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Identification of Diseases in Paddy Leaves Using Texture Features and Neural Network

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ABSTRACT

Disease identification in agricultural field is the most challenging task. Initially experts visit the agricultural field or known farmer identifies the diseases. In the proposed work using image processing and soft computing technique disease identification has been done. RGB microscopic images transformed to HSV color model, Otsu segmentation used for segmentation by considering hue component of HSV color model. GLCM Features and feed forward back propagation neural network is used to classify the data and obtained result of 100% accuracy.

Keywords: Disease, GLCM, Neural Network, Segmentation, Microscope Images.

I. INTRODUCTION

In an agriculture the disease identification is the most important to get good quality of yield without loss. In this proposed work disease, identification has been done using feed forward back propagation neural network to classify the data. In agricultural field diseases like Bacterial, fungal and viral diseases occurs on the plant parts like stem, panicle, leaf surface and neck region, due to disease the plant may die or it gives less yield. Rice is the most important traditional stable food in Asian country, and also most of the people depend on rice as a major food and 75% of Asian people depends on rice to get calories from their food habit Mizoguchi et al., (2011). Magnaporthe grisea (Hebert) (Barr 1977; Yaegashi and Udagawa 1978) is a filamentous, heterothallic Ascomycotina that collectively causes disease on many species of the grass (Poaceae) family. M. grisea is the teleomorph corresponding to the previously distinct anamorphs Pyricularia oryzae, infecting rice (Oryza sativa), and P. grisea, infecting other grasses. M. grisea is an ascomycete fungus. It is an extremely effective plant pathogen as it can reproduce both sexually and asexually to produce specialized infectious structures known as appressoria that infect aerial tissues and hyphae that can infect root tissues. Rice blast has observed on rice strains, initial symptoms are white to gray-green lesions or spots with darker borders produced on all parts of the shoot, while older lesions are elliptical or spindle-shaped and whitish to gray with necrotic borders. Lesions may enlarge and coalesce to kill the entire leaf. Symptoms are observed on all above-ground parts of the plant. Lesions can be seen on the leaf collar, culm, culm nodes, and panicle neck node. Inter modal infection of the culm occurs in a banded pattern. Nodal infection causes the culm to break at the infected node (rotten neck). It also affects reproduction by causing the host to produce fewer seeds. This is caused by the disease preventing maturation of the actual grain. The pathogen infects as a spore that produces lesions or spots on parts of the rice plant such as the leaf, leaf collar, panicle, culm and culm nodes. Using the structure called an appressorium, the pathogen penetrates the plant. M. grisea then sporulates from the diseased rice tissue to be disperse as conidiospores. After overwintering in sources such as rice straw and stubble, the cycle repeats. A single cycle could be complete in about a week under favourable conditions where one lesion can generate up to thousands of spores in a single night. With the ability to continue to produce the spores for over 20 days, rice blast lesions can be devastating to susceptible rice crops (L Aryal et al., 2016; Chakrabarti N K et al., 2001).

Brown Spot called as sesame leaf spot or Helminthosporium or fungal blight, the fungus attacks the crop from seedling in nursery to milk stage in main field. The disease appears first as minute brown dots; later becoming cylindrical or oval to circular (resemble sesame seed). Spots measures 0.5 to 2.0mm in breadth - coalesce to form large patches, then several spots coalesce and the leaf dries up, Infection occurs on panicle, neck with brown colour appearance. Seeds also get infected (black or brown spots on glumes spots are covered by olivaceous velvety growth), the seedlings die and affected nurseries can be often recognized from a distance by their brownish scorched appearance. Dark brown or black spots also appear on glumes, the infection of the seed causes failure of seed germination, seedling mortality and reduces the grain quality and weight, 50% yield reduction in severe cases (L Aryal et al., 2016; Chakrabarti N K et al., 2001).

II. LITERATURE REVIEW

A research survey has conducted based on relevant to the proposed work. Some of the significant research works have described in the literature survey.

Raghavendra S P et al., (2016) proposed work for identification of Bank cheques has done using pattern recognition techniques. In this proposed work, the bank logo is segmented to identify the bank cheques and geometrical features have used. In this work, six bank logos are considered. Classification is done using neural network and obtained 92.85% of accuracy.

Suresha M et al., (2018) proposed a work for identification of birds. In this proposed work, RGB images are converted into HSV color model and saturation component of HSV is used for segmentation. GLCM features are extracted from the segmented image. The feed forward back propagation neural network classifier is used for classification and obtained a result of 87.50% accuracy.

Narmdha R. P et al., (2017) proposed a work to classify the paddy leaves diseases using artificial neural network. Authors considered Blast, Brown spot and Narrow Brown spot diseases for classification. In this work, RGB images are segmented using k-means clustering algorithm, shape features and GLCM color features are extracted from RGB components, using artificial neural network classification of paddy leaves have been carried out and obtained accuracy of 94.7%.

Karmokar B C (2015) proposed a work for identification of diseases in leaf. Images are captured and segmented by threshold value. Segmented images are normalized to 30 X 33 pixels images. Negative correlation learning (NCL) and Scale Conjugate Gradient (SCG) algorithms were used for features extraction for both NCL and SCG features. Among these features for NCL features, the neural network gives better result, which is of 91% accuracy.

III. PROPOSED WORK

A. Image Acquisition: Preliminary step is collection of images from paddy fields. Sony digital camera with 18.1 megapixels used to capture the training images of different diseases in daylight condition, and testing images are captured under micro biology lab with a laboratory and clinical microscope with 40X lens.

Collected samples are mounted to a microscopic view and after clear visualization of disease part of leaves using the same camera the images are captured. The figure 1 and figure 2 shows that, the images captured using digital camera and images captured using microscope respectively. Image samples are collected by visiting the places in Shimoga district, Karnataka, India.

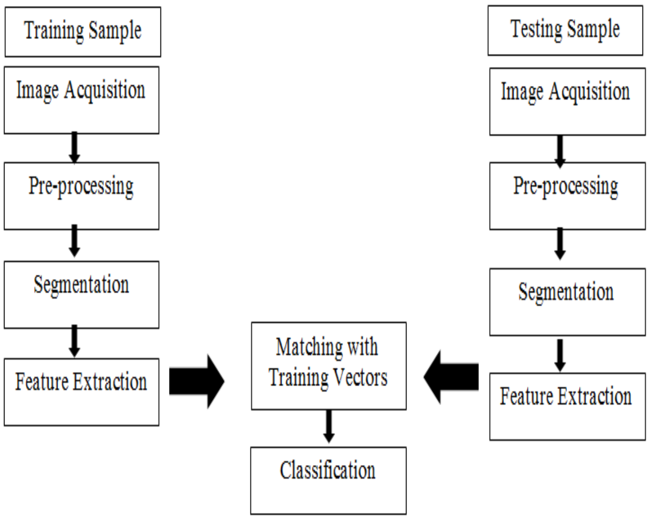
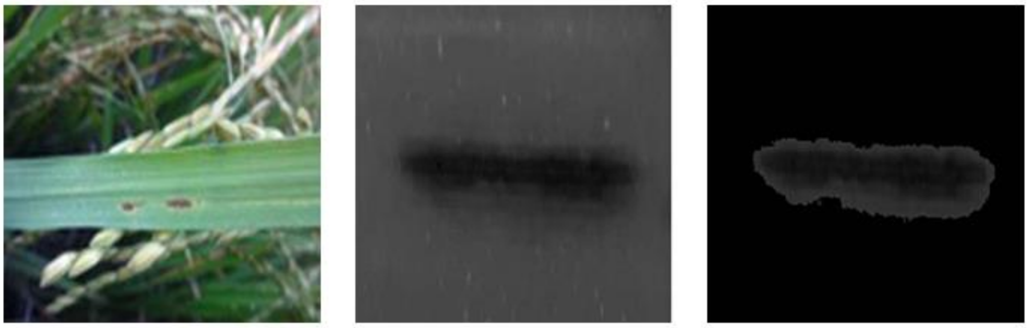


Figure 1. Workflow of the proposed method



Original Image | Hue Image | Segmented Image

Figure 2. Paddy leaves images

Original Image | Hue Image | Segmented Image

Figure 3. Paddy leaves Microscopic image

B. **Pre-processing**: After collecting, the image samples are resized to 256 X 256 pixels resolution to improve the processing time and original RGB images are converted into HSV color space images are shown in figure 1 and figure 2, individual color space are extracted.

C. Segmentation: Segmentation is a general process dividing an image into connected regions and highlighted as the pre-process of the classification Deserno (2011). Regions of an image segmentation should be homogeneous and uniform with respect to characteristic such as texture and gray tone Morel, J. M., & Solimini, S. (2012). In proposed work Otsu segmentation is carried out using hue component of HSV color space and transformed to binary image. The segmented binary image is interpolated with hue component of HSV color space and segmented hue component is used for feature extraction, the segmented images of digital images and microscope images are shown in figure 1 and figure 2 respectively.

D. **Feature Extraction:** An important step after segmentation process is feature extraction. The gray level co-occurrence matrix features of a segmented image are extracted. The properties of gray level co-occurrence matrix like Contrast, Correlation, Energy and Homogeneity features are extracted using GLCM matrix.

1) **Contrast:** Local variations are estimated by contrast attribute in gray level co- occurrence matrix using equation (1).

$$\sum_{i,j} |i-j|^2 \; p(i,j) \qquad (1)$$

2) **Correlation:** Joint probability occurrence of specified pixel pairs are estimated by correlation using equation (2)

$$\sum_{i,j} \frac{(i-\mu i)(j-\mu j)p(i,j)}{\sigma_i \sigma_j} \qquad (2)$$

3) **Energy:** Angular second moment or uniformity is called as energy which provides sum of squared elements in gray level co-occurrence matrix using equation (3)

$$\sum_{i,j} p(i,j)^2 \qquad (3)$$

4) **Homogeneity:** closeness of the distribution of elements in gray level co-occurrence matrix to gray level co-occurrence diagonal matrix is measured using equation (4).

$$\sum_{i,j} \frac{p(i,j)}{1+|i-j|} \qquad (4)$$

E. **Classification**: Artificial neural network is used to classify the data, neural networks works like human brain and its tries to simulate its learning method so it is called neural network. In terms of traditional approach, biological neurons process and transmit the information in artificial neural networks interconnecting artificial neurons are works like biological neurons. Neural computing is information proceeding by using neurons to solve the specific problems like pattern recognition or data classification through training the network.

In the proposed work, GLCM features are extracted form segmented image. Four neurons are considered in input layer because four feature vectors are extracted from GLCM, ten neurons are used in hidden layer and two neurons are considered in output layer. The typical neural network diagram shown in the figure 3. Men Squared performance function is used to measure the performance of the algorithm. Performance of the algorithm with epochs shown in the figure 4. Figure 5 represents training method for the input data. The gradient descent process is used to calculate the variance among the actual target output and output. The validation phase determines the validation check for the training set. The training process stops when it reached to the extreme gradient and validation stops after reaching valid values. Figure 6 shows the regression classification result.

IV. EXPERIMENTAL RESULT AND DISCUSSION

Proposed work for identification of paddy leaves diseases using feed forward back propagation neural network. Primarily the captured RGB images resized to 256 X 256 and RGB images converted into HSV color space, individual component of HSV extracted and tested for better segmentation using Otsu segmentation method. Among HSV individual components the Hue component gives better segmentation. After getting the segmented binary image the Hue component is interpolated with segmented image using resultant image the GLCM features are extracted for training and testing. The training data and target data used to train the feed forward back propagation neural network and trained network tested with testing features by simulation method and result obtained 100% of accuracy. Collected paddy leaves images used for both training and testing. Testing images are captured using microscope. The spatial digital images used for train the neural network and microscopic images used for testing. Narmada R P et al., (2017) works in diseases identification on paddy leaves and obtained result is 94.7% accuracy. In our approach obtained 100% of accuracy in disease identification.

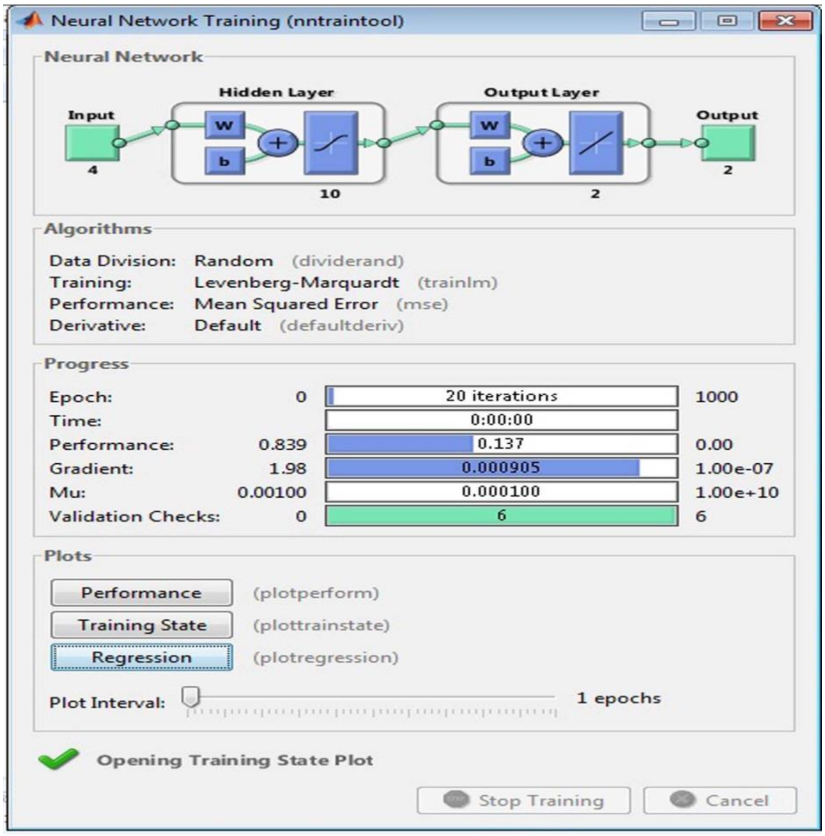


Figure 4. Training of a feed forward back propagation neural network

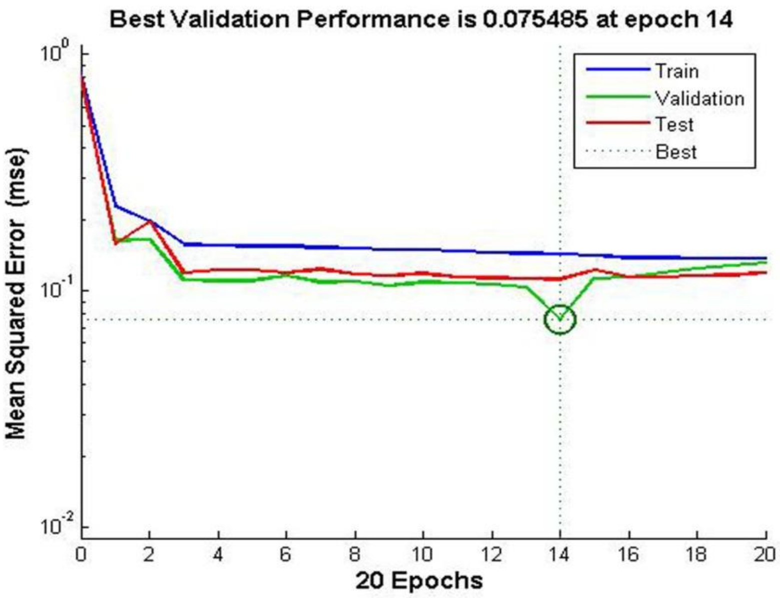


Figure 5. Performance graphs of epochs values for feed forward back propagation neural network

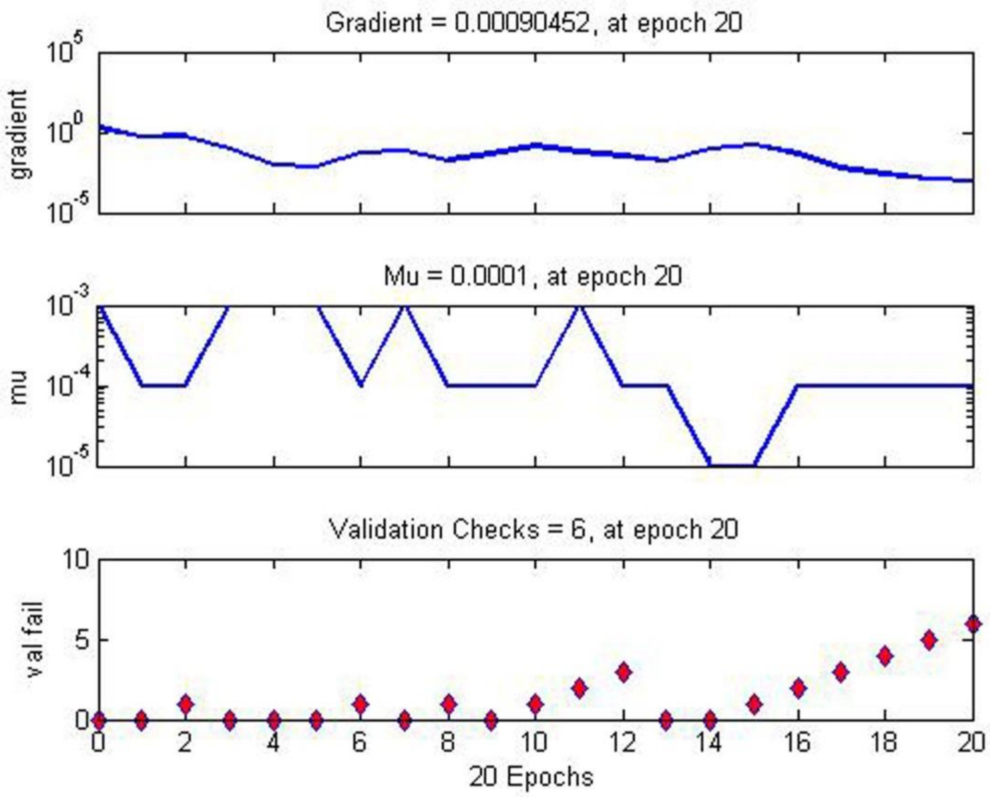


Figure 6. Training phase of the input signals for feed forward back propagation neural network

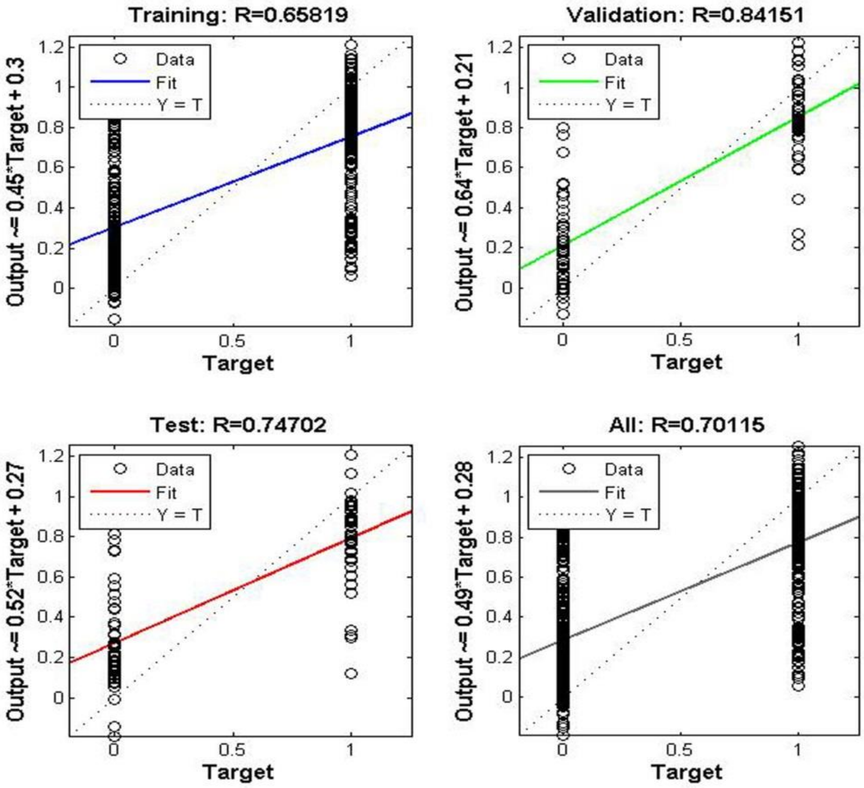


Figure 7. Regression diagram for performance of feed forward back propagation neural network

V. CONCLUSION

Paddy leaves diseases identification is done by using feed forward back propagation neural network with GLCM features. Segmentation carried out using Otsu segmentation method. Due to limitations in capturing microscopic images, limited number of images are captured in the future work, all sort of diseases would be considered.

VI. REFERENCES

[1]. Deserno, T. M. (Ed.). (2011). Biomedical image processing. Springer Science & Business Media.

[2]. Karmokar, B. C., Ullah, M. S., Siddiquee, M. K., & Alam, K. M. R. (2015). Tea leaf diseases recognition using neural network ensemble. International Journal of Computer Applications, 114(17).

[3]. Morel, J. M., & Solimini, S. (2012). Variational methods in image segmentation: with seven image processing experiments (Vol. 14). Springer Science & Business Media.

[4]. Narmadha, R. P., & Arulvadivu, G. (2017). Disease Symptoms Identification In Paddy Leaf Using Image Processing. Advances in Computational Sciences and Technology, 10(8), 2213-2223.

[5]. Raghavendra S.P., Danti A. (2016) A Novel Recognition of Indian Bank Cheques Using Feed Forward Neural Network. In: Behera H., Mohapatra D. (eds) Computational Intelligence in Data Mining—Volume 2. Advances in Intelligent Systems and Computing, vol 411. Springer, New Delhi. DOI - https://doi.org/10.1007/978-81-322-2731-1_7

[6]. Suresha M, Sandeep and Harisha Naik T (2018) Recognition of Salient Bird Objects Using Feed Forward Back Propagation Neural Networks International Journal of Computer Engineering and Applications, Volume XII, Issue I, Jan. 18, www.ijcea.com ISSN 2321-3469

[7]. Barr, M.E. (1977) Magnaporthe, Telimenella and Hyponec-tria (Physosporellaceae). Mycologia 69:952-966

[8]. Yaegashi, H. and Udagawa, S. (1978) The taxonomical identity of the perfect state of Pyricularia grisea and its allies. Canadian Journal of Botany, 56:180-183

[9]. L. Aryal , G. Bhattarai , A. Subedi , M. Subedi, B. Subedi & G.K. Sah. 2016. Response of Rice Varieties to Brown Spot Disease of Rice at Paklihawa, Rupandehi, Global Journal of biology. Agriculture and Health sciences, 5(2): 50-54.

[10]. Chakrabarti, N. K. (2001). Epidemiology and disease management of brown spot of rice in India. In Major Fungal Diseases of Rice (pp. 293-306). Springer Netherlands.

[11]. Mizoguchi M (2011). Paddy and Water Environment. Volume 1 / 2003 - Volume 11 / 2013. Springer Japan.