PLANT LEAF DISEASE DETECTION USING DEEPLEARNING ALGORITHM

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Abstract

Identification of the plant diseases is the key to prevent the losses in the yield and quantity of the agricultural product. Health monitoring and disease detection on plant is very critical for sustainable agriculture. It requires tremendous amount of work, expertise in the plant diseases, and also require the excessive processing time. Hence, image processing is used for the detection of plant diseases. The latest generation of convolution neural networks (CNNs) has achieved impressive results in the field of image classification. This is concerned with a new approach to the development of plant disease recognition model, based on leaf image classification, by the use of deep networks. Novel way of training and the methodology used facilitate a quick and easy system implementation in practice. The developed model is able to recognize different types of plant diseases out of healthy leaves, with an ability to distinguish plant leaves from their surroundings. Beginning with acquiring photographs to build a database that is reviewedby agricultural professionals.

Keywords: Convolution neural network (CNN), image classification.

I. INTRODUCTION

The project presents leaf characteristics analysis using image processing techniques for automated vision system used at agricultural field. In agriculture research of automatic leaf characteristics detection is essential one in monitoring large fields of crops, and thus automatically detects symptoms of leaf characteristics as soon as they appear on plant leaves. The proposed decision making system utilizes image content characterization and supervised classifier type of neural network. Image processing techniques for this kind of decision analysis involves preprocessing, feature extraction and classification stage. At Processing,an input image will be resized and region of interest selection performed if needed. Here, color and texture features are extracted from an input for network training and classification. Color features like mean, standard deviation of HSV color space and texture features like energy, contrast, homogeneity and correlation. The system will be used to classify the test images automatically to decide leaf characteristics and pesticide recommendation. For this approach, automatic classifier NN be used for classification

based on learning with some training samples of that some category. This network uses tangent sigmoid function as kernel function. Finally, the simulated result shows that used network classifier provides minimum error during training and better accuracy in classification.

II. LITERATURE SURVEY

Plant leaf disease detection is an important task in agriculture as it helps in identifying and managing plant diseases. In recent years, there has been a growing interest in using machine learning and computer vision techniques to automate the process of detecting plant leaf diseases. In this literature review, we will explore the latest developments in plant leaf disease detection using various techniques. One of the popular techniques used in plant leaf disease detection is image processing. In the study conducted by Gupta et al. (2020), they used image processing techniques to extract features from plant leaf images. These features were then used to classify plant leaf diseases using machine learning algorithms. They achieved an accuracy of 94.4% in classifying six different types of plant leaf diseases.[1] Another popular approach is using deep learning models such as Convolutional Neural Networks (CNNs) to detect plant leaf diseases. In the study conducted by Sladojevic et al. (2016), they used CNNs to detect plant leaf diseases from images. They achieved an accuracy of 98.5% in detecting tomato leaf diseases. In addition to image processing and deep learning, other techniques such as fuzzy logic, decision trees, and support vector machines have also been used for plant leaf disease detection. In the study conducted by Patel et al. (2017), they used a fuzzy logic-based approach to detect plant leaf diseases. They achieved an accuracy of 96.53% in detecting six different types of plant leaf diseases.[2] In conclusion, plant leaf disease detection is an important task in agriculture, and various techniques such as image processing, deep learning, fuzzy logic, decision trees, and support vector machines have been used for this purpose. The use of deep learning models, particularly CNNs, has shown promising resultsin detecting plant leaf diseases with high accuracy. However, further research is needed to improve the accuracy and efficiency of plant leaf disease detection systems.

Here are some methods:

1) Leaves Classification Using SVM and Neural Network for Disease Detection:

The process to classify cotton, orangeand Lemon leaf diseases using neural network analysis and support vector machine. A few of infected leaf samples were collected and they were captured using a digital camera with specific calibration procedure under controlled environment. The classification on the leavesdiseases is based on colour feature extraction from RGB colour model where the RGB pixel colour indices have been extracted from the identified Regions of Interest (ROI). The proposed automated classifications model involved the process of diseases classification using Support Vector Machine and Neural Network Pattern Recognition Toolbox in MATLAB. The proposed techniques based on performance indices results are promising with accuracy.[3]

2) **Plant Disease Detection Using Leaf Pattern**:

A Review In this review paper we discuss the various methodologies for plant disease detection. Studies show that relying on pure naked-eye observation of experts to detect and classify diseases can be time consuming and expensive, especially in rural areas and developing countries. So we present fast, automatic, cheap and accurate image processing based solution. Solution is composed of fourmain phases; in the first phase we create a color transformation structure for the RGB leaf imageand then, we apply color space transformation for the color transformation structure. Next, in the second phase, the images are segmented using the K-means clustering technique. In the third phase, we calculate the texture features for the segmented infected objects. Finally, in the fourth phase the extracted features are passed through a pre-trained neural network.[4]

III. EXISTING SYSTEM

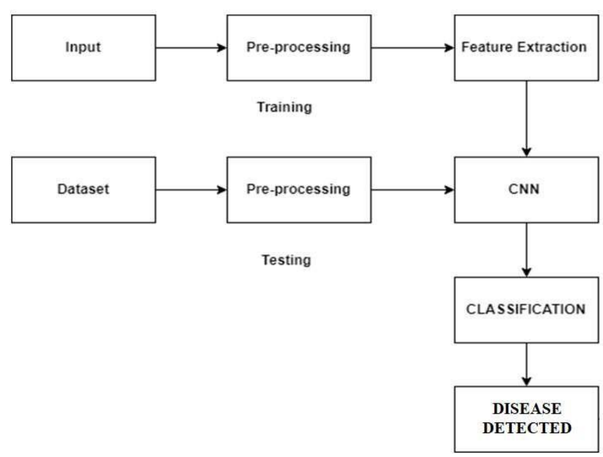
Visual inspection by trained personnel: This is the traditional and most common method of detecting plant leaf diseases. Trained personnel visually inspect plants and look for symptoms of disease on the leaves.

Mobile applications: Several mobile applications have been developed that use image recognition technology to identify plant leaf diseases. These applications allow users to take a picture of a plant leaf and receive a diagnosis of the disease.

Machine learning-based approaches: Machine learning algorithms can be trained onlarge datasets of plant leaf images to identify diseases with high accuracy. These algorithms can be integrated into mobile applications or used as standalone tools for disease detection.

Hyperspectral imaging: This technique uses sensors that can capture images of the plant leaves in multiple wavelengths. By analyzing the spectral signatures, researchers can identify the presence of diseases in plants.

IV. PROPOSED SYSTEM



Segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more Pesticide recommendation using deep learning meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entireimage, or a set of contours extracted from the image (see edge detection). Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic(s) when applied to a stack of images, typical in medical imaging, the resulting contours after image segmentation can be used to create 3D reconstructions with the help of interpolation algorithms like Marching cubes.

V. SOFTWARE

Arduino OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception inthe commercial products. Being an Apache 2 licensed product, OpenCV makes it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithmscan be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 18 million. The library is used extensively in companies, research groups and by governmental bodies. Along with well-established companies like Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda, Toyota that employ the library, there are many startups such as Applied Minds, VideoSurf, and Zeitera, that make extensive use of OpenCV. OpenCV's Pesticide recommendation using deep deployed uses span the range from stitching streetview images together, detecting intrusions in surveillance video in Israel, monitoring mine equipment in China, helping robots navigate and pick up objects at Willow Garage, detection of swimming pool drowning accidents in Europe, running interactive art in Spain and New York, checking runways for debris in Turkey, inspecting labels on products in factories around the world on to rapid face detection in Japan. It has C++, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS. OpenCV leans mostly towards real-time vision applications and takes advantage of MMX and SSE instructions when available. A fullfeatured CUDA and OpenCL interfaces are being actively developed right now.

VI. METHODOLOGY

In this case, distance is the squared or absolute difference between a pixel and a cluster center. The difference is typically based on pixel color, intensity, texture, and location, or a weighted combination of these factors. K can be selected manually, randomly, or by a heuristic. This algorithm is guaranteed to converge, but it may not return the optimal solution. The quality of the solution depends on the initial set of clusters and the value of K. In statistics and machine learning, the k-means algorithm is a clustering algorithm to partition n objects into k clusters, where $k < n$. It is similar to the expectation maximization algorithm for mixtures of Gaussians in that they both attempt to find the centers of natural clusters in the data. The model requires that the object attributes Pesticide recommendation using deep learning correspond to elements of a vector space. The objective it tries to achieve is to minimize total intra-cluster variance, or, the squared error function. The k-means clustering was invented in 1956. The most common form of the algorithm uses an iterative refinement heuristic known as Lloyd's algorithm.Lloyd's algorithm starts by partitioning the input points into k initial sets, either at random or using some heuristic.

ADVANTAGES

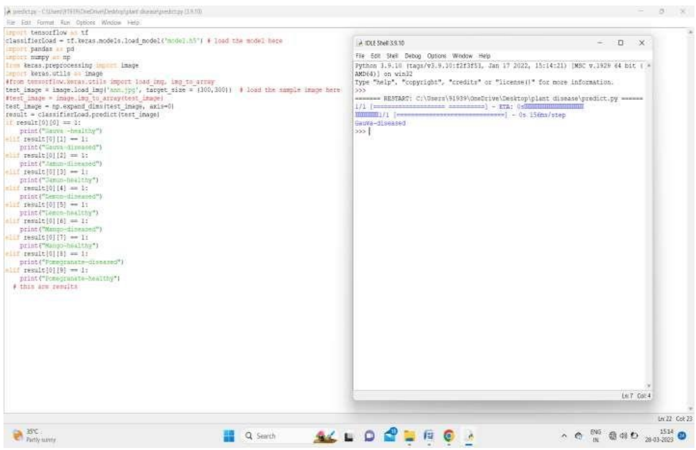
- Early detection
- Accurate diagnosis
- Reduced labor costs
- Improved cost yields
- Environmental benefits

APPLICATIONS

- Early detection

- Prevention of plant diseases
- Increased crop yield
- Improved food security
- Environmental protection

VII. EXPERIMENTAL RESULTS



VIII. CONCLUSION

Plant leaf disease detection using image processing and machine learning techniques has the potential to revolutionize the way we manage plant diseases. These techniques can help detect diseases at an early stage, allowing for more targeted and effective management strategies to be implemented, ultimately resulting in better crop yield and quality.

Several image processing and machine learning techniques have been developed to detect plant leaf diseases, including segmentation, feature extraction, classification, and deep learning algorithms. These techniques have shown promising results in detecting a wide range ofplant diseases, including fungal, bacterial, and viral diseases.

In conclusion, plant leaf disease detection using image processing and machine learning techniques is a rapidly developing field that has the potential to transform the agriculture industry. As these techniques continue to improve and become more accessible, they have the potential to help farmers increase their yields and profits while reducing the need for pesticides and other chemicals, ultimately leading to a more sustainable future.

IX. FUTURE SCOPE

The future scope of plant leaf disease detection is quite promising, as advancements in technology and research are constantly improving the accuracy and efficiency of these systems. Here are some potential future developments in thisfield:

Integration of IoT:

The integration of Internet of Things (IoT) technology with plant leaf disease detectionsystems can provide real-time monitoring of planthealth. Sensors can be placed in the field to collect data on various environmental factors like temperature, humidity, and soil moisture, which can be used to predict disease outbreaks and take preventive measures.

Use of Hyperspectral imaging:

Hyperspectral imaging can provide more detailed information about the chemical and physical properties of plants than traditional RGB imaging. This technology can help in early detection of diseases and provide more accurate diagnosis.

Use of machine learning:

Machine learning algorithms can be used to analyze large amounts of data and identify patterns that may be difficult for humans to detect. These algorithms can be used to improve the accuracy and speed of plant disease detection systems.

Integration with precision agriculture:

Plant leaf disease detection systems can be integrated with precision agriculture systems to provide targeted treatments for diseased plants. This can reduce the use of pesticides and other chemicals, which can have harmful effects on the environment.

Development of mobile apps:

Mobile apps can be developed to allowfarmers and gardeners to easily identify and diagnose plant diseases. These apps can use image recognition and machine learning algorithms to provide accurate diagnosis and treatment recommendations. Overall, the future of plant leafdisease detection is bright, and these systems havethe potential to revolutionize agriculture by improving crop yields and reducing the use of harmful chemicals.

REFERENCE

Here are some references related to plant leaf disease detection:

1. "Deep learning-based automatic detection of plant diseases using leaf images" by Mohanty et al. was published in 2016.

2. "A review on deep learning techniques for image and feature-based plant disease detection" by Sladojevic et al. was published in 2016.

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