Detection of Rice Leave Disease using Image Processing Techniques

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Abstract: Rice is now one of the most important crops at the global level and second most important crop of Pakistan. Pakistan earns billions of rupees through its export. In order to maintain in the International market, quality and quantity is very necessary for the production line of rice. The productivity of rice is good only if the farmer produces good quality rice, butt seasonal diseases damage plant leaves. If the farmer does not pay proper attention to the growing stage of rice production, then these diseases damage the rice plant and as a result yield decreases. Therefore identification of disease in plants in early ages is very significant to maintain the quality and quantity of this yield production. Know computer technology spread very fast. Automatic detection of plant disease is now possible. It reduces large work of monitoring the farming. In this article we suggested a method which is image processing techniques. Using this system, it identifies plant diseases and further classifies them. Infected plants are first photographed and then these digital images are processed. By using image processing technique the infected area of plants can be detected. In 2nd phase disease can be identify from the infected area of plants and then classified respectively.

Keywords: Rice yield, leave disease, digital image processing, Segmentation, feature extraction

1 Introduction

Along with wheat and corn, rice is a major and significant yield for a large number of people worldwide. According to one report, during 2019 and 2020 approximately five hundred millions tons of rice is produced globally in these years. Many countries produce this crop but china and India both together produce approximately fifty percent of rice crop globally. Rice yield is produced by many countries about 120 countries in this world produced rice crop. The economies of many emerging nations rely upon this yield. Pakistan a land of agriculture is also produced the rice yield, about 8 percent of the world rice trade export by Pakistan. In 2019, Pakistan delivered 7.5 million tons of rice and put tenth in biggest rice creating nations in world. That's why Pakistan economy is highly dependent on this crop and considered back bone of the country economy. To maintain the reputation in international market it is very important to maintain the product quality and quantity or productivity of rice. The consistent expansion in the total population is one more serious issue for food security. Rice takes care of a large portion of the total population consistently, yet it is likewise a significant trigger for an Earth-wide temperature boost. For that reason it is so important to meet the needs of the people. In the 2020/2021 yield year, around 504.3 million metric huge loads of rice were utilized around the world. Internationally, farmers need to produce at least 8-10 million tons additional paddy every year - an increase of 1.2-1.5 percent every year over the next decade, up to 0.6 tons in the next period. The normal yield per hectare is equivalent to the increment. To fulfill demand productivity must be enhanced. However plant disease has been major yield loss in the production of rice crops. In initial phase it is very compulsory for detection of plant leaves disease to maintain the production efficiently.

It is very difficult for the human eye to detect the disease in the leaves of rice plants. Now in 21st century where computer technology has spread so fast, so it is possible to detect and classify the leaves disease automatically. Many techniques have been proposed for this purpose, but image processing techniques are the most commonly used to detect leaf disease because of their high accuracy. So images of infected rice plant have been taken from some digital camera and processed them from computer vision technology to classify the disease. MATLAB software is utilized for examine these digital pictures. It is not correct to say that the leaves of rice plant are affected by only one disease; they can be impacted by different symptoms like leaf curse, earthy colored spots and leaf spots. (Phadikar, 2013).

Related Work:

(Sachin, 2015) This paper utilizes picture processing strategies to recognize plant infections. For this purpose they use pictures of plant leaves. They examined the different stages associated with picture securing, pre-picture processing, highlight extraction, picture dissemination, and characterization.

(Santanu, 2008) This paper proposed a method which is based on software prototype system for the detection of rice plant disease. This system contains both methods in which soft computing technique and image processing technique consist. They classify the disease using SOM.

(Khainar, 2014) This article discussed different technique to identify the plan disease and also described many techniques for the classification of these diseases. They examine various methods which contain Support vector, (SVM), back propagation (BP) Network, Artificial Neural Network (ANN) and Radial Basis Function (RBF) Neural Network.

(Tanmoy, 2018) This paper uses Data Mining Techniques and Using Image Processing for the detection of leaves disease. Image processing techniques are used to collect the infected part of the leaves and then extract their features to classify the disease and additionally use data mining strategies to separate applicable secret data that is valuable for illness discovery.

(Mique, 2018) In this article system is utilized to identify rice bug vermin and infections utilizing Convolutional Neural Network (CNN). By utilizing this interaction they prepared their model and get 90.7% precision.

(Pothen, 2020) The proposed method describes the various strategies used for the purpose of classifying rice leaf disease. They utilize Otsu's technique for the segmentation procedure and Support vector machine (SVM) is used for classification of disease. After trained the model they achieve 94.6% accuracy.

(Amrita, 2016) In this paper described the method of detection of rice plant leaves using image processing technique for the detection they utilize the Minimum Distance Classifier (MDC) and k-Nearest Neighbor classifier (k-NN) methods to extract features. They took a total of 115 photographs of the addresses of various diseases, of which 70% were used for training and 30% for testing. The accuracy is achieved by using KNN model is 87.02 and using MDC is 89.23%.

(Kitpo, 2018) Image processing technique is used in this proposed system. They execute the Internet of Things (IOT) structural robot execution framework. They proposed a system which aims to detect disease at initial phase by using IOT architecture.

(Shreyasi Bhattacharya, 2020) CNN is used for in-depth learning approaches to diagnose rice disease and classify rice leaf diseases. In this article, the author collects about 1500 raw images of leaves of healthy and affected plants. He prepared his CNN model to separate among solid and contaminated plants with an exactness of 94% through 500 pictures and order of different sicknesses with a precision of 78.44%.

(Durai, 2021) Datasets of infected plants from two different sources are collected. The CNN method is used for the identification of diseases in plants. He proposed the M-Net model to classify the disease and achieve 71% accuracy.

Description of Rice Diseases:

Brown spot is caused by fungal pathogen coleoptiles. Brown spot causes both quantity and quality sufferers. On average, the disease causes a 5% reduction in production of all low-lying rice in South and Southeast Asia. Seriously contaminated field can have as high as 45% yield misfortune. Vigorously contaminated seeds make seedling scourge and lead 10−58% seedling mortality.


Fig 1: Brown Spot infection in rice plant

 Bacterial blight is caused by bacterial Xanthomonas oryzae. (sativa, 2021). Rice blight affects the filling of grains and the removal of penicillin's. Sensitive fields have seen a decline of about 28-30% in production. The illness can debilitate the plant and grain misfortune in more seasoned plants can be 4.5-29.1%.

Fig 2: Leaf Blight infection in rice plant

METHODOLOGY:

The leaves of the rice plant can be affected by a number of diseases such as brown spots and burns which are the most common. Photographs of these impacted addresses can be taken with a computerized camera for additional analysis. In this article, we collect two different kinds of rice plants diseases to predict the disease. Chosen examples of illness are Leaf Blight and Brown Spot. These processing images stored in RGB format but we have to change these images into JPEG format. At last these images were processed to classify the disease using MATLAB Toolbox. The flow chart of our proposed system is shown below:

Proposed Model for RLD Classification
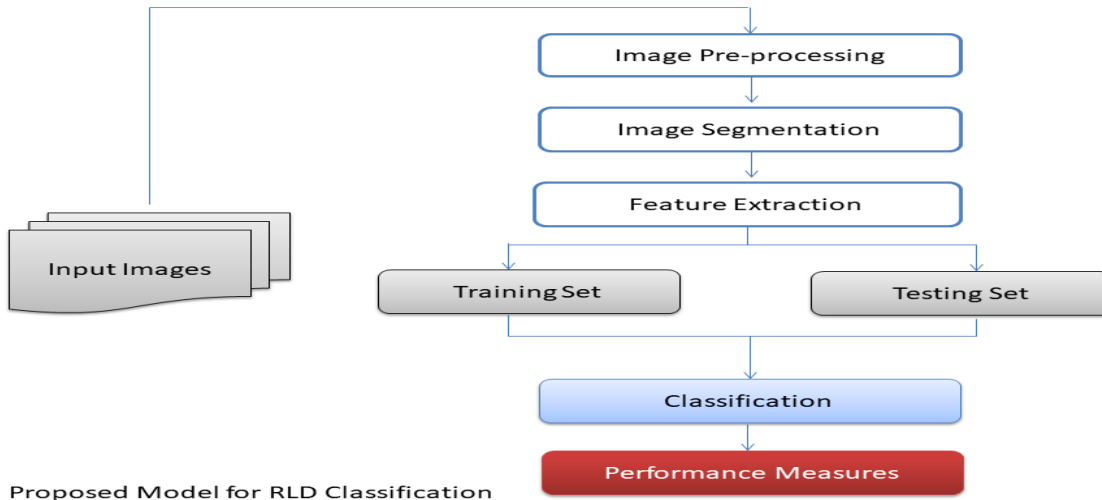
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