IJCSE International Journal of Computer Sciences and Engineering Open Access
Review Paper Vol.-7,Issue-5,May2019 E-ISSN: 2347-2693

Paddy Leaf Disease Identification and Classification System: A Review

P. Iswarya[1*], D. Maheswari[2]

[1,2] Department of Computer Technology, Dr.N.G.P Arts and Science College, Coimbatore, India

[*]*Corresponding Author: iswaryacbe333@gmail.com*

DOI: https://doi.org/10.26438/ijcse/v7i5.976979 | Available online at: www.ijcseonline.org

Accepted: 21/May/2019, Published: 31/May/2019

Abstract— In many of the developing countries economy greatly depend on the agricultural productivity. The most common form of detecting the plant disease infection is recognized from the leaves color and texture. The researchers with the help of information and communication enabled technology, automated the farmers traditional process of plant disease identification. To enhance the agricultural crop production, plant disease detection should be done at early stage in an automatic manner that helps in spreading the infection to other plants. This paper focus to analyze the previous studies in identifying paddy plant disease detection system. The manuscript summarizes various available paddy leaf diseases, and discusses techniques employed in the classification of healthy and infected paddy plant. The survey would help the researchers to understand the challenges involved in dataset collection and highlights several points in future research directions.

Keywords- Edge detection, Image processing, Internet of Things, K-means clustering and K Nearest neighbor

I. INTRODUCTION

Agricultural sector plays a vital role in contributing to the Indian economy. The one of the most important food crop in agriculture is Rice, which is a staple crop for millions of Indians. India is second largest producer of Rice in the world for about 106.5 million tonnes. There are several factors affecting the crop production that causes yield loss. The one of the major factor that reduces agricultural productivity is due to plant diseases, and other is nutrient deficiency in the soil.

The TamilNadu agricultural university portal is mentioned that there are several common rice field diseases that include Brown spot, sheath blight, sheath rot, false smut, grain discolorations and leaf streak. The above mentioned paddy plant disease that cause 70% to 80% in yield production loss, and overall due to crop disease infection it causes 20 to 30% reduction in their productivity [1]. In this digital age decade, farmers have to use latest technology for the efficient crop management. Through knowledge and experience some farmers know how an infectious plant can be treated; at times it may work or might not. Detecting diseases in timely manner play an important role in cultivation. Farmers identifying the disease manually and sending the sample for expert device is a common practice [2].

An automatic detection of paddy leaf disease using Internet of Things (IoT) at earlier stage and their infectious state is intimated to the farmers. The process of paddy leaf disease identification helps in early detection of infected plant, and prevents them from spreading the disease to other plants. The paper organized as follows, Section 2 discusses some of the related works in paddy leaf disease identification. Section 3 describes about the steps involved in paddy leaf disease identification system and Section 4 discusses the techniques employed in related woks and their challenges. The Conclusion and scope of future enhancement of the existing work is presented in Section 5.

II. RELATED WORK

C.Nandini and Anoop G.L[3] proposed the classification system that detect and categorize the diseases in paddy leaf such as leaf blast, brown spot and Sheath blight. The real time dataset consists of 200 paddy leaf images that were preprocessed using weiner filter and adaptive histogram technique. The enhanced images are segmented with the help of two threshold binary decomposition method. In this threshold estimation is carried out using multi-level Otsu algorithm recursively and corresponding features were extracted using boundary detection technique. Finally classification and grading the level of diseases was implemented with SVM and fuzzy classifier respectively.

N.Neelaveni and S.Rajeswari [4] classify the paddy leaf disease, and provide some possible remedy measures to control the spreading of infected plant disease. The paddy leaf images were segmented using k-means clustering

technique and neural network is used for classification process.

M.Suresha and Shreekanth K.N, HarishaNaik, T. [5] identified healthy and diseased paddy leaf using global thresholding otsu methods for segmentation. From the segmented infected regions local binary pattern texture feature is extracted and those selected features are fed in to the KNN classifier for classification.

Toran verma and Sipi Dubey[6] recognize five disease infected categories, and each category having 150 paddy leaf images. Each image is preprocessed and segmented using global threshold otsu algorithm into three segmented regions. The discrete wavelet based features are extracted for infected part of segmented region alone, and these wavelet features are classified using Radial basis function neural network.

Jagan Mogan.K et.al., [7] focused on identifying three paddy leaf disease namely brown spot disease, leaf blast disease and bacterial blight disease. The proposed work is categorized in to two parts: the first part involves identifying the healthy and infected plant using harr wavelet based features with AdaBoost classifier. The second part is recognition of disease category by extracting Scale Invariant Feature Transform (SIFT) with Support Vector Machine and K-Nearest neighbor classifier.

R.P.Narmadha and G.Arulvadivu [8] identified different paddy plant disease like Blast, Brown spot and Narrow Brown Spot. The acquired paddy leaf images are segmented using K-means algorithm and from the segmented regions shape as well as color based features were extracted. The Support Vector Machine (SVM) classifies whether the leaf is infected or not, if it is infected further based on lesion color, boundary color, spot color and paddy leaf color, the type of paddy plant disease is recognized using Artificial Neural Network (ANN) and fuzzy classification.

G. Anthonys and N. Wickramarachchi [9] acquired paddy leaf images under laboratory condition from the fields of Srilanka, and these images are segmented using mathematical morphology. The texture, shape and color based features were extracted and classified using fuzzy membership function in to three disease categories such as Rice blast *(Magnaporthe grisea),* Rice sheath blight *(Rhizoctonia solani)* and Brown spot *(Cochiobolus miyabeanu).*

Manoj Mukherjee et.al, [10] acquired images using digital camera, and RGB image is converted into gray scale images. The histogram calculation for gray scale images, determine the different intensity values for healthy plant and infected plant.

K. Jagan Mohan and M. Balasubramanian [11] cropped the affected portion of paddy leaf images and from that histogram oriented gradient features are extracted for classification. The SVM classifier trained to classify the disease into three classes such as brown spot, bacterial blight and leaf blast disease.

S.Ramesh and Bharghava Rajaram [12] proposed IoT based crop disease identification. The field monitoring web camera is interfaced with Raspberry pi for automation. The acquired images are segmented using sobel edge detection method and these images are compared, optimized with cloud analytic architecture.

III. PADDY LEAF DISEASE IDENTIFICATION SYSTEM

The general architecture for paddy leaf disease identification system has shown in Figure 1. It has following modules such as image acquisition, pre-processing, segmentation, feature extraction and classification.

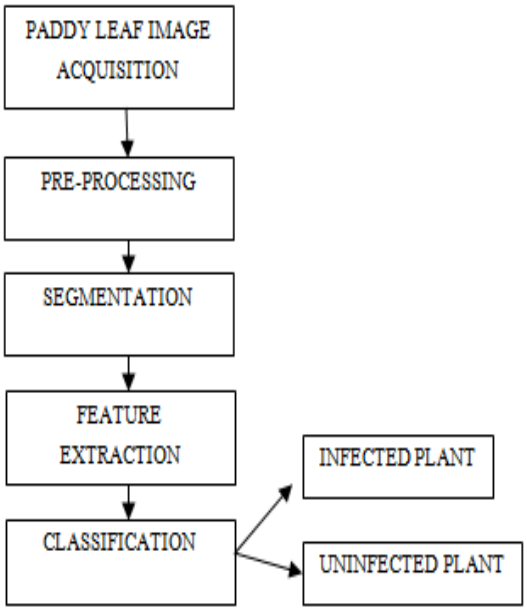

Figure.1. Steps involved Paddy leaf disease identification system

Acquisition: The quality of image sample depends on the camera type and its orientation [13]. Most of the previous works acquired paddy leaf images from the digital camera in an uncontrolled environmental condition. Very few researchers have collected images from Lousiana State University (http://www.lsuagcenter.com/), Indian Rice Research Institute (IRRI) and Bangladesh Rice Research Institute (BRRI). The paddy leaf images can be collected either under natural or controlled environmental conditions.

Pre-processing: The one of a most important step in image processing technique is pre-processing which helps to improve the accuracy of disease recognition system. The common techniques employed in pre-processing were color space transformation, filtering techniques applied are weiner, laplachian and adaptive methods, cropping based on region of interest, smoothing, sharpening and some enhancements.

Segmentation: The process of splitting the images into sub images with robust correlation along the objects of interest. Edge based segmentation method employed in previous work are sobel edge detection and canny edge detection methods. Some of the studies used k-means clustering based segmentation method. In global thresholding based algorithm, determination of optimum threshold value plays a major factor for achieving better results.

Feature Extraction: The features extracted from effectively segmented image helps in identifying the healthy and infected plant. Also the right selection of optimized features helps in categorizing disease type such as fungal or bacterial or viral. The existing works extracted the features based on color, shape and texture.

Classification: The classifications are of two types supervised and unsupervised classification. The classification is a process of categorizing healthy and unhealthy plant using machine learning algorithm. Most of the related works adopted supervised learning algorithm.

IV. DISCUSSION AND SUMMARY

The dataset for paddy leaf images for different type of infections such as bacterial, fungal and viral were very difficult to obtain. There is no standard database available for particular crop and their related infections [13]. So it is difficult to compare the implementation results with the other algorithm. Highly acceptable accuracy are reported [11] in some the previous studies, but considering only the limited images. The majority of the studies reveals only on the classification of healthy and infected plant. Very few researchers have classified the disease type, disease name and severity level of the disease [3], [6], [7], [8]. Some part of the earlier work sent the infected images for expert opinion to give possible remedies. Recent studies [12] combined image processing with Internet of Things (IoT) that uses the concept of continuous remote monitoring the field area for disease identification. But this type of research involves time complexity, computational complexity and memory requirement issues.

V. CONCLUSION AND FUTURE SCOPE

Rice is one of the important staple crops not only in India but also in several other countries. Due to advancement of Science and Technology, it is necessary to automate the manual process of farmers visiting to the field and giving samples to plant pathologist for the plant disease identification. The researchers automated the field monitoring using web cameras and IoT devices. The paddy leaf images undergone various image processing techniques and detects the type of pathogens in an infected plant. The manuscript summarizes various studies involved in paddy leaf disease detection using machine learning and image processing techniques. Several limitations that involve in the field of research they are dataset collection for every bacterial/ viral/fungal infection, disease name classification, severity level of the disease and their possible solutions. These above challenges make the researchers to do problem specific research in near future.

.

REFERENCES

[1] Pragya Lariya and Mukul Srivastava, "*Review Paper on Crops Disease Diagnosing Using Image-Based Deep Learning Mechanism***",** International Journal of Computer Sciences and Engineering, Vol.**7**, Issue**.4**, pp.**306-312, 2019**.

[2] Shiddalingappa Kadakol and Jyothi B Maned, "*Intelligence System for Leaf Extraction and Disease Diagnostic",*International Journal of Computer Sciences and Engineering, Vol.**4**, SpecialIssue**.3**, pp.**62-66, 2016**.

[3] C.Nandini and G.L. Anoop, "*Classification and Grading the Level of Paddy Leaf Diseases Using Multi Classifiers*", International Journal of Advances in Science Engineering and Technology, ISSN: 2321-9009 Vol**. 4**, Issue.**4**, pp.**124-128, 2016.**

[4] N.Neelaveni and S.Rajeswari, "*Paddy Leaf Disease Detection Classification and Remedy Finder Using K means Clustering and Image Mining*", International Journal of Innovative Research in Computer and Communication Engineering, Vol**. 4**, Issue.**12**, pp.**20859-20864, 2016.**

[5] M.Suresha, Shreekanth K.N, HarishaNaik, T., "*Identification of Healthy and Diseased Paddy Leaves using KNN classifier"*, International Journal of Advanced Research in Computer Science, Vol.**8**, No. **9**,pp.**705-710, 2017**.

[6] Toran verma and Sipi Dubey, "*Paddy Disease Recognition using Image Processing and Radial basis Function Network*", Indian Journal of Science and Technology, Vol.**10(46)**, pp.**1-7,2017**.

[7] K. Jagan Mohan, M. Balasubramanian and S. Palanivel, "*Detection and Recognition of Diseases from Paddy Plant Leaf Images*", International Journal of Computer Applications, Vol. **144**, No.**12**, pp.**34-41, 2016.**

[8] R.P.Narmadha and G.Arulvadivu, *"Disease Symptoms Identification In Paddy Leaf Using Image Processing*", Advances in Computational Sciences and Technology,Vol. **10**, No. **8**, pp. **2213-2223, 2017**.

[9] G. Anthonys and N. Wickramarachchi, "*An Image Recognition System for Crop Disease Identification of Paddy fields in Sri Lanka*", In the Proceedings of Fourth International Conference on Industrial and Information Systems, ICIIS 2009 pp. **28 - 31, December2009**, Sri Lanka.

[10] Manoj Mukherjee, Titan Pal and Debabrata Samanta, "*Damaged Paddy Leaf Detection Using Image Processing"* , Journal of Global Research in Computer Science, Vol.**3**, No. **10,** pp.**7-10, 2012.**

[11] K. Jagan Mohan and M. Balasubramanian, "*Recognition of Paddy Plant Diseases Based on Histogram Oriented Gradient Features*", International Journal of Advanced Research in Computer and Communication Engineering, Vol.**5**, Issue.**3**, pp.**1071-1074, 2016**.

[12] S.Ramesh and Bharghava Rajaram, "IoT based Crop Disease Identification System using Optimization Techniques", ARPN Journal of Engineering and Applied Sciences, Vol.**13**, No.**4**, pp.**1392-1395, 2018.**

[13] Sukhvir Kaur, Shreelekha Pandey and Shivani Goel, "*Plants Disease Identification and Classification through Leaf Images: A Survey* ", Archives of Computational Methods in Engineering, **2018**.

Authors Profile

Dr.P.Iswarya currently working as Assistant Professor in Department of Computer technology, Dr.N.G.P Arts and Science college , Coimbatore since 2018.
She has published more than 10 research papers in reputed international journals including Thomson Reuters (SCI & Web of Science) and conferences including IEEE and it's also available online. His main research work focuses on Data Analytics, Data Mining, Image processing and natural language processing . She has 2 years of teaching experience and 4 years of Research Experience.

D.Maheswari pursuing Ph.D. and currently working as Assistant Professor and HoD in Department of Computer technology, Dr.N.G.P arts and Science college, Coimbatore since 2008. She has published more than 6 research papers in reputed international journals His main research work focuses on Cryptography Algorithms, Network Security, Cloud Security and Privacy, Big Data Analytics, Data Mining, IoT and Computational Intelligence based education. She has 13 years of teaching experience.

