iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** I **Month of publication:** January 2022

DOI: https://doi.org/10.22214/ijraset.2022.40003

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

Different Plant Disease Detection and Pest Detection Techniques Using Image Processing

Nanda Barthare[1], Dr. A. D. Mishra[2]
[1]*PG Student,* [2]*H.O.D, Department Electronics and Telecommunication Engg., Maharashtra Institute of Technology, Aurangabad(MS), India*

Abstract: ***In India, agriculture is a significant industry. Our Indian economy is also heavily reliant on agriculture; given that agriculture employs near about 70% of the population, it is critical to boost crop/plant productivity. Farmers have struggled to achieve higher productivity and better market prices due to many sorts of crop diseases. As a result, early detection of plant diseases becomes an essential strategy for avoiding losses in an agricultural production system. The disease's symptoms are mostly noticeable on leaves. It's difficult to keep track of each plant manually across a large area. As a result, image processing techniques are used to observe and diagnose plant diseases, which may be a better option for detecting diseases fast and accurately. This paper provides the review of different plant disease and pest control techniques using image processing in the recent years.***

Keywords: Image Processing, Agricultural, Disease Techniques, Pest Control.

I. INTRODUCTION

Agriculture is straining to meet its needs as the global population grow is growing at a rapid rate. Agriculture is the primary source of food, raw materials, and fuel for a country's economic prosperity. A Crop disease has a negative impact on food output and quality. Crop diseases have a negative impact on small-scale farmers whose livelihood is dependent on proper cultivation. The ability to control agricultural diseases by identifying them as soon as they appear on crops has an advantage. Crop infections have grown significantly in recent years as a result of extreme climate changes and a lack of immunity in crops. This results in large-scale crop destruction, reduced, and eventually financial loss for farmers. Identification and treatment of disease has become a serious concern due to the fast expansion of a range of diseases and lack of basic knowledge among farmers [1].

Diseases, pests, poor circumstances, and nutrient shortage harm the plant in general. Infectious agent plant and microorganism diseases are measured using the classification of plant diseases squares. Clean eye observation by experts is a typical method of detecting disease. However, in order to prevent the plant from becoming infected, a quick and early detection is required [2].Plant disease detection can be done using image processing techniques. Symptoms of disease can be noticed on the leaves, stems, and fruits in the majority of cases. The symptoms are shown on the plant leaf, which is used to detect the sickness [3] .The remaining part of the paper, is organized as follows. Section 2 deals with the different imaging techniques used in image processing. Section 3includes the related work done in this particular area and finally Section 4gives conclusion of the overall paper.

II. IMAGING TECHNIQUES

Following are the different imaging techniques used in image processing.

1) *Magnetic Resonance Imaging (NMR):* It is commonly referred to as a magnetic resonance imaging device and is distinguished by its powerful magnets. These magnets are useful because they efficiently polarize and further excite the focused proton individually contained in water molecules present in the tissue, resulting in a measurable signal that can be spatially encoded to produce different views of the body.
2) *Photo Acoustic Imaging:* Photo acoustic imaging is a hybrid biomedical imaging approach that was developed in response to the photo acoustic effect. It combines several advantages, such as optical absorption contrast and ultrasonic spatial resolution, to perform deep imaging of diffusive and other regimes.
3) *Tomography:* Tomography is one of the imaging techniques that uses a single plane or object to produce a tomogram. Tomography can be classified into linear, poly tomography, zonagraphy, computed type or computed axial, and Positron Emission tomography.

©IJRASET: All Rights are Reserved

4) *Thermography:* Breast imaging is one of the most prevalent uses for it. Telethermography, dynamic angiothermography, and contact thermo graph are the three most prevalent techniques. The advantage of the idea gained from metabolic activity is used in imaging thermo graphic digital technologies.
5) *Multispectral Imaging:* Multispectral imaging techniques capture all forms of images, whether they are invisible or visible images of fruits, crops, or vegetation, using different types of wavebands such as green, red, or near infrared wavebands. For the detection of plant diseases, multispectral photos are combined with machine learning and classification algorithms, which transform the information into useful data.
6) Hyper Spectral Imaging: To combine different spectrum information concurrently, hyper-spectral imaging employs a combination of classic imaging techniques and spectroscopy. The goal of this technique is to determine the spectrum of each concerned pixel in the image under consideration.
7) *Fluorescence Techniques:* Plant photosynthetic performance has long been studied using fluorescent methods. This method is highly important for crop monitoring since it allows us to remove stress at an early stage, minimizing yield losses significantly.
8) *Thermal Imaging:* This is a method of converting the numerous forms of radiation detected from an item into multiple sorts of images in order to extract various attributes, analyze them, and classify them. It was initially developed for defensive purposes, but it has since found widespread application in a variety of disciplines, including agricultural engineering techniques.
9) *3D Imaging:* Data is collected from two different dimensions in 2D imaging, which distinguishes given plant identifiers such as development, overall height, and yield estimation. As a result, 3D imaging looks to be a requirement for automatic plant disease identification.

III. LITERATURE SURVEY

Omkar Kulkarni [1] suggested a Deep Convolutional Neural Networks algorithm that is trained using photos of healthy and damaged crop leaves from a public dataset. The program achieves this goal by categorizing images of leaves into ill or healthy categories based on defect patterns. For each class, the proposed methodology was tested on five different types of crops and three different forms of crop diseases. The InceptionV3 model outperforms the Mobile Net model in terms of accuracy and validation loss, according to the results. J. Karthika et al. [2] claimed that disease analysis is practicable and that the detection of cotton leaf illnesses is possible. The analysis of the various diseases present on cotton leaves is frequently early discovered in the early stage before it damages the entire plant, according to J. Karthika et al. To discover diseases in cotton leaves, k-means clustering will be utilized for feature extraction, and a support vector machine will be employed to find them.

R. Mounika et al. [4] describe a method for detecting and classifying several forms of crop diseases using image processing techniques. One of the picture techniques that automatically detects and classifies diseases is image segmentation. It is used to carry out a method for identifying and ordering leaf diseases. K-Means is used to divide the ill section. The surface highlights of the GLCM are then separated, and the arrangement is completed with SVM. For the location of infections in citrus leaves, this technique is being tested.Using image processing techniques, Md. Abdul Awal et al. [5] devised a method for detecting agricultural illnesses and providing a solution. The system was created using Android Studio. The image of afflicted crops is compared with the CDDASS database by the crops diseases detection and solution system (Crops Diseases Detection and Solution system). If CDDASS detects any disease symptoms, it will make recommendations to farmers so that they can make the best decision possible about whether or not to treat the affected crops with drugs. Various ways for segmenting the disease section of the plant were explored by Sachin D. Khirade and A. B. Patil [6]. This research also examined feature extraction and classification strategies for extracting infected leaf features and plant disease categorization. For disease classification in plants, ANN approaches such as self-organizing feature maps, back propagation algorithms, and SVMs can be employed well. Utilizing image processing techniques, we can accurately identify and classify numerous plant diseases using these methods. Muhammad Hammad Saleem et al. [7] carried out the difficult task of disease localization and categorization in plant leaves. The Tensor Flow object identification framework was used to apply three DL meta-architectures: the Single Shot MultiBox Detector (SSD), Faster Region-based Convolution Neural Network (RCNN), and Region-based Fully Convolution Networks (RFCN). To recognize disease in plant species, all of the deep learning models were trained and tested in a controlled environment dataset. The development and comparison of two alternative techniques for vision-based automated pest detection and identification utilizing learning algorithms is presented by Aitor Gutierrez et al. [8]. A deep learning solution is contrasted to a solution that combines computer vision and machine learning. The Region Proposal Network (RPN) is used to generate region proposals, while the Disease Detection Network (DDN) is used to identify diseases in the selected regions. The RPN proposes a collection of varied sized zones that appear to have a disease. In order to locate regions having an insect or an egg, a repressor and a classifier inspect proposed locations.

An automatic detection and extraction system was published by Johnny L. Miranda et al. [9], in which multiple image processing techniques were employed to detect and extract the pests in the acquired image. The system given is basic but effective. The procedure for extracting the detected objects from the image is straightforward: the image was scanned horizontally and vertically to determine each coordinate and store the object image. Faithpraise Fina et al. [10] offer a method for detecting and recognizing pests that combines the k-means clustering algorithm with the correspondence filter. The dataset is detected by dividing the data space into Voronoi cells, which tend to discover clusters of similar geographic extents, isolating the objects (pests) from the background (pest habitat). The detection is made by collecting the many distinguishing characteristics of the pest and its habitat (leaf, stem) and applying the correspondence filter to identify plant pests in order to produce correlation peak values for various datasets. This research also found that the recognition likelihood from a pest image is proportional to the height of the output signal and inversely proportional to viewing angles, confirming that plant pest recognition is a function of their position and viewing angle. It's heartening to see that the correspondence filter can achieve pest rotational invariance up to 360 degrees, demonstrating the algorithm's usefulness in detecting and recognizing plant pests

IV. COMPARISON

Table 1 shows the comparison overview of techniques that are used in the recent years for the detection of plant diseases.

Journal	Title	Author	Description
Fourth International Conference on Computing Communication Control and Automation (ICCUBEA),IEEE	Crop Disease Detection Using Deep Learning	Omkar Kulkarni	Proposed a deep learning based model which is trained using public dataset containing images of healthy and diseased crop leaves.
Journal of Physics: Conference Series, ICCCEBS	Disease Detection in Cotton Leaf Spot Using Image Processing	J. Karthika et al.	Cotton leaf diseases detection and classification using image processing
International Journal of Engineering Research & Technology (IJERT)	Plant Disease Detection using Image Processing	Mr. V Suresh et al.	image processing is used for the detection of plant diseases by capturing the images of the leaves and comparing it with the data sets
Journal of Critical Reviews	Detection of Plant Leaf Diseases Using Image Processing	R. Mounika and Dr. P. Shayamala Bharathi	Detection of different types of diseases that are occurring for the crops and an algorithm.
Journal of Sensors	A Benchmarking of Learning Strategies for Pest Detection and Identification on Tomato Plants for Autonomous Scouting Robots Using Internal Databases	Aitor Gutierrez et al.	A dataset with a huge number of infected tomato plants images was created to generate and evaluate machine learning and deep learning models.
International Journal of Informatics and Communication Technology (IJ-ICT)	Density Based Clustering with Integrated One-Class SVM for Noise Reduction	Md. Abdul Awal et al.	This research developed for crops diseases detection and to provides solution by using image processing techniques.
International Conference on Computing Communication Control and Automation, IEEE	Plant Disease Detection Using Image Processing	Sachin D. Khirade and A. B. Patil	This paper not only discussed the methods used for the detection of plant diseases using their leaves images but also segmentation and feature extraction algorithm.
Plants, MDPI Journals	Image-Based Plant Disease Identification by Deep Learning Meta-Architectures	Muhammad Hammad Saleem	perform the complex task of plant disease localization and classification in a single framework

Table 1. Comparison Overview

A. Few Mathematical Terms

1) Mean: Mean is the first moment of first order data statistics. It provides the average color value of whole image.

$$Mean = \mu = \frac{1}{n}\sum_{i,j} p(i,j)$$

where n = Number of pixels in image i = Number of rows j = Number of columns μ = Mean

2) Variance: Variance gives the square of the deviation of image distribution.

$$Variance = \sum_{i,j} p(ij-\mu)p(i,j)$$

where i = Number of rows j = Number of columns μ = Mean

3) Standard Deviation: Standard Deviation is the second moment of first order data statistics. It gives the square root of variance of image distribution.

$$Standard\ Deviation = \sqrt{\frac{1}{n}\sum_{i,j}(p(i,j)-\mu)^2}$$

where n = Number of pixels in image i = Number of rows j = Number of columns μ = Mean

4) Skewness: Skewness is the third moment of low order data statistics. It gives measure of asymmetry in the distribution.

$$Skewness = \sqrt[3]{\frac{1}{n}\sum_{i,j}(p(i,j)-\mu)^3}$$

where n = Number of pixels in image i = Number of rows j = Number of columns μ = Mean

V. CONCLUSION

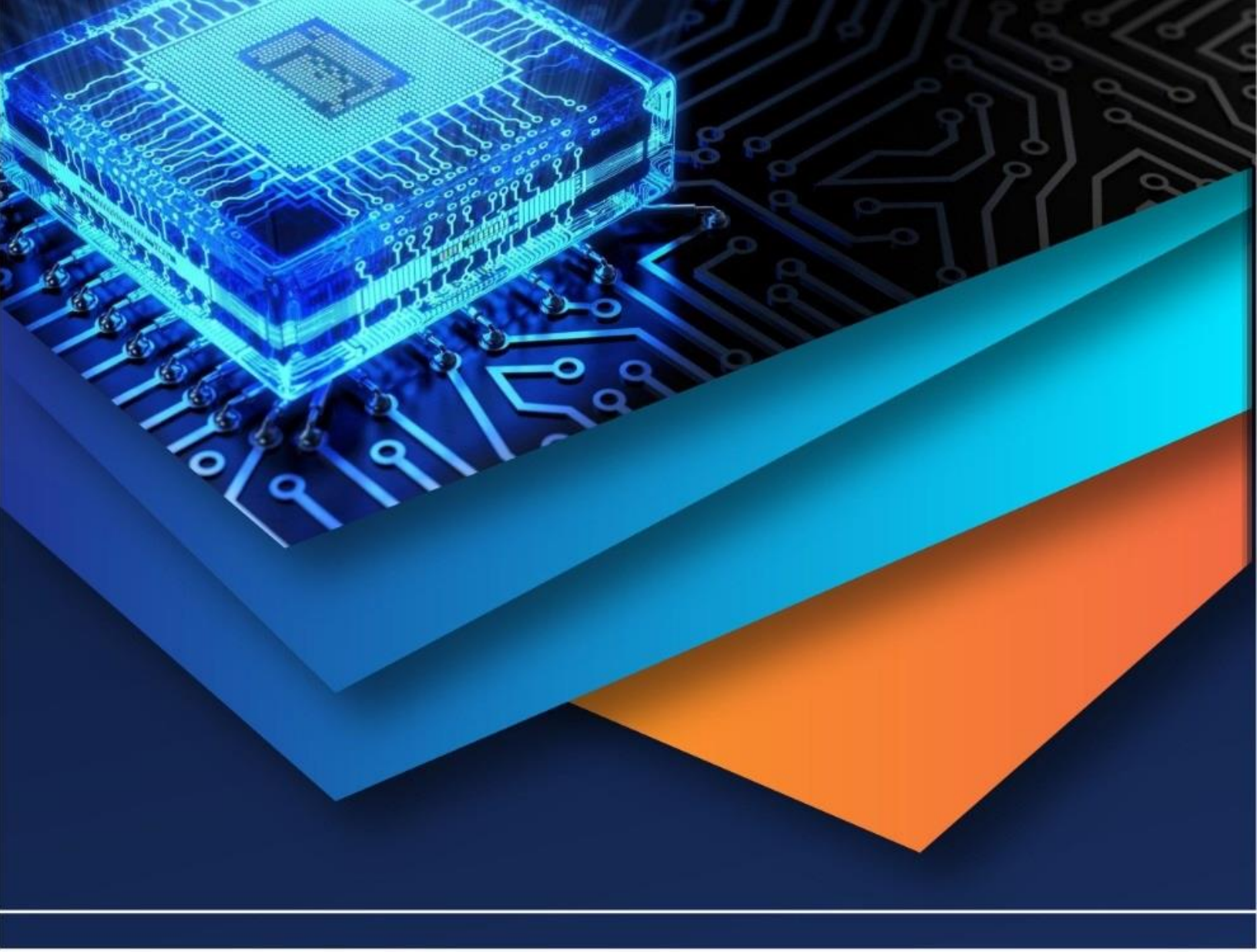
In the India, Agriculture employs near about70 percent of the population, either directly or indirectly. Crop infections have grown significantly in recent years as a result of extreme climate changes and a lack of immunity in crops. This results in large-scale crop destruction, reduced cultivation, and eventually financial loss for farmers. Identification and treatment of disease has become a serious concern due to the fast expansion of a range of diseases and a lack of basic knowledge among farmers. Hence, in order to prevent the plant from becoming infected, a quick and early detection is required. The investigation of various image processing approaches and applications for pest identification and plant disease detection was developed in the recent year, and it is presented in this research.

REFERENCES

[1] OmkarKulkarni, “Crop Disease Detection Using Deep Learning”, Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), IEEE, 2018.
[2] J. Karthika, K. Mathankumar, M. Santhose, T. Sharan, Sri hariharan. S, “Disease Detection in Cotton Leaf Spot Using Image Processing”, Journal of Physics: Conference Series, ICCCEBS 2021, 2021.
[3] Mr.V Suresh, D Gopinath, M Hemavarthini, K Jayanthan, Mohana Krishnan, “Plant Disease Detection using Image Processing”, International Journal of Engineering Research & Technology (IJERT), Vol. 9 Issue 03, March-2020.
[4] R. Mounika and Dr. P.ShayamalaBharathi, “Detection of Plant Leaf Diseases Using Image Processing”, Journal of Critical Reviews, Vol. 7, Issue 06, 2020.
[5] Md. Abdul Awal, Mohammad Jahangir Alam, Md. Nurul Mustafa, “Density Based Clustering with Integrated One-Class SVM for Noise Reduction”, International Journal of Informatics and Communication Technology (IJ-ICT), Vol.6, No.3, December 2017, pp. 209-217.
[6] Sachin D. Khirade and A. B. Patil, “Plant Disease Detection Using Image Processing”, International Conference on Computing Communication Control and Automation, IEEE, 2015.
[7] Muhammad HammadSaleem, SapnaKhanchi, Johan Potgieter andKhalid MahmoodArif, “Image-Based Plant Disease Identification by DeepLearning Meta-Architectures”,Plants, MDP Journals, vol.9, 2020.
[8] Aitor Gutierrez , Ander Ansuategi, Loreto Susperregi, Carlos Tub-o, Ivan RankiT, and Libor LenDa, “A Benchmarking of Learning Strategies for PestDetection and Identification on Tomato Plants for AutonomousScouting Robots Using Internal Databases”, Journal of Sensors, Hindawi, Volume 2019, Article ID 5219471, 15 pages

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

[9] Johnny L. Miranda, Bobby D. Gerardo, and Bartolome T. Tanguilig III, "Pest Detection and Extraction Using Image Processing Techniques",International Journal of Computer and Communication Engineering, Vol. 3, No. 3, May 2014.
[10] Vijai Singh, Namita Sharma and Shikha Singh, "A review of imaging techniques for plant disease detection", Artificial Intelligence in Agriculture, ScienceDirect, vol. 4, 2020.
[11] Shital Bankar, Ajita Dube,Pranali Kadam, Prof. Sunil Deokule, "Plant Disease Detection Techniques Using CannyEdge Detection & Color Histogram in ImageProcessing", International Journal of Computer Science and Information Technologies, Vol. 5 (2) , 2014.
[12] Trimi Neha Tete and Sushma Kamlu, "Plant Disease Detection Using DifferentAlgorithms", Proceedings of the Second International Conference on Research inIntelligent and Computing in Engineering, ACSIS, Vol. 10, 2017.
[13] Tejal Deshpande, Sharmila Sengupta, and K.S.Raghuvanshi, "Grading & Identification of Disease in Pomegranate Leaf and Fruit," IJCSIT, vol. 5 (3), pp 4638-4645, 2014.
[14] Jitesh p.shah,Harshadkumar B.Prajapati.Vipul.K.Dhabhi" A Survey on Detection and Classification of Rice Plant Diseases" IEEE,2016
[15] P.Revathi and M.Hemalatha, "Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques," IEEE International Conference on Emerging Trends in Science, Engineering and Technology (INCOSET), Tiruchirappalli, pp 169-173, 2012.
[16] Vaibhavi S. Bharwad, Kruti J. Dangarwala "Recent Research Trends of Plant Disease Detection" International Journal of Science and Research vol. 4, issue 5, 2014
[17] Amanpreet kaur "Comparative Analysis of PCA+BPA with Novel PCA+BPA+SVD Technique in Neural Network to Improve Plant Disease Detection Rate" International Journal of Advance Research in Computer Science and Management Studies, Volume 4, Issue 7, July 2016
[18] Saradhambal, G., Dhivya, R., Latha, S., Rajesh, R., „Plant Disease Detection And Its Solution Using Image Classification", International Journal of Pure and Applied Mathematics, 2018,Volume 119, No. 14, pp. 879- 884
[19] Aravind, K.R., Raja, P., Mukesh, K.V., Aniirudh, R., Ashiwin, R., „ Disease Classification in Maize Crop using Bag of Features and Multiclass Support Vector Machine", Proceedings of the Second International Conference on Inventive Systems and Control (ICISC), 2018, pp. 1191-1196
[20] Santanu Phadikar and Jaya Sil, "Rice Disease Identification using Pattern Recognition Technique", Proceedings of 11th International Conference on Computer and Information Technology (ICCIT 2008) , 25- 27 December, 2008
[21] H. Al-Hiary, S.Bani-Ahmad, M.Reyalat et.al, "Fast and Accurate Detection and Classification of Plant Diseases", International Journal of Computer Applications (0975-8887) Volume 17 – No. 1, March 2011
[22] Sabah Bashir, Navdeep Sharma, "Remote Area Plant Disease Detection Using Image Processing", IOSRJournal of Electronics and Communication Engineering (IOSRJECE), ISSN: 2278-2834 Volume 2, Issue 6(Sep-Oct 2012), PP 31-34
[23] Piyush Chaudhary, Anand K. Chaudhari et.al, "Color Transform Based Approach for Diseases SpotDetection on Plant Leaf", International Journal of Computer Science and Telecommunications, Vol 3, Issue6, June 2012
[24] Haiguang Wang, Guanlin Li et.al, "Image Recognition of Plant Diseases Based on Back propagationNetworks", 5th International Congress on Image and Signal Processing (CISP 2012), IEEE, 2012
[25] Sagar Patil, Anjali Chandavale, "A Survey on Methods of Plant Disease Detection", International Journal ofScience and Research (IJSR), ISSN: 2319-7064, 2013
[26] Shital Bankar, Ajita Dube et.al, "Plant Disease Detection Technique using Canny Edge Detection & ColorHistogram in Image Processing", International Journal of Computer Science and InformationTechnologies, Vol. 5(2), 2014, 1165-1168



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)