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Identification and Classification of Plant Diseases Using Image Processing Technique

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ABSTRACT: ***When it comes to productivity, economics, quality, and quantity of agricultural goods, plant diseases have a significant negative impact. It is important to reduce the damage caused by plant diseases because 70% of India's gross domestic product (GDP) depends on agricultural output. To prevent such illnesses, plants must be watched carefully beginning very early in their life cycle. The conventional way for this monitoring is naked eye inspection, which is more time-consuming, costly, and requires a great deal of experience. So, automating the illness detection system is necessary to speed up this procedure. It is necessary to use image processing techniques to create an illness detection system. Systems built using different image processing methods have been created by several researchers. This research examines the possibilities of plant leaf disease detection systems that aid in agricultural progress. It consists of several stages, including image acquisition, segmentation, feature extraction, and classification.***

KEYWORDS: ***Agricultural Goods, Disease Detection, Crop, Image Processing, Plant Disease.***

1. INTRODUCTION

India's economic progress is significantly influenced by its agricultural sector. Agriculture accounts for almost 70% of India's GDP. Damage to the crops would therefore result in a significant loss in productivity, which would have an impact on the economy. Because they are the most vulnerable, a plant's leaves are where disease signs first appear. From the beginning of the crop's life cycle until the moment of harvest, the crops must be kept under close observation for illness. Initially, specialists had to personally inspect crop fields using the time-consuming approach of traditional naked-eye observation to check for disease-affected plants [1], [2]. The precision and dependability of detection and analysis procedures are improved by the use of technology.

For instance, individuals who employ cutting-edge technology to study diseases that emerge suddenly have a better chance of managing them than those who do not. With the recent coronavirus outbreak, the globe relied on cutting-edge technology to create preventive measures that have slowed the spread of the illness. Crop diseases pose a serious hazard to human survival because they might trigger famines and droughts. In situations where farming is done for commercial objectives, they also result in significant losses. It is presently used in medical operations to identify and evaluate items. It is principally employed in assessing drivers, parking, and driving of self-driven automobiles. Food security is made simple by the use of computer vision to improve plant disease prevention accuracy.

Agricultural productivity is negatively impacted by the prevalence of plant diseases. Food insecurity will worsen if plant diseases are not found in time. Plant diseases must be managed and decisions made about agricultural output are based on early identification, which is the key to successful prevention and control. It has become increasingly important in recent years to identify plant diseases [3], [4]. Plants with disease typically have noticeable stains or lesions on their leaves, stems, flowers, or fruits. The majority of diseases and pest conditions have a

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distinct visual pattern that may be utilized to specifically identify irregularities. The majority of illness signs may start to show on the leaves, which are often the main source for detecting plant diseases.

2. DISCUSSION

On-site identification of diseases and pests of fruit trees is often done by agricultural and forestry professionals, or by farmers using their knowledge. This approach is not only subjective, but also arduous, time-consuming, and ineffective. Farmers with little expertise could make mistakes and utilize medications carelessly while making identifications. Environmental contamination brought on by quality and output will result in avoidable financial losses. The use of image processing methods for plant disease identification has emerged as a popular study area to address these issues.

1.1. Current Approach:

The current method for diagnosing plant illnesses is a straightforward naked-eye observation by plant specialists, which may be utilized to find and recognize plant diseases. The recommended method works well for tracing wide fields of crops in these conditions. Additionally, in certain countries, farmers lack access to the necessary resources or are unaware that they may speak with specialists. The cost and time involved in contacting specialists are thereby increased. The proposed method for tracking a large number of plants might be valuable in those cases [5].

1.2. Disadvantages of the Current Approach:

Figure 1 illustrating the major disadvantages of the current approach to plant disease detection. The key drawbacks are given as follows.

1. Prediction of diseases is only possible by humans.
2. It moves along at a glacial pace.
3. Also highly high are the levels of time and space consumption.
4. Additionally, it is expensive.

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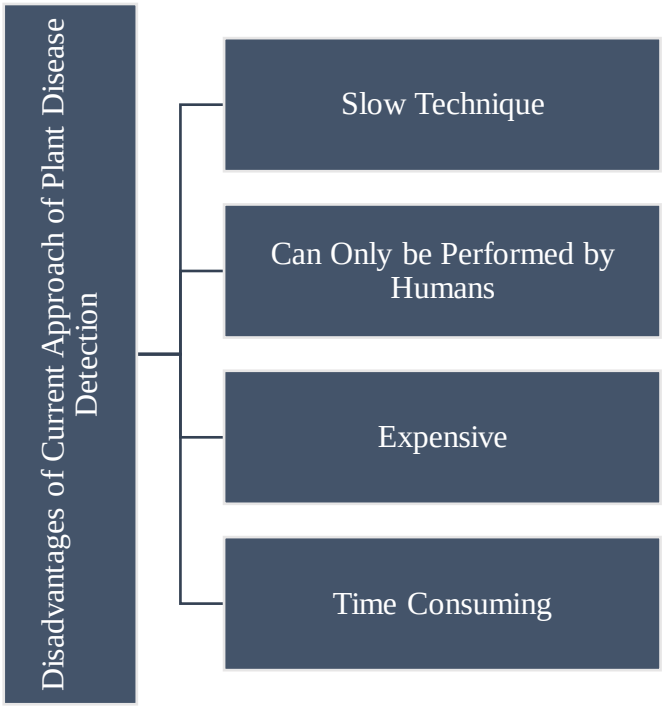

Figure 1: Illustrating the major disadvantages of the current approach to plant disease detection.

1.3. Image-based Plant Disease Detection:

The first stage entails acquiring images by a camera phone, cell phone, or online. The second step divides the image into several clusters for which various strategies can be used. The following step includes feature extraction methods, and the last stage is all about disease categorization [6]. Figure 2 illustrating the workflow of image-based plant disease detection.

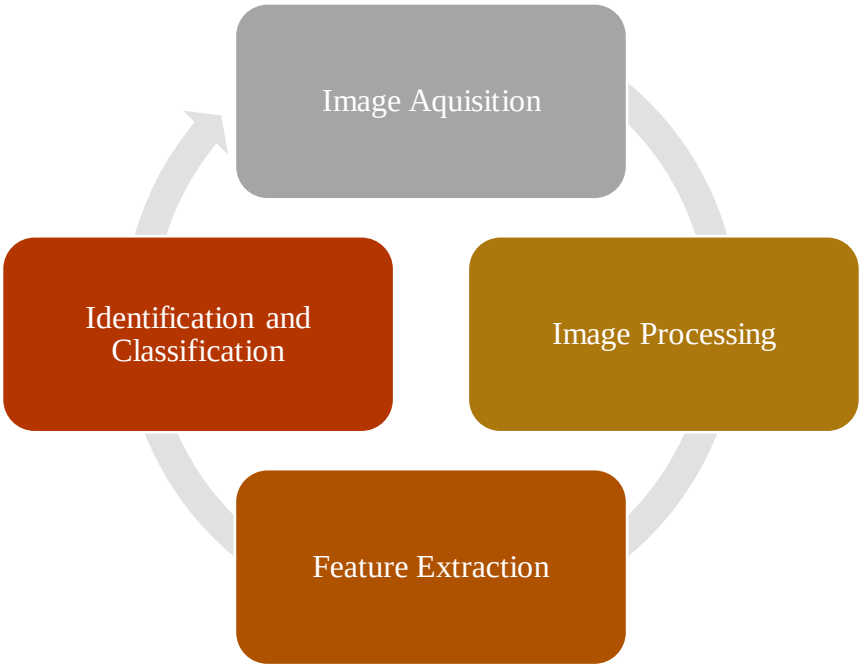

Figure 2: Illustrating the Workflow of Image-based Plant Disease Detection.

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1.3.1. Image Acquisition:

This stage involves gathering plant leaf photographs with the necessary resolution and size using digital devices like cameras, smartphones, etc. Images may also be downloaded from the internet. The application system developer has total control over the creation of the picture database. The picture database contributes to the classifier's improved performance in the final stage of the detection system [7].

1.3.2. Image Segmentation:

To make a picture more relevant and understandable, this step simplifies its depiction. This stage serves as both the foundation for feature extraction and the basic strategy for image processing. Images may be segmented using a variety of techniques, including thresholding, k-means clustering, Otsu's algorithm, etc. K-means clustering divides objects or pixels into K number of classes based on a collection of characteristics. The process of classifying items involves reducing the sum of squares of the distances between the objects and the clusters that correspond to them.

1.3.3. Feature Extraction:

A vast collection of raw data is reduced and divided into smaller groups using machine learning's dimensionally reduced technique, which includes feature extraction. This stage is crucial when we have a lot of data and must use the fewest resources possible while avoiding mistakes. Function extraction thereby assists in the selection of the optimal feature from huge data sets by merging variables into functions.

1.3.4. Classification:

Identifying whether the input image is healthy or unhealthy is the goal of the classification step. If it is determined that the image is diseased, several previously published papers have further categorized it into various diseases. A MATLAB software procedure, also known as a classifier, must be built to do classification. Researchers have utilized a variety of classifiers recently, including Naive Bayes, Support Vector Machines (SVM), Artificial Neural Networks (ANN), Back Propagation Neural Networks (BPNN), and Decision Tree classifiers. The SVM classifier is determined to be the most popular one. Although each classifier has benefits and drawbacks, SVM is a straightforward and effective way [8].

About 70% of the population in India is dependent on agriculture. To prevent crop losses, it is crucial to identify plant diseases. Manually observing plant diseases is difficult. It requires a significant amount of effort, knowledge of plant diseases, and a significant amount of time. To identify plant diseases, image processing, and machine learning models can be used. In this study, we have presented a method for identifying plant illnesses using images of the leaves. Visual processing is a subset of signal processing that may extract valuable information or image features[9], [10]. It is easier and less expensive to automatically identify illnesses by merely seeing the signs on plant leaves. Since the suggested technique combines statistical machine learning and image processing algorithms, it is computationally less costly and takes less time to predict than other deep learning-based systems.

3. CONCLUSION

The approach used to identify diseases infected plants use plant disease detection. Two steps make up the plant disease detection methods. The process of detecting plant illnesses consists of two processes. The first involves segmenting the picture, and the second employs a technique for feature extraction and classification that will identify the image's normal and

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diseased areas. The first involves segmenting the input picture to find the portions of the image that are unhealthy. Utilizing several classifiers, the approach of feature extraction is used to both extract the image's characteristics and categorize those features. In this paper to conclude, numerous feature extraction, segmentation, and classification algorithms are examined and explained in terms of some different criteria.

REFERENCES:

[1] E. Nwokolo, "Sweet potato," in *Non-Traditional Feeds for Use in Swine Production (1992)*, 2017. doi: 10.1201/9780203711248.

[2] A. J. Stein, "Global impacts of human mineral malnutrition," *Plant Soil*, 2010, doi: 10.1007/s11104-009-0228-2.

[3] G. Kaushal and R. Bala, "GLCM and KNN based Algorithm for Plant Disease Detection," *Int. J. Adv. Res. Electr. Electron. Instrum. Eng.*, 2017.

[4] S. D. Khirade and A. B. Patil, "Plant disease detection using image processing," 2015. doi: 10.1109/ICCUBEA.2015.153.

[5] V. Singh and A. K. Misra, "Detection of plant leaf diseases using image segmentation and soft computing techniques," *Inf. Process. Agric.*, 2017, doi: 10.1016/j.inpa.2016.10.005.

[6] S. P. Mohanty, D. P. Hughes, and M. Salathé, "Using deep learning for image-based plant disease detection," *Front. Plant Sci.*, 2016, doi: 10.3389/fpls.2016.01419.

[7] S. Thomas, M. Wahabzada, M. T. Kuska, U. Rascher, and A. K. Mahlein, "Observation of plant-pathogen interaction by simultaneous hyperspectral imaging reflection and transmission measurements," *Funct. Plant Biol.*, 2017, doi: 10.1071/FP16127.

[8] M. Barón, M. Pineda, and M. L. Pérez-Bueno, "Picturing pathogen infection in plants," *Zeitschrift fur Naturforsch. - Sect. C J. Biosci.*, 2016, doi: 10.1515/znc-2016-0134.

[9] D. Muhanguzi *et al.*, "Prevalence and spatial distribution of Theileria parva in cattle under crop-livestock farming systems in Tororo District, Eastern Uganda," *Parasites and Vectors*, 2014, doi: 10.1186/1756-3305-7-91.

[10] M. Leach *et al.*, "Local disease ecosystem livelihood dynamics: Reflections from comparative case studies in Africa," *Philos. Trans. R. Soc. B Biol. Sci.*, 2017, doi: 10.1098/rstb.2016.0163.