Detection and Controlling of Paddy Diseases using Image Processing Techniques

J. Monica Reena Rai[1],T.Nithya Priya[2],A.Uma[3],A.Ganesh[4],Mr P.Prabakaran [5] M.E,MBA (Assistant Professor/ECE) ,CKCET

Abstract-The Indian economy is extensively depend on development of agriculture. Hence enhancement in field of agriculture is conspicuous for developing country like India. The diseases in rice are mainly caused due to bacteria, fungus and pathogens which leads to decrease in productivity of yield. Manual detection of disease by farmer are challenging and requires constant assistance by experts. Therefore image processing technique are used for identification of type of disease in paddy crops. A small robot unit is used to spray the pesticide according to disease detected (RBB, RB, RSR, RBS).This consists of cost effective devices as microcontroller, wireless camera, sprayer and RF transmitter and receiver.

Keywords-KthNearstNeighbor Classifier,MinimumDistance classifier,yCbCr-colorspace, agriculture robot, pesticide sprayer.

I.INTRODUCTION

India is the world`s 2nd largest rice producer and constitutes about 22% of income in country. The common problem faced by farmers is extensive use of pesticide and low production of yield. The statistics says that every year farmers lose up to 37% of crops to pests and diseases. For good crop management accurate and timely analysis can significantly reduce losses. But detection of disease in early stage is not possible since it requires expert`s advice. Hence this creates a necessity for image processing technique to detect the disease automatically. This greatly reduces human efforts and minimizes the harmful effects of pesticide on skin. This paper deploys a robotic vehicle which is used in agriculture field to spray the pesticides. The wireless camera is mounted on the top of the vehicle tracks the path taken by the robot. This serves as cost effective robot vehicle can improve the productivity, safety and meet with demand for labors.

II.EXISTING SYSTEM

The existing methods for pesticide application include a human operator travelling along the Field rows and selectively spraying the target manually using Backpack sprayer and mechanized non selective spraying in which human drives a tractor with a sprayer connected to a trailer behind tractor that sprays the pesticide throughout the field .Although humans use overcoats to protect themselves from pesticides still they are exposed to them which may cause negative issues in their health. During a survey conducted among the farmers it is found that hey conduct visual survey of their farmland they are aware of more common diseases and seek help of the nearby knowledgeable farmers or approach dealers with sample of infected crops if they have any doubt

Even then once in three years they face extensive crop damage due to delay in information of spreading disease Furthermore manual spraying tedious job ,very slow and limited due to lack of workers in agriculture

III.PRROPSED SYSTEM

This paper is ongoing research aimed to replace the traditional spraying method with a agricultural robotic vehicle. Hence image processing technique are combined with embedded system to give a automatic system which detects the disease, classify the type and spray pesticides to control the growth of pests. There are many diseases in rice out of which four main disease have studied in this paper RBB(Rice Bacterial Blight),RBB(Rice Brown Spot),RSR(Rice Sheath Rot), RB (Rice Blast).These disease have similar symptoms which confuse the human vision while detecting them. So we use two different types of classifiers namely MDC(Minimum Distance Classifier), K–NN(K^{th} Nearest Neighbor) which provides an accuracy of 89.3% The methodology for identifying and classifying rice diseases involves pre-processing, segmentation, feature extraction, classification. In training phase, few images have been trained by extracting their feature values and storing them in a file. This trained dataset is further used as reference data for the classifier to classify the input or test images. Then at the final stage classifier compares the trained Dataset with input testing image which is captured and sent by the robot vehicle in the field and the results are again send back to the vehicle to spray the specified pesticide.

BLOCK DIAGRAM

There are two main units used to implement proposed system

1. Control Unit

2. Robot Unit

The robot vehicle is placed in the field to detect the disease and control unit placed away where a team person operates it, The camera mounted on the robot vehicle which takes the picture of paddy crops and transmits to camera receiver(control unit) further forwarded to PC with MATLAB, type of disease is classified and information is forwarded to the vehicle in the field with help of RF transmitter and receiver ,First the type of disease is displayed on the LCD then robot sprays the required pesticide according to the disease detected. If any obstacle is detected on the of the robot vehicle IR sensor sends signal to microcontroller the path of robot is changed accordingly(left or right). The process is repeated for the entire field of rice crops.

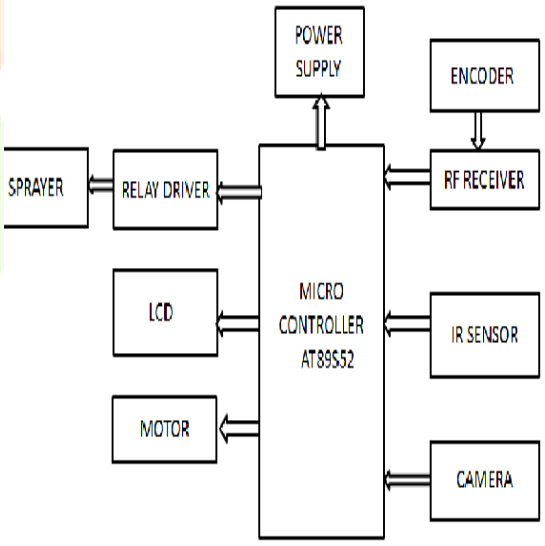

Fig 1. Robot Vehicle Unit

In Control unit MAX232 IC is used to interface the microcontroller with PC for the purpose of serial interface. The encoder and decoder are used for secured transmission of data between devices.

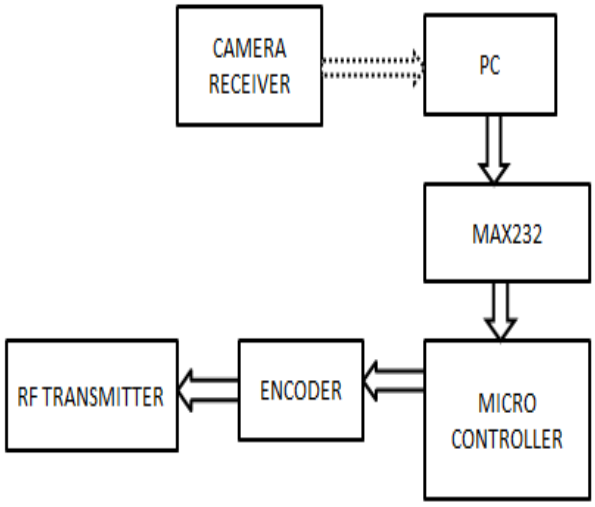

Fig 2.Control Unit

IMAGE PROCESSING TECHNIQUES

A. Data collection and Preprocessing

In this work, JPEG images of four infected rice leaves were collected. The input image is first resized to 256 X 256 pixels. In order to remove the effect of outdoor illumination, normalize the image. To normalize the image, extract R,G,B components and take the mean of three components and find the maximum value out its mean. Multiply the R,G,B component values with this scaling factor, which results in the normalized image.

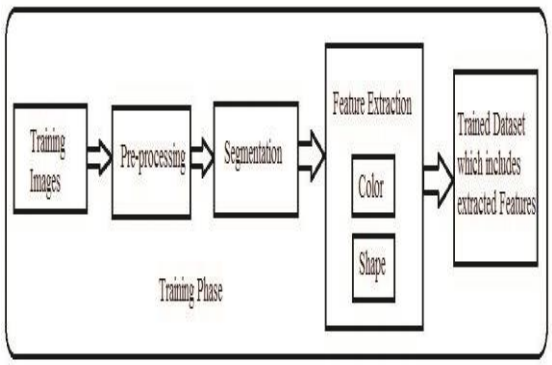

Fig No.3 Training Phase of Sample Images

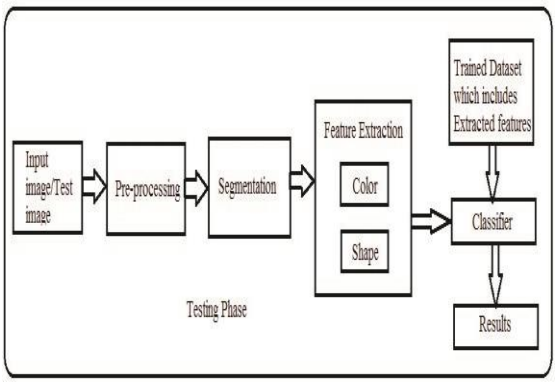

Fig No 4 Testing Phase of Images

B. Segmentation

Convert the normalized RGB image into YCbCr space. YCbCr color space has been used mainly for segmentation of rice diseases .After calculation of the range of Cb and Cr, check the row and column number of the image which satisfy this range and convert that rows and columns pixels to white (assign the value 255 to a pixel). Convert the image into binary and multiply this with the originalRGB image, this will result in the segmented image.

C. Feature Extraction

I) Color Feature Extraction

The color of the diseased part of the leaf is one of the important indication for detecting the different diseases. The color of the affected part is different for every disease and also varies for different varieties of the rice plant. The color of the diseased part for the same disease is also different. R, G, B components of the segmented image are extracted. Mean and standard deviation in three R,G,B plane are calculated. Total 6 color features are extracted

II) Zone Wise Shape Feature Extraction

The segmented image is converted into a binary image and the number of connected components is calculated. Area and centroid of each connected component are calculated. The area is the number of white

Disease Type	Remedies
RBB	Spray crop with Streptomycin sulphate (200ppm) + Copper oxychloride (0.25%) + sticker (0.10%). First spray immediately after disease appearance followed by 1 to 2 sprays at 10 to 15 days interval
RB	Carbendazim 50WP @ 500 grams/hectare Tricyclozole 75 WP @ 500 grams/ hectare Metominostrobin 20 SC @ 500 milliliters / hectare Azoxystrobin 25 SC @ 500 milliliters / hectare Propiconazole 500 milliliters / hectare
RBS	Seed treatment with iprodione (0.25%) or carbendazim (0.10%)
	Use fungicides *viz.*, iprodione (0.25%), propiconazole (0.10%), azoxystrobin(0.05%), trifloxystrobin (0.10%), chlorothalonil (0.25%), Metominostrobin (0.10%), etc. for foliar sprays
RSR	Seed treatment with fungicide like Carbendazim or benomyl @ 3.0 g/kg seed.
	Apply a foliar fungicide like Carbendazim or propiconazole or Metominostrobin or Hexaconazole 75% WG @ 500grams/hectare

pixels in a given image and centroid is the center of mass of the given region. Morphological operation 'skel' is performed on the cropped area of an infected part. The logic to find following features is based on feature extraction technique used for recognition of hand written character

1) The no. of horizontal lines.
2) The average length of horizontal lines.
3) The no. of right diagonal lines.
4) The average length of right diagonal lines.
5) The no. of vertical lines.
6) The average length of vertical lines.
7) The no. of left diagonal lines. The average length of left

All the extracted features are combined and used as an input to classifiers.

TABLE I. REMEDIES FOR DISEASES

D. Classification

Two classifiers namely MDC and k-NN has been applied for the classification of diseases. Distance classifier is preferable because of its simplicity of usage and less classification time MDC with Manhattan distance and k-NN with the 'cityblock' distance metric are implemented. To test the performance of the proposed technique, 70 % data is used for training purpose and 30% data is used for testing purpose. Manhattan distance is also called cityblock distance and is a distance (d), between two points A(x_1, y_1) and B(x_2, y_2) .

Techniques	Classification accuracy
Anthonys G., & N. Wickramarachchi	70 %
Kurniawati, Nunik Noviana	86 %
Phadikar S.& J. Sil	82%
Phadikar S. & J. Sil	68.10%
Proposed technique	89.23 %

CONCLUSION

A system for monitoring rice bacterial blight, rice blast, rice sheath rot and brown spot diseases has been developed in this

study. In the feature extraction, color and zone wise shape features have been extracted and used as an input to the classifier. The proposed technique is compared with the few existing techniques which are related to the rice diseases detection and found that the proposed technique is superior in terms of time complexity, accuracy, number of diseases covered.

In this work, color and shape features extraction have been carried out. In addition to this, texture feature can be included and can be checked for the impact of this extra feature on the performance of an algorithm**.** There are other rice diseases except four covered in this work. Future work can be to cover other rice diseases. The same techniques can be applied to other crops with little modifications.

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