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A Decision Tree Approach Using Thresholding and Reflectance Ratio for Identification of Yellow Rust

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Abstract-India is known as agricultural country; about 70% of the population of India depends on agriculture. Wheat is one of the major crops for nutrition and production. Yellow rust is the major diseases in wheat crop that causes considerable yield losses in India and all over the world. Identification of yellow disease manually is very time-consuming. Therefore automatic detection of disease in wheat crop is required. In the presented work an automated system has been developed for detecting affected part of wheat leaf using thresholding technique of image processing. In this work a new approach has been demonstrated that targets the problem of environment setting in which images has been tested for different weather conditions, resolution, orientation and size . The concept of feature extraction, thresholding, decision tree, color models has been exploited in the proposed approach. The system has been tested for various images captured using a mobile and camera and performance is evaluated.

Keywords: Thresholding , feature extraction, Image Acquisition

1. INTRODUCTION

Wheat is the world's most widely cultivated crop, in 2000; world wheat production was approximately 572 million metric tons on 205 million hectares. Of the cereal crops, wheat contributes for the highest volume of international trade. Wheat is the essential food for about 40% of the population of the world. While, every year, large area of wheat diseases really affect the yield and quality of the wheat. Yellow rust along with Stem rust is the two major diseases in wheat crop that causes considerable yield losses in India and all over the world. It is observed that virulent pathotypes has become a threat to wheat crop production and yield. For this reason new approaches which can prevent yield loss by rust disease is needed.

The main approach for the diagnosis of wheat crop is manual examination by experts. But this approach is very costly and needs continuous monitoring of the crop which is very time consuming. Therefore automatic detection of disease in wheat crop is required. Computer vision techniques have great significance on the automatic identification of yellow rust in wheat crop. These techniques not only decrease the labour cost, but also enhances the speed and precision of identification of the disease in large fields.

Image processing techniques are used for detecting diseases in wheat crops. The image processing techniques are widely applied to agricultural science and it has immense perception especially in the plant protection field, which eventually leads to crops management.

The goal of this Research work is to design effective and efficient disease identification method which gives better performance as compared to the conventional disease identification systems.In the presented paper, the visual inspection of yellow rust identification work is divided into following steps:

- Importing the image with the help of image acquisition tools.
- Analysis and manipulation of image.
- Image Analysis Report.

With these techniques it is now possible to reduce errors, costs to achieve ecological and economically sustainable agriculture. Using MATLAB software as a tool in image processing, we can analyze fungus using various algorithms. These algorithms or methods are relatively complex, run longer and less than ideal identification. The experimental results showed that it could recognize wheat disease by extracting the shape feature values.

OVERALL PROCESS OF DISEASE IDENTIFICATION

In this section whole process require for completion of thesis is outlined including implementation details and flow chart. The whole process is divided into these main core steps:

- Pre-processing of data.
- Extracting features from the given data.
- Identification of yellow rust disease by decision trees rules.

Figure 1 shows the block diagram of the overall process required for completion of the thesis. First of all wheat images are collected from various resources such as farmer's field or laboratories after that image preprocessing is applied for removing distortion or noise from image then we partition image into various meaningful regions so that we can extract meaningful information that is present in the image. At the end yellow rust is identified in the wheat leaf images by performing analysis on image.

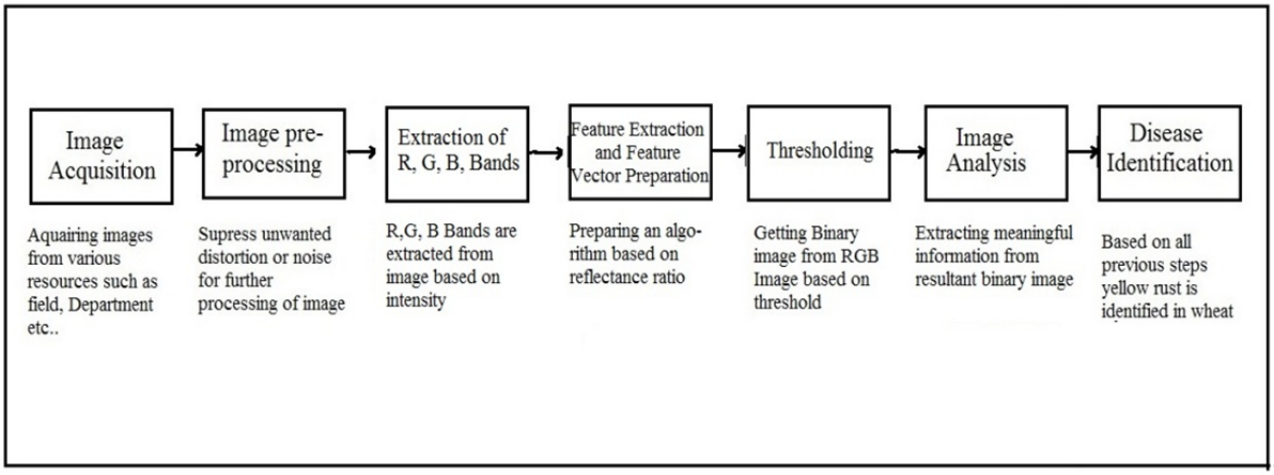


Figure 1 : Overall Process Description

2. Implementation Of The Proposed Technique

The effects of applying various operations, involved in my proposed method, on the images are depicted using screenshots of images obtained after each step of proposed method. It can be used to analyse the complete stepwise working of proposed method.

2.1 Image Acquisition

The acquired image has been shown in figure 2. The image shown has been taken by camera.

Figure 2: Original Image

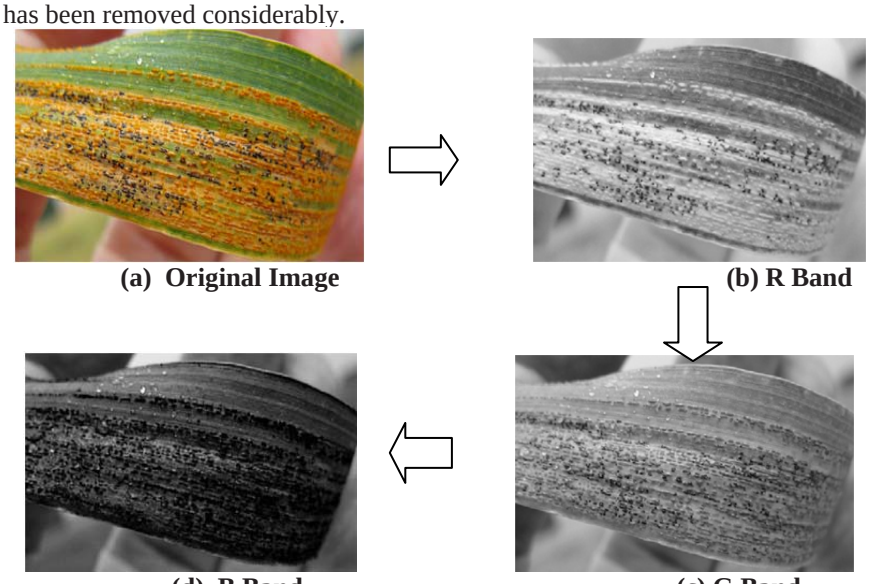
2.2 Pre-processing

Figure 3 shows the image after adjustment of intensity and taking relevant parts from the image and deleting extraneous parts by cropping the image. The noise present in the image (if any) has been removed considerably.

Figure 3: Pre-processed Image

2.3 Extraction of R, G, B Bands

In this step R, G, B bands are extracted from the given color image. R band shows high brightness in the picture where intensity of red color is high and low brightness in the picture where intensity of red color is low as shown in Figure 4 (b). G band shows high brightness in the picture where intensity of green color is high and low brightness in the picture where intensity of green color is low as shown in Figure 4 (c). B band shows high brightness in the picture where intensity of blue color is high and low brightness in the picture where intensity of blue color is low as shown in Figure 4 (d). Based on these bands further process is performed for calculating reflectance ratio.



(a) Original Image **(b) R Band**

(d) B Band **(c) G Band**

Figure 4: Extracting R, G, B Band

2.4 Thresholding

In Figure 5 binary image is obtained after calculating reflectance ratio from extracted R, G, B components and based on these ratio thresholding is applied on the images.

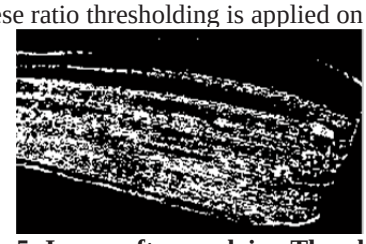


Figure 5: Image after applying Thresholding

2.5 Image Analysis

Resultant image is a binary image in which:

- Black pixels indicate healthy part of the wheat leaf.
- White pixels indicate infected part of the wheat leaf.

2.6 Output on Matlab for Disease Identification

Disease is identified by the proposed method and final output is shown in the Matlab command window as shown in Figure 6

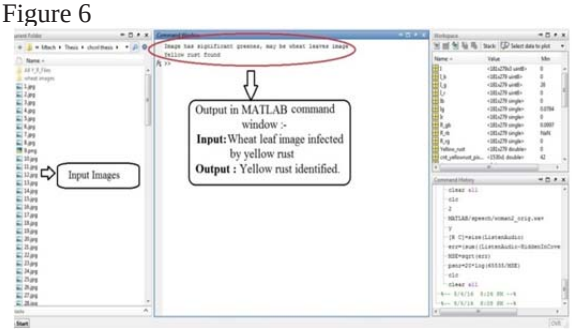


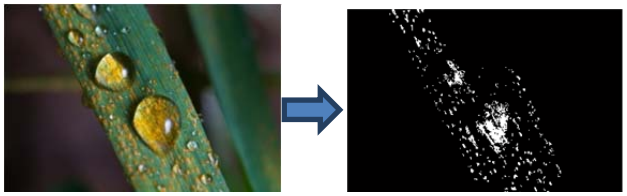
Figure 6: Screenshot of output in MATLAB

3. RESULTS

SCENARIO-1 Results for yellow rust images taken in inappropriate conditions

3.1 Case-1 When rain droplets are on leaf

Yellow rust can be found in wheat in unseemly climate conditions, for example, intensely rain, daylight, dampness and so forth. Figure 7 shows wheat leaf when beads of downpour are on the yellow rust disease. We have tested yellow rust pictures in different conditions and effective results are appeared in following figure

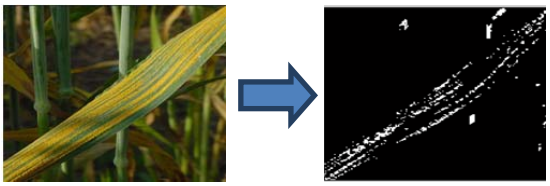


(a) Input Image (With Water Droplets) (b) Output Image

Figure 7 Result for test image 1

3.2 Case 2- When leaf picture taken in Shadow

Figure 8 shows image of yellow rust of wheat leaf taken in shadow. After executing this image by proposed system yellow rust has been identified successfully which is shown in figure 8:

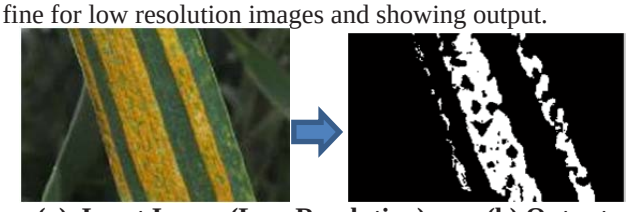


(a) Input Image (In Shadow) (b) Output Image

Figure 8 Result for test image 2

3.3 Case -3 Low Resolution

Resolution of images is vital variable which influences result. Pictures of low resolution are tested by proposed framework. In the resultant picture appeared in Figure 9 we can examine that output of low resolution images are obscure than high resolution images and yellow rust is not legitimately perceived, but rather framework is working fine for low resolution images and showing output.



(a) Input Image (Low Resolution) (b) Output Image

Figure 9: Result for test image 3

3.4 Case -4 Image Size

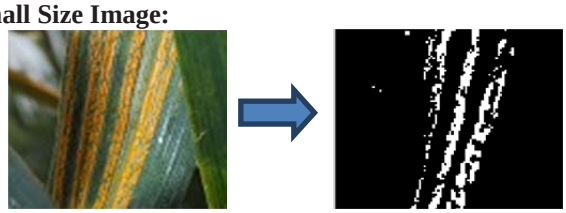
Size of image plays important role and affects quality of results. Images of different size are tested by proposed system and it is analyzed that results of yellow rust disease are clearer in large size images than small size images. In the resultant image shown in Figure 10(a) we can analyze that output images having small size are blur than images having large size. Pixels of yellow rust is not properly recognized in small size images shown in figure 10 (b), but system is working fine for both small and large size images and providing accurate output for both of the cases.

Large Size Image:

(a) Input Image (Large Size) (b) Output Image

Figure 10 (a): Result for test image 4

Small Size Image:

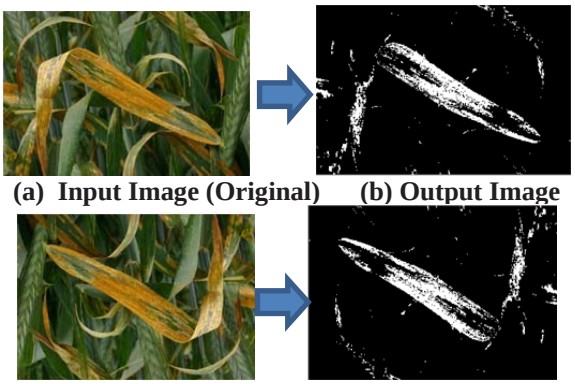


(a) Input Image (b) Output Image

Figure 10 (b): Result for test image 4

3.5 Case -5 Image Orientations

If we rotate input image then there is there is no effect on output as shown in Figure 11. Pixels of the rotated image are same as original image



(a) Input Image (Original) (b) Output Image

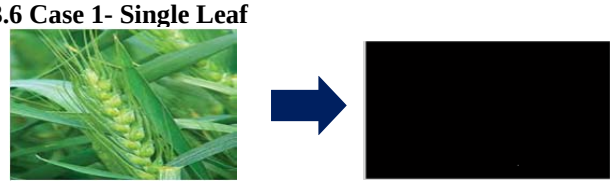
(c) Input Image after rotation of 180° (d) Output Image

Figure 11: Result for test image 5

SCENARIO-2 Results for Healthy Wheat Leaf Image

Some of the Healthy wheat Leaf Images are taken and executed on the system and the successful results have been shown in Figure 4.16 and 4.17. Figure 4.16(b) is full if black pixels which indicate that wheat leaf dose not affected by any kind of disease. Since black pixels indicates healthy part and white pixels in the binary image indicates infected part of the wheat leaf image.

3.6 Case 1- Single Leaf

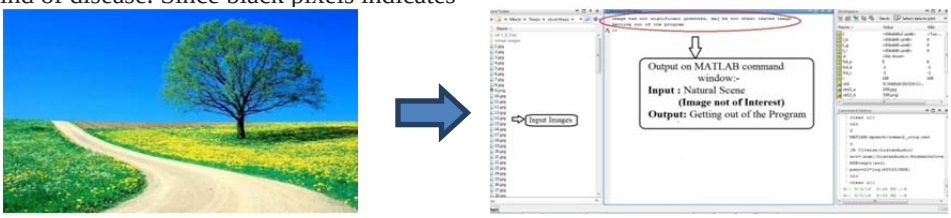


(a) Input Image (b) Output Image

Figure 12: Result for test image 6

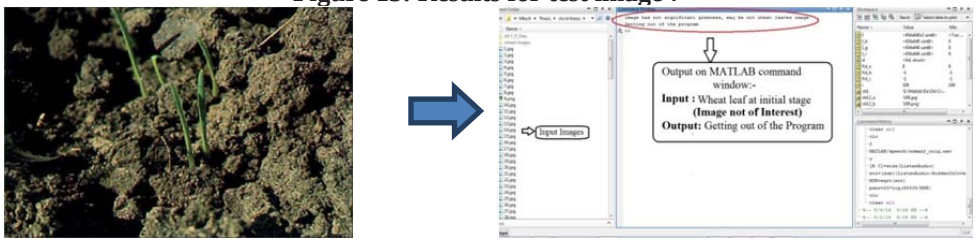
SCENARIO-3 Results for Images other than wheat leaf

If the images sent by farmer are other than wheat leaf images such as house images, natural scenes or other color images etc. than according to the Matlab code and decision tree it will fail in the first step and it will not pass greenness test. Then a result is shown that "Image has not significant greenness, may be not wheat leaf image". Hence to pass the test at the first step image should be a leaf image, all other images which are not of interest will be rejected by the system.



(a) Input Image (b) Output on Matlab

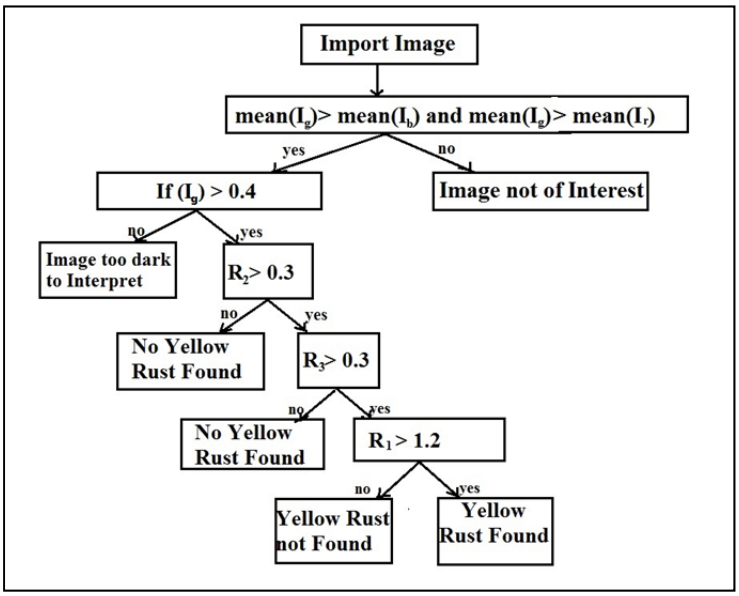
Figure 13: Results for test image 7



(a) Input Image (b) Output on Matlab

Figure 14: Results for test image 8

DECISION TREE FOR PROPOSED SYSTEM



4. CONCLUSION

In this thesis a decision tree approach using thresholding and reflectance ratio for identification of yellow rust has been developed. MATLAB has been used as a programming environment for developing the system. This thesis provides a new approach in the field of automatic yellow rust disease detection in wheat crop for images taken from hostile environment and from web in which problem of resolution, orientation, size of image have been addressed. Already existing techniques and approaches have been surveyed and analyzed. Then a new approach based on decision tree and thresholding algorithm has been implemented to develop a Yellow rust disease identification system in wheat crop. By observing the results taken in various conditions, we can say that the proposed method is good for identification of yellow rust disease in wheat leafs, where the disease can be easily recognized.

REFERENCES

[1] **Komal Bodkhe, Nisha Thakur, Shraddha Deshmukh, PreranaJaipurk**"Analysis of Fungus in Plant Using Image Processing Techniques" International Journal of computer applications, April 2015

[2] **G.T. Hariharn, G.P.S. Hariharn, R. Vijay Anandh,** "Crop Disease Identification Using Image Processing, International Journal of latest trends in engineering and technologies, March 2016

[3] **Hiteshwari Sabrol& Satish Kumar,** "An Identification Of Wheat Rust Diseases In Digital Images:A Review, International Journal of Computer Science Engineering and Information Technology Research (IJCSEITR)

[4] **Tarun Kumar, Karun Verma,** "A Theory Based on Conversion of RGB image to Gray image" International Journal of Computer Application, September 2010

[5] **Irani, M., Peleg, S., 1991,** "Improving resolution by image Registration, Graphical Models and Image Processing" vol.53,no. 3, pp.231-239.

[6] **Feiyun Zhang,** "Feature Extraction Method for Wheat Diseases Based on Multi-fractal Spectrum" Proceedings of the 2nd International Conference on Computer Science and Electronics Engineering (ICCSEE 2013)

[7] **Shruti and Nidhi Seth** "Fungus/Disease Analysis in Tomato Crop using Image Processing Techniques" International Journal of Computer Trends and Technology (IJCTT) Volume-13,No.2-Jul 2014.

[8] **Meenu Dadwal, V. K. Banga**"Estimate Ripness Level of Fruits Using RGB Color Space and Fuzzy Logic Tecnique" International Journal of Engineering and Advanced Technology (IJEAT) ISSN:2249-8958, Volume-2,Issue-1,October 2012.

[9] **Stephen N. Wegulo, and Emmanuel Byamukama,** "Rust Diseases of Wheat" Plant Dieases Wheat, NebGuide" University of Nebraska–Lincol, Nov 2012.

[10] **AminaKhatra,** " A Novel Machine Vision System for Identification of Yellow Rust in Wheat Plants", International Journal of Image Processing (IJIP), Volume (7) : Issue (5) : 2013

[11] **Arjun M.A., 2013.** Indian Agriculture- Status, Importance and Role in Indian Economy

[12] **Camargo A., Smith S.J. 2009**. Image pattern classification for the identification of disease causing agents. Computers and Electronics in Agriculture, pp-121-125.

[13] **Hiary H., Ahmad B. A., Reyalat M., Braik M., Rahamneh Z. 2011.** Fast and Accurate Detection and Classification of Plant Diseases. International Journal of Computer Applications, Volume 17– No.1

[14] **Khatra A. 2013.** A Novel Machine Vision System for Identification of Yellow Rust in Wheat Plants, International Journal of Image Processing (IJIP), Vol. 7, Issue 5.

[15] **Li H.,Chutatape O. 2004.** Automated Feature Extraction in Color Retinal Images by Model Based Approach, IEEE Transactions on Biomedical Engineering, pp. 246-254.