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Various Parametric Approaches to Detecting Sugarcane Diseases through Image Processing

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A B S T R A C T

The foundation of the Indian economy is agriculture. Nearly 65% of the population depends on it, and it contributes significantly to the GDP. Reduced crop productivity due to disease is the most important factor to take into account. In order to avoid both the quantity and quality of agricultural products from declining, disease detection is essential. Numerous studies are being conducted actively to detect plant diseases. In addition to maximizing yield production, the identification of plant diseases can help a variety of agricultural methods. Research and developments in the sector of agriculture are making geometrical progress in the divergent field of image processing.

The goal of this research paper is to detect and track sugarcane diseases like, red rot, smut, wilt, yellow leaf in early on in order to minimize agricultural production losses. The modern Image processing techniques involves, Image collection, processing, segmentation, feature extraction, classification, and disease classification in this study. Alerts are sent by the research team after the disease has been identified. Additionally, using the appropriate software tool, these two suggested approaches were implemented in the Graphical User Interface (GUI). The community should benefit from the suggested method since it reduces human labor, boosts productivity, and produces faster, more accurate results.

Keywords: Agriculture, Sugarcane, Image Processing, Disease Detection

1. Introduction

The old and classical approach for detection and recognition of plant diseases is based on necked eye observation. Due to the availability of experts, it can be costly and time-consuming to consult them in certain nations to determine plant diseases. India has several different types of climates, from tropical in the south to hot in the north. Because of erratic variations in the climate, the crops are deficient in minerals and nutrients. Deficiency infections resulted from this, and crop output was impacted. Microorganisms such as bacteria, viruses, and fungi can have an impact on plants. The infected plant images are collected, processed, segmented, features are extracted, classified, and diseases are classified in this study using contemporary image processing techniques. Once the sickness has been detected, the results are displayed, stored and sends out alerts.

2. Literature Review

[1] Ashwini, et al - 2020 - "Plant Disease Detection using Image Processing" International Journal of Engineering Research & Technology (IJERT), NCCDS - Conference Proceedings. Based on this paper, many farmers and the majority of agro-assistance institutions today use various forms of technology to increase agricultural output. Plants are the most significant energy source. Diseases that affect plants frequently might have negative social and financial effects. The leaves of the plants are where many diseases are first observed. If the condition is not detected in its early stages, it may cause greater damage. Image processing aids in the detection of certain diseases and offers protection for certain diseases by recognizing the color characteristics of the leaves.[4]The first step involves segmenting the image by first taking an RGB image of the plant, and then removing the green pixel. Texture statistics are a set of plants are the most significant energy source. Diseases that affect plants frequently might have negative social and financial effects.

[2] R.Meena Prakash et al - 2017 - "Detection of Leaf Diseases and Classification using Digital Image Processing" International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS). This paper makes use of image processing techniques to identify illnesses in plant leaves. The aim of this project is to apply methods for image analysis and classification for identification and categorization of leaf diseases. The suggested there are four components to the framework. They are (1) Picture prior processing (2) Using K-means clustering to segment the leaf to identify the areas affected by the disease (3) feature extraction & (4) illness classification. Texture features are extracted using statistical Gray-

Level Co-Occurrence Matrix (GLCM) features and classification is done using Support Vector Machine (SVM). A system for identifying and categorizing leaf diseases is put into place. K-Means segmentation is used to segment the sick portion. After that, GLCM texture characteristics are retrieved, and SVM is used for classification. The technique for identifying illnesses in citrus leaves is being tested.

[3] Abirami Devaraj, et al - 2019 - "Identification of Plant Disease using Image Processing Technique" International Conference on Communication and Signal Processing, examines Cercospora leaf, Alternaria alternata, antracnose, and bacterial blight. See these MATLAB image processing algorithms for automatic disease identification. It entails loading an image, segmenting it, preprocessing it, extracting features, and classifying it. The creation of an autonomous detection system that makes use of cutting-edge technology, such as image processing, helps farmers identify diseases early on and provide useful information for managing them. Using cutting-edge technologies such as image processing, an autonomous detection system can be developed to help farmers identify diseases early on and provide useful information for managing them. We might want to continue working on a lot of disease detection. The creation of an autonomous detection system that makes use of cutting-edge technology, such as image processing, helps farmers identify diseases early on and provide useful information for managing them. We may want to continue working on many illness detection projects.

[4] Arifa Khan et al – 2017 - "Image Processing Based Disease Detection for Sugarcane Leaves" - International Journal of Advance Research, Ideas and Innovations in Technology, in this paper a computer vision-based method for identifying sugarcane plant leaf disease. These days, there are several uses for image processing in agriculture. These applications are now more accurate thanks to the coupling of feature extractions like color, size, and form with various classifiers. In India, the three most prevalent diseases affecting sugarcane plants are mosaic disease, leaf scald disease, and red rot disease. The leaf dataset has been categorized based on the disease using k-means classification and image processing techniques. To identify the sort of illness present in the plant, the leaf image is compared to this database. A method based on computer vision has been used to identify sugarcane plant leaf disease. These days, there are several uses for image processing in agriculture. These applications are now more accurate thanks to the coupling of feature extractions like color, size, and form with various classifiers. In India, the three most prevalent diseases affecting sugarcane plants are mosaic disease, leaf scald disease, and red rot disease. This research paper presents a comprehensive analysis of the etiology and symptoms of this condition. Image processing techniques along with k-means classification have been used to classify the leaf dataset, according to the disease. To identify the sort of illness present in the plant, the leaf image is compared to this database.

[5] Shivani K. et al - 2016 - " Plant Diseases Detection Using Image Processing Techniques" Online International Conference on Green Engineering and Technologies (IC-GET). Based on this paper, plants are infected by pests such as bacteria, fungi, and viruses, which reduces the amount and quality of their output. A significant portion of farmers' output is lost. For this reason, plants must be properly cared for. An overview of image processing techniques for the detection of several plant diseases is provided in this work. Image processing offers more effective methods for identifying plant illnesses brought on by bacteria, viruses, or fungi. Eye observations alone are insufficient to identify illnesses. When pesticides are not adequately cleansed, they can induce dangerous chronic diseases in humans. Overuse also degrades the nutrients in plants. It causes farmers to lose a significant amount of their output. Therefore, it is beneficial to apply image processing techniques for disease detection and classification in agricultural applications. Thus, it is evident from the description above that image processing methods have been beneficial in every way. Using the aforementioned methods, we may precisely identify and categorize illnesses on a variety of plants. K-means Neural networks and clustering to identify diseased objects are therefore frequently employed to achieve accuracy in disease detection and classification. These methods could therefore be used to the Agrobot system.

[6] Chau-Chung Song et al – 2020 - "Automatic Detection and Image Recognition of Precision Agriculture for Citrus Diseases" 2nd IEEE Eurasia Conference on IOT, Communication and Engineering 2020. This study presents an autonomous citrus disease detection and picture recognition system that can assist farmers in locating and identifying the illness from photos. This technique uses an object detection model called the YOLO (You Only Look Once) algorithm to identify and diagnose illnesses in pictures of citrus leaves. YOLO can identify the illness in real time and draw a circle around it in pictures and videos. Images of citrus leaves with two different diseases—Citrus Canker and Citrus Greening—are included in the dataset. Citrus leaf illnesses were identified and categorized using the YOLO v4 model, which also displayed the disease's location on the image. The development of an automated disease detection system is the aim of this paper. We primarily concentrate on the following areas in our upcoming work: First, enhancing the model makes it more accurate in identifying citrus diseases. Second, the dataset is expanded by increasing the training data. Thirdly, consider making the model smaller. On a mobile device, it can be used.

[7] Ankit Chhillar et al – 2020 - "Survey of Plant Disease Detection Using Image Classification Techniques" 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) Amity University, Noida, India. June 4-5, 2020. discuss about an overview of the many types of plant diseases and the machine learning methods used in agricultural fields to identify them are presented in this research. In terms of total farm yields, India is ranked second. According to data from 2018, the agricultural sector employed over 50% Indian labor and made almost 18% of the country's total production. One of the major sources of income in India is cultivation. A daily increase in population leads to an increase in the need for the use of soil products. The agriculture sector needs a boost to enhance yield in order to satisfy the rising demands. The agricultural sector in India is facing significant challenges due to a lack of water, inefficient soil, frequent disasters, plant diseases, insects, and other factors. One major factor contributing to yield loss is plant disease. In terms of total farm yields, India is ranked second. According to data from 2018, the agricultural sector employed over 50% Indian labor and made almost 18% of the country's total production. One of the major sources of income in India is cultivation.

[8] Pooja V et al - 2017 - "Identification of Plant Leaf Diseases using Image Processing Techniques" 2017 IEEE International Conference on Technological Innovations in ICT For Agriculture and Rural Development (TIAR 2017). Research and developments in the field of image processing

are making exponential strides in agriculture. Numerous studies are being conducted actively to detect plant diseases. In addition to maximizing yield production, the identification of plant diseases can help a variety of agricultural methods. In this research, a method for detecting and classifying diseases using image processing tools and machine learning techniques is proposed. First, the affected area is located and photographed, and then the image is preprocessed. Further, the segments are obtained and the area of interest is recognized and the feature extraction is done on the same. Ultimately, the results are acquired by passing them via SVM classifiers. Support Vector Machines perform better thanNumerous studies are being conducted actively to detect plant diseases. In addition to maximizing yield production, the identification of plant diseases can help a variety of agricultural methods. Tn summary the identification of plant diseases using a variety of methodologies and a steady, adequate data collection and the application of several feature extraction approaches have made it easier to acquire appropriate experimental results. Support Vector Machines (SVM), a type of classifier, have improved system performance and yielded better outcomes.

[9] Arpan Kumar et al – 2019 - "Detection of Sugarcane Disease and Classification using Image Processing" International Journal for Research in Applied Science & Engineering Technology (IJRASET). In this paper, issues pertaining to science, medicine, weather, and other fields have been successfully resolved with the use of image processing. An essential first step in manually determining the illness and its type is analyzing the color deterioration in a diseased leaf or plant. The work completed for this thesis will automate the manual disease identification procedure and teach individuals how to tell healthy plants from diseased ones. Although the sugarcane plant was used as the test dataset in this work, the technique can be applied to other plant species as well. Expert systems can be developed with the use of soft computing approaches, which are useful for creating knowledge-based systems. Farmers will find this system useful inAn essential first step in manually determining the illness and its type is analyzing the color deterioration in a diseased leaf or plant. The work completed for this thesis will automate the manual disease identification procedure and teach individuals how to tell healthy plants from diseased ones. Although the sugarcane plant was used as the test dataset in this work, the technique can be applied to other plant species as well. Expert systems can be developed with the use of soft computing approaches, which are useful for creating knowledge-based systems.

[10] Bharat Mishra et al - 2017 - "Recent Technologies of Leaf Disease Detection using Image Processing Approach – A Review" 2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS). This study offers an overview of various image processing-based leaf disease detection systems, classifying them according to the kind of analytic tool and application. Nearly all of the current technologies utilized in leaf disease detection systems are reviewed critically and briefly described; a comparison of the various approaches is also looked at and given. The main problems and difficulties in identifying leaf diseases are emphasized. Researchers, farmers, and policymakers working in the field of agriculture can benefit from the extensive collection of papers, books, and standards included in the reference list. In recent years, a number of image processing-based methods for detecting leaf diseases have been developed. This study offers an overview of various image processing-based leaf disease detection systems, classifying them according to the kind of analytic tool and application. Nearly all of the current technologies utilized in leaf disease detection systems are reviewed critically and briefly described; a comparison of the various approaches is also looked at and given. The main problems and difficulties in identifying leaf diseases are emphasized. Researchers, farmers, and policymakers working in the field of agriculture can benefitted from this study.

3. Conclusion

The study of sugarcane leaf diseases highlights several significant diseases—such as rotten red, whip smut, wilt, grassy shoots, yellow leaves, pokkah boeng, and orange and brown rust—each caused by specific fungi, viruses, or phytoplasma, and characterized by distinct symptoms affecting the leaves and overall plant health. Accurate identification and diagnosis of these diseases are crucial for effective management. Image processing for sugarcane leaf disease diagnosis involves capturing images, enhancing quality, segmenting diseased areas, extracting key features, reducing data dimensions, classifying health status, and displaying results for informed disease management.

In summary, combining expertise in disease pathology with cutting-edge image processing methods offers a strong and effective framework for the early identification and precise categorization of sugarcane leaf diseases, which eventually helps with crop health management and prompt intervention. This multidisciplinary strategy promotes sustainable sugarcane production and improves precision agriculture techniques.

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