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LEAF DISEASE DETECTION USING IMAGE PROCESSING FOR PESTICIDE SPRAYING

Sakshi Mude[1], Divyasha Naik[2], Amrita Patil[3]

[1]*Electronics and Telecommunication Engineering , AISSMS IOIT*
[2]*Electronics and Telecommunication Engineering , AISSMS IOIT*
[3]*Electronics and Telecommunication Engineering , AISSMS IOIT*

Abstract - Various diseases found on plants can reduce the quantity and quality of the agricultural products. Identification of plant diseases with naked eye is time consuming and does not give accurate results. Farmers get affected with various diseases due to long exposure to pesticides. Automatic spraying of pesticides will reduce the health issues related to farmers. The present work proposes an efficient method to detect the cotton leaf diseases using various image processing techniques. In this paper we have implemented the image processing techniques using MATLAB to detect four types of diseases on cotton leaf. Once the disease is detected spraying of pesticides is done with the help of a robot.

Keyword- *Cotton Leaf diseases , Database , Artificial Neural Network , Image Processing Techniques , HSV feature extraction , Pesticide Spraying system.*

I. INTRODUCTION

Agriculture is very important in Indian economy. It provides employment to over 60% of the population. In India cotton cultivation is done on a very large scale . Maharashtra is a traditional producer of cotton with production of 29.78% of total cotton production in India. Over 80% of the production of cotton is produced by Khandesh, Vidarbha and Marathwada.
Plant disease detection and its management is a challenging task. Generally diseases are seen on the leaves or stems of the plant. In this paper we present a approach to detect the cotton leaf diseases using image processing techniques and Artificial Neural Network. An Artificial Neural Network is a computational model inspired by the structure, processing method and learning ability of a biological brain.

About 80-90% of the diseases found on cotton plant are on its leaves. Here we are detecting four diseases on cotton leaves namely Rendening, Rust , Bacterial, Fussarium. So our study of interest is only the cotton leaf and not the entire plant.

Fig. 1. Fussarium

Fig.2. Bacterial

Fig.3. Rendening

Fig.4. Rust

The term pesticide refers to variety of compounds like insecticides, fungicides , herbicides and others. The main use of pesticides in India is for cotton crops (45%) followed by paddy and wheat. The farmers suffer from various adverse effects of spraying pesticides like cancer, infertility and sterility, long term brain damage, respiratory disorders like asthma, bronchitis etc.
This paper provides a solution to the health issues that arise due to spraying of pesticides. The diseases found on cotton plant are detected by performing following steps. The image of the diseased leaf is acquired using a camera. Various preprocessing techniques like RGB to GREY, thresholding , boundary detection, cropping, segmentation, feature Extraction, analysis are performed. ANN is used as a classifier for testing the input image with the images already stored in database.

II. LITERATURE SURVEY

A lot of research has been done in digital image processing to improve the quality and quantity in agriculture production all over the world.

[1] Amandeep Singh & Mahinder Lal Singh has shown the use of LCC to predict the color of paddy crop leaf using image processing. Leaf color chart (LCC) consists of various shades of green color which varies from light green to dark green color. Based on the leaf color chart prepared, health status of leaf can be determined. It is simple, robust technique with 100% accuracy.

[2] Detection of cotton leaf disease by Eigen feature Regularization & extraction Technique was proposed by Ajay. A. Gurjar, Viraj. A. Gulhane. They have detected various kinds of disease like Bacterial, Fungal and viral on cotton Leaf. Three diseases were detected by Eigen Feature regularization and extraction techniques.

[3] In this paper Arti N Rathod, Bhavesh A. Tanawala & Vatial H.Shah has detected leaf disease using image processing & neural network algorithm. Initially leaf image is captured and preprocessing is done on it. It followed by segmentation by K-Medoids clustering method , feature extraction, statistical analysis and classification using Artificial Neural Network. It is a valuable approach to detect disease on leaf with little computational efforts.

III. METHODOLOGY

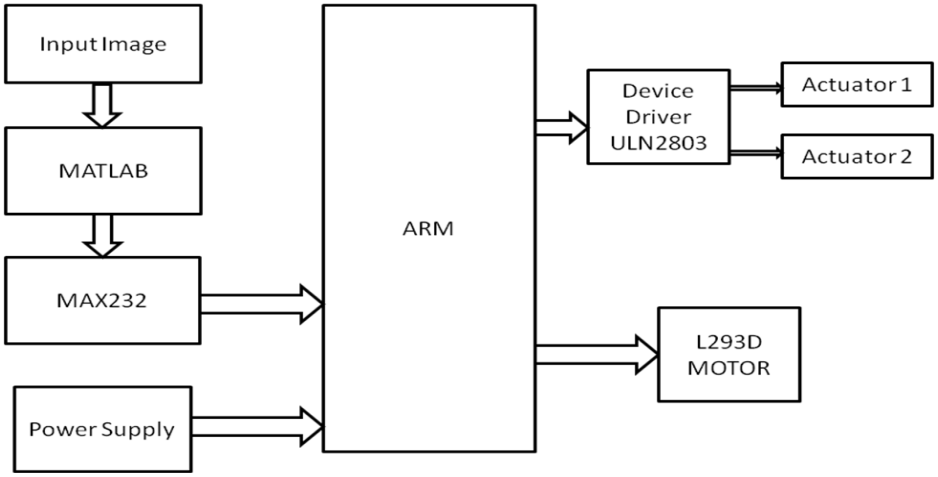

Fig. 5. Basic block diagram of disease detection system

The objective of this proposed work is to present technical solution to reduce health hazards of farmers involved in spraying pesticides. The proposed algorithm can easily detect the cotton leaf diseases early and accurately using diverse image processing techniques and ANN algorithm.

The following flowchart provides a brief information about proposed work:

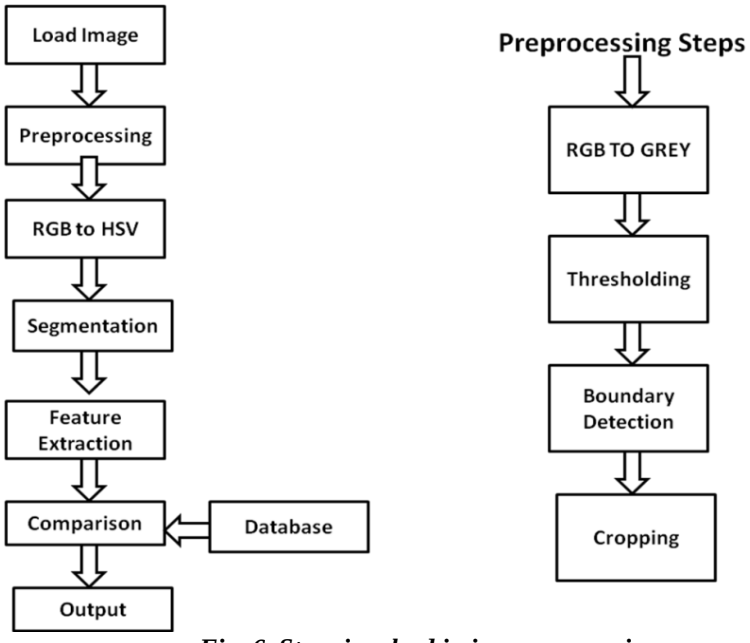

Fig. 6. Steps involved in image processing

A. Database:
Various images of cotton leaves are collected and stored in database for training and testing. Database consists of images of normal and diseased leaves.

B. Image acquisition and preprocessing:
The very first step is to acquire the images of cotton leaves by a camera. Various image preprocessing operations like RGB to gray, thresholding, boundary detection, cropping is done for further processing and analysis.

C. RGB to HSV:
First RGB images of leaves are converted into Hue, Saturation, value colour space representation. Colour model is the popular model because it is based on human perception. Hue is a colour attribute that refers to the dominant colour as perceived by an observer. Saturation refers to the relative purity or the amount of white light added to the hue and intensity refers to the amplitude of the light.

D. Segmentation:
After the HSV values of the leaf is extracted, the image is then segmented into number of blocks of equal size. In this approach block size of 10*10 is taken. So the blocks which are having more information are used for further analysis.

E. Feature extraction:
In the proposed approach, colour is the desired feature. In this phase, RGB values are converted to Hue, Saturation and Value for further analysis.

F. Classification:
Here classification of input image is done by comparing with various images in database. In this proposed work ANN is used as a classifier.ANN usually called neural network (NN) is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural network. A neural network consists of an interconnected group of artificial neurons and it processes information using a connectionist approach to computation.

IV. ADVANTAGES

1. Spraying of pesticides by robot will eliminate the health issues of farmers.
2. It will have less use of manpower.
3. There will be increase in productivity of cotton.
4. This system has low cost and provides easy detection of cotton leaf diseases.

V. APPLICATIONS

1. Agriculture Farms.
2. Race Course
3. Lawn/ Cricket Ground
4. At home level for gardening

VI. FUTURE SCOPE

1. Live feedback of spraying can be taken for observation by farmers.
2. SMS based system using GSM can be implemented
3. Android interface can be given to navigate the robot.

VII. RESULTS AND CONCLUSION

Image Sr no	Normal	Bacterial	Fussarium	Rendening	Rust	Correctly detected
Image 1	71.19 %	0.0 %	0.0 %	15.78 %	13.03 %	yes
Image 2	3.04 %	0.0 %	0.0%	82.04 %	14.92%	no
Image 3	90.42 %	0.0 %	0.0 %	5.28 %	4.30 %	yes
Image 4	94.66 %	0.0 %	0.0%	4.47 %	0.87 %	yes
Image 5	96.28 %	0.0 %	1.06 %	0.18 %	2.48 %	yes

This paper addresses how efficiently the cotton leaf disease detection is possible with various image processing techniques. Recognizing the disease and spraying pesticide is the main purpose of the proposed work. In future work can be extended to detect more number of diseases in cotton plant. Also over usage of pesticides can be avoided with proper control. Health issues related to farmers can be reduced by automatic spraying of pesticides.
The result obtained above shows that Rendening and Rust are the most occurring disease in cotton plant. The efficiency of the proposed work is about 84%. This is a quite simple, accurate and robust method to detect cotton diseases. This model can help to improve the productivity of cotton in India.

VIII. REFERENCES

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