Automatic Classification of Brown Spot and Blast Diseases of Rice Using Vegetation Indices Based Segmentation

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Abstract— Rice is widely cultivated economical crop in the world. India is an agricultural country and plant disease plays key role in the production of agricultural product. Earlier detection will help to improve the quality and quantity of the product. The proposed system is an identification of brown spot and blast disease of rice. Plant disease detection is emerging field in India as agriculture is important sector in economy and social life. Earlier unscientific method were in existence. Automatic identification of plant diseases is the new challenging area for the researchers. One of the most important steps in automatic identification of plant diseases is to extract the infected region from the normal portion of the plant. Studying the infected leaves it has been observed that the greenness of the infected portion of the leaves changes significantly with respect to the normal leaves. Vegetation indices (VI) are some metric used for the remote sensing images to measure the greenness. Thus VIs are computed from the acquired images of the infected plant. These VI are then used to extract the infected portion from the acquired visual images.

Keywords— Vegetation index, Rice Disease, Brown Spot, Leaf Blast

I. INTRODUCTION

Increasing population and rapid climate change have compelled the researchers to think about the sustainable development. One of the major challenges of sustainable development is to reduce the use of pesticides not only to reduce the cost, but to save the environment and increase quality. Precise, accurate and early diagnosis of plant diseases may reduce the use of pesticides. Rice is one of the major crops cultivated in the world. Thus two most commonly occurred diseases which can cause catastrophe through destroying large areas of rice fields namely Leaf Blast and Leaf Brown spot are consider for this experiment. Studying the literatures it has been found that, with the help of advance technologies like remote sensing, image processing, and Sensor technology, researchers are trying to develop some systems for automatic and early detection of diseases. In remote sensing based technique images of different spectrum bands are used for computing the VI which are mainly used to measure the forest are Urbanization rate etc. In case of the remote sensing, images are acquired from satellite, far away from the field, thus contain very much noises. At the same time very small changes in the plant (such as infection in the leaf) cannot be recognize by the remote sensing images. Thus early detection of the infection is not possible by the remote sensing techniques. Thus visual image based automatic disease detection system is proposed here. Recently some researchers are trying to use some sensors for early detection of diseases. In a nose sensor is used to detect the basal stem rot diseases. Major draw backs of these methods are sensors are costly, and they are used only to detect the diseases not to classify the images. Studying the rice leaves infected by blast and the brown spot diseases, it has been observed that visual symptoms (colour, shapes, and texture) created by these diseases are different. Thus image processing techniques have been used by the researchers for classifying these diseases. One of the important steps on which the success of these systems depends is the accurate identification of the infected portion. Many segmentation methods are available in the literature for different types of applications. Basic attributes used for developing segmentation algorithms are image luminance amplitude for monochrome images and colour components for colour images. However, performance of a particular algorithm is image dependent. Energy based segmentation method deals with pixel information of different colour components separately and useful where change of colour is noticeable. Moreover, energy based segmentation algorithms are robust. In another paper, Fermi energy is used to identify the infected regions of the diseased rice plant images. Fermi energy is the highest possible energy of a particle obtained at absolute zero temperature. Fermi energy of an image is calculated considering pixel with different colour as different particles while mass of the particles corresponds to weighted intensity of the
image, and treated as threshold to segment the infected region. This method is computationally inexpensive because calculation of Fermi energy of each pixel involves simple arithmetic operations and constant term is evaluated once only. Success of the segmentation not only depends on the particular method it also depends on the quality of input images. Studding the infected leaves it has been observed that the greenness of the infected portion of the leaves changes significantly with respect to the normal leaves. Vegetation indices (VI are some metric) used for the remote sensing images to measure the greenness. Thus VI are computed from the acquired images of the infected plant. These VI are then used to segment the infected portion from the acquired visual images.

II. LITERATURE SURVEY

Vegetable pathologies may manifest in different parts of the plant. There are methods exploring visual cues present in almost all of those parts like roots, kernels, fruits, stems and leaves. Two methods it can be said that our proposed method is more accurate (84% accuracy) than the conventional method (82% accuracy). We have considered here only two diseases of rice but can also be used for other rice disease detection.

III. PROPOSED METHOD

The steps of the proposed system are shown in Fig. 1.

3.1 Image Acquisition

The first stage of any vision system is the image acquisition stage. The first stage of any image processing based approach is the image acquisition stage. It is a process in which image is retrieved from some source, usually a hardware based source. The source can be anything from webcam to a mobile camera. After acquiring the image, various methods of processing can be applied to the image to perform the many different vision tasks required. Basically it is a creation of photographic images.

3.2 Pre-Processing

Images obtained from image acquisition stage cannot be used directly for identifying of disease due to presence of some factors such as unwanted background, poor resolution of camera etc. The main aim of pre-processing is to eliminate unwanted distortion and enhance some image features for further processing. Various filtering techniques are used in this stage for faster evaluation.

3.3 Segmentation

Image Segmentation is used to classify an image into meaningful region. There are many types of segmentation techniques such as Clustering based segmentation, Region based segmentation, Edge based segmentation, Threshold based segmentation etc. Clustering based image segmentation is suitable for our proposed approach because image can be partitioned into clusters in which one cluster can contain the majority of the diseased part of the image. Here K-Means clustering algorithm developed by J. MacQueen (1967) can be used for the image segmentation. This clustering method produces tighter clusters than hierarchical clustering.

3.4 Feature Extraction

Feature extraction involves reducing the redundant input data and transforming it into a reduced set of features also called as feature vector. The extracted features contains only relevant information so that the desired task of disease classification can be performed using limited representation instead of using complete initial data. Feature extraction techniques like Global Color Histogram, Color Coherence Vector, Local Binary Pattern, and Complete Local Binary Pattern can be used.

3.5 Feature Training

In Feature training, based on characteristic properties of image feature extracted in previous step a unique description of each classification category, i.e. training class, is created. The description of training classes is an important component of disease classification process. Feature training can be done using supervised or unsupervised approach. The supervised approach is based on an a prior knowledge of probability distribution functions which extracts class descriptors. Unsupervised approach relies on clustering algorithms to automatically segment the training data into prototype classes.
3.6 Feature Classification

Feature classification methods essentially consist of identifying features in images that can be matched with corresponding features in the other images from which a transformation model can be estimated. Correlation method can be used for feature classification. In this method the extracted features are correlated with one another and we get a specific training class to which that particular image belongs to. This step gives us the actual classification of both diseases that is brown spot and blast images.

IV. RESULT

100 samples of both blast and brown spot disease are collected from the field. Then each of these images are converted into four vegetation indices. For each VI indices spots are detected using the above method. Then for each VI spot texture feature are extracted and classifies the disease.

Fig. 2: Brown Spot  
Fig. 3: Blast Image

V. CONCLUSION

This paper provides a detailed literature review and gives an idea that what has been done till now and what is the scope of current research for the image categorization problems. Image processing based approach composed of the following steps is used; in the first step the proposed approach would be using clustering technique for image segmentation which is followed by extraction of some features from the segmented image and finally images are classified into one of the classes.

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