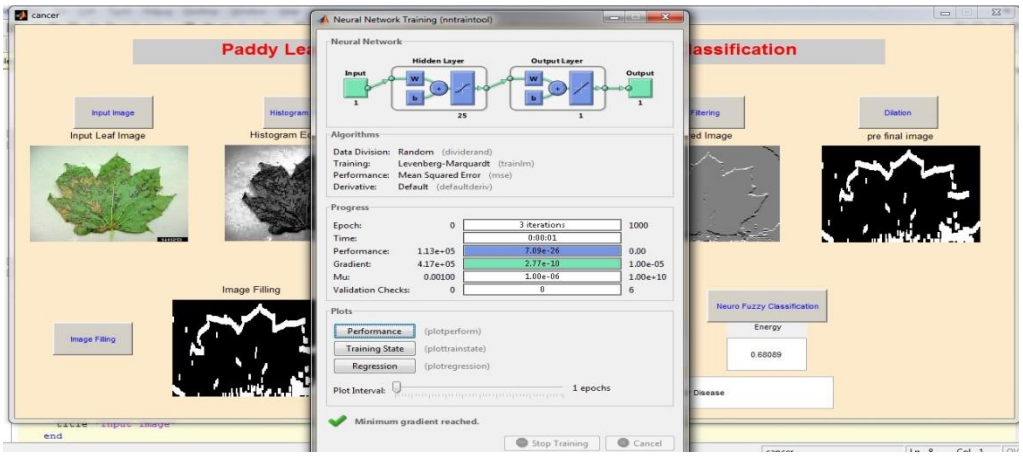

Figure 11 Neural Network Classifier

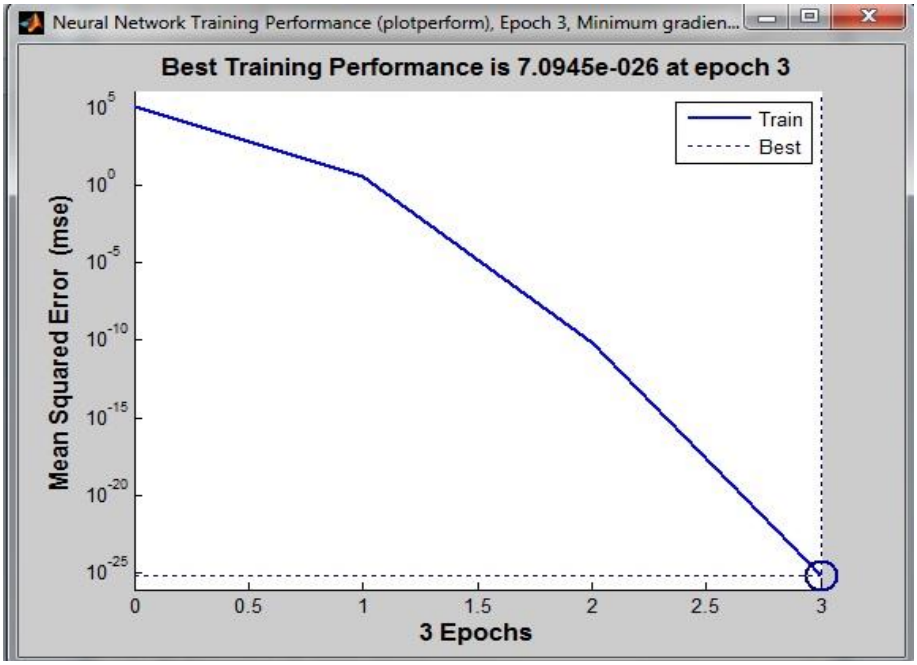

Figure 12 System performances in neural network

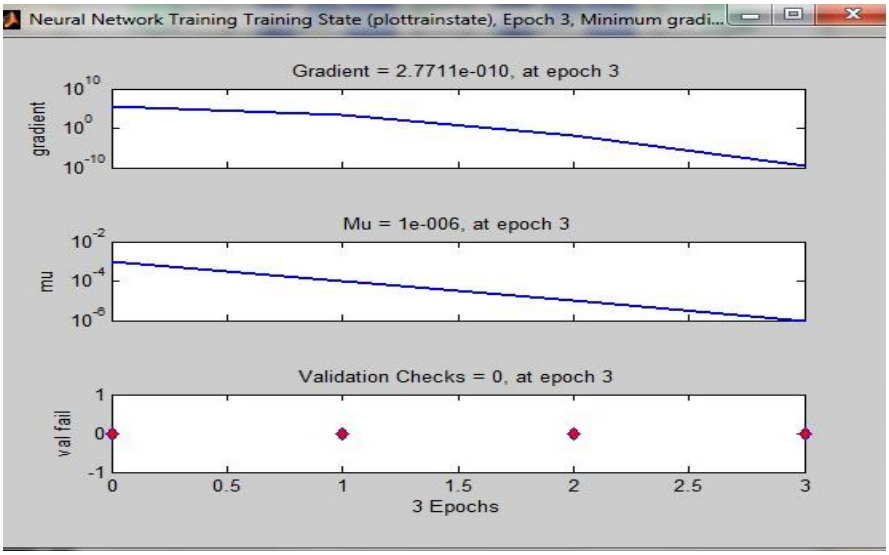

Figure 13 Regression analyses in neural network

RESULT

Table 1: Testing result

No	Type of Paddy Disease	Total Sample	Sample Pass	Sample Fail	Accuracy for each sample
1	Paddy Blast	10	9	1	90%
2	Narrow Brown Spot Disease	10	10	-	100%
3	Brown Spot Disease	10	8	2	80%
4	Normal	10	10	-	100%
Total		40	37	3	92.5 %

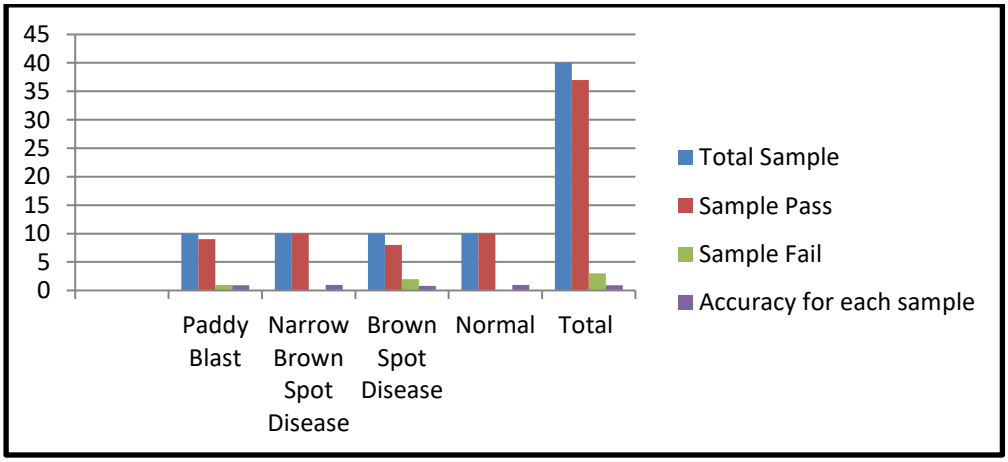

Figure 11 Graph of Result anaysis

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.

REFERENCES

[1] .http://www.merriam-webster.com/dictionary/rice?show=0&t=1320089188

[2] J.B. Cunha. 2003. Application of Image Processing Techniques in the Characterization of Plant Leafs. Proc. IEEE Intl" Symposium on Industrial Electronics.

[3] K.J. Runtz. 1991. Electronic Recognition of Plant Spesies for Machine Vision Sprayer Control Systems. Proc. IEEE Western Canada Conference on Computer, Power, and Communication System in a Rural Environment (WESCANEX"91), pp. 84-88.

[4] Eliza Yingzi Du and Chein-I Chang. 2003. An Unsupervised Approach to Colour Video Thresholding. IEEE Proc. International Conference on Multimedia and Expo ICME"03 3:III 337-40.

[5] Kurniawati, N.N. Abdullah, S.N.H.S. Abdullah.S. Investigation on Image Processing Techniques for Diagnosing Paddy Diseases". International Conference of Soft Computing and Pattern Recognition pg 273-277, 2009.

[6] Meunkaewjinda, A. Kumsawat, P. Attakitmongcol, K. and Srikaew, A. " Grape Leaf Disease Detection from Color Imagery using Hybrid Intelligent System" Poceeding of ECTI-CON pg 513-516, 2008.

[7] Sachin D. Khirade, A.B Patil, "Plant Disease Detection Using Image Processing", International Conference on Computing Communication Control and Automation", 2015.