LEAF DISEASE DETECTION USING K-MEANS CLUSTERING ALGORITHM

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Abstract:

INDIA is an agricultural country, and the agricultural industry is the largest contributor (about 20.19%) of GDP ahead of other industrial sectors. Agriculture is one of the pillars of our economy. Therefore, the farming industry is the main source of gaining. However, due to some factors such as plant diseases, pests, climate change, the yield of the farming industry decreases, and the productivity decreases as well.The detection of plant diseases is crucial to avert the losses in the productivity and in the yield. It is not obvious to monitor the plant diseases manually as the act of disease detection is very critical. It needs a huge effort, along with knowledge of plant diseases and extensive processing times. Therefore, image processing technology is used to detect the plant disease, this is done by capturing the input image that undergoes the process and is compared with the dataset. This dataset is composed of diverse plant leaves in the image format. This project aims at designing a standalone application that will provide the framer with the necessary information about the type of disease. The purpose of this project is to assist and provide efficient support to the monoculture farmers.In this paper, we propose a system that will use the different techniques of the image process to both analyze and detect the plant diseases. The results of the implementation show that the designed system could give a successful result by detecting and classifying the plant diseases.

INTRODUCTION:

any of the techniques of digital image processing, or digital picture processing as it often was developed in the 1960s, at Bell Laboratories, the Jet Propulsion Laboratory, Massachusetts Institute of Technology, University of Maryland, and a few other research facilities, with application to satellite imagery, wire-photo standards conversion, medical imaging, videophone, character recognition, and photograph enhancement. The purpose of early image processing was to improve the quality of the image. It was aimed for human beings to improve the visual

effect of people. In image processing, the input is a low-quality image, and the output is an image with improved quality. Common image processing includes image enhancement, restoration, encoding, and compression. The first successful application was the American Jet Propulsion Laboratory (JPL). They used image processing techniques such as geometric correction, gradation transformation, noise removal, etc. on the thousands of lunar photos sent back by the Space Detector Ranger 7 in 1964, taking into account the position of the sun and the environment of the moon. The impact of the successful mapping of the moon's surface map by the computer has been huge success. Later, more complex image processing was performed on the nearly 100,000 photos sent back by the spacecraft, so that the topographic map, color map and panoramic mosaic of the moon were obtained, which achieved extraordinary results and laid a solid foundation for human landing on the moon.The cost of processing was fairly high, however, with the computing equipment of that era. That changed in the 1970s, when digital image processing proliferated as cheaper computers and dedicated hardware became available. This led to images being processed in real-time, for some dedicated problems such as television standards conversion. As general-purpose computers became faster, they started to take over the role of dedicated hardware for all but the most specialized and computer-intensive operations. With the fast computers and signal processors available in the 2000s, digital image processing has become the most common form of image processing, and is generally used because it is not only the most versatile method, but also the cheapest.One of the first application of digital image was in the newspaper industry, when picture were first sent by submarine cable between London and New York. Introduction of the Bartlane cable picture transmission system in the early 1920s reduced the time required to transport a picture across the Atlantic from more than a week to less than three hours. Specialized printing equipment coded pictures for cable transmission and then reconstructed them at the receiving.

Fig 1 General image

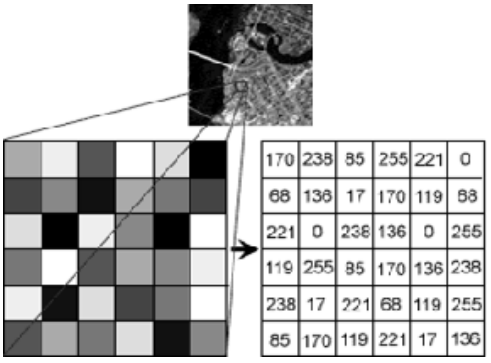

Fig 2 Image pixel

An image is a rectangular grid of pixels. It has a definite height and a definite width counted in pixels. Each pixel is square and has a fixed size on a given display. However different computer monitors may use different sized pixels. The pixels that constitute an image are ordered as a grid (columns and rows); each pixel consists of numbers representing magnitudes of brightness and Each pixel has a color. The color is a 32-bit integer. The first eight bits determine the redness of the pixel, the next eight bits the greenness, the next eight bits the blueness, and the remaining eight bits the transparency of the pixel.

OBJECTIVES:

- To identify leaf disease using k-means clustering algorithm.
- To significantly support an accurate detection of leaf disease.
- Sufficient amount of pesticide spraying also suggested by computing the amount of disease present in the leaf and can effectively control the pest in turn the crop yield will be increased.
- Research and development
- To give effective result of 4 leaf diseases.

Anthracnose , Cercospora , Bacterial Blight , Alternaria Alternata are the four diseases which gives effective result.

PROPOSED METHOD:

Image acquisition and preprocessing

We take picture of effected part of the skin as an input for image acquisition. For preprocessing unwanted noises are removed for the improvement of image and can enhance it.

Gray scale conversion:

Here a 3-channel image (RGB) is

taken which means that we have to add rwith g with b and then divide it by 3 to get desired grayscale image.

Noise Reduction:

To remove/reduce the noise, we have used Gaussian blur filter which helps in image size reduction and for better edge detection. It also smoothens the image.

K-means clustering algorithm

K-means is an unsupervised classification algorithm, also called clusterization, that groups objects into k groups based on their characteristics. The grouping is done minimizing the sum of the distances between each object and the group or cluster centroid. The distance usually used is the quadratic or euclidean distance.The k-means algorithm solves an optimization problem and the function to be optimized (minimized) is the sum of the quadratic distances from each object to its cluster centroid.

The algorithm has three steps:

1. **Initialization:** once the number of groups, *k* has been chosen, *k* centroids are established in the data space, for instance, choosing them randomly.
2. **Assignment of objects to the centroids:** each object of the data is assigned to its nearest centroid.
3. **Centroids update:** The position of the centroid of each group is updated taking as the new centroid the average position of the objects belonging to said group.

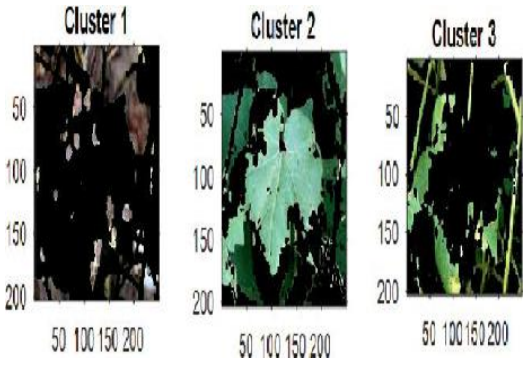

FIG 3 CLUSTERING USING K-MEANS

IMPLEMENTATION OF THE PROJECT:

Block Diagram:

The proposed methodology uses some techniques to remove the background noise, and features extraction to detect and classify images. The proposed method comprises of 4 phases:

1.Input image

2.Pre-processing of image

3.Segmentation

4.Classification

5.Post-processing

6.Result

Content related to block diagram and individual blocks

Input image

Image acquisition is the process of converting an analogue image into digital form. This usually happens in a camera or scanner, but it can be done with any device that produces analog images. Image acquisition is often used to create a digital representation of data from surveys and experiments, but it can be also used for other purposes such as printing pictures or other types of graphics.

Pre-processing

The pre-processing is a series of operations performed on scanned input image. It essentially enhances the image rendering it suitable for segmentation. The role of pre- processingis to segment the interesting pattern from the background. Generally, noise filtering, smoothing and normalization should be done in this step. The pre-processing also defines a compact representation of the pattern. Binarization process converts a gray scale image into a binary image. Dilation of edges in the binarized image is done using Sobel technique.Image preprocessing is the steps taken to format images before they are used by model training and inference. This includes, but is not limited to, resizing, orienting, and color corrections.Image preprocessing may also decrease model training time and increase model inference speed. If input images are particularly large, reducing the size of these images will dramatically improve model training time without significantly reducing model performance. For example, the standard size of images on iPhone 11 are 3024×4032. The machine learning model Apple uses to create masks and apply Portrait Mode performs on images half this size before its output is rescaled back to full size.

RESULTS

CASE-1:

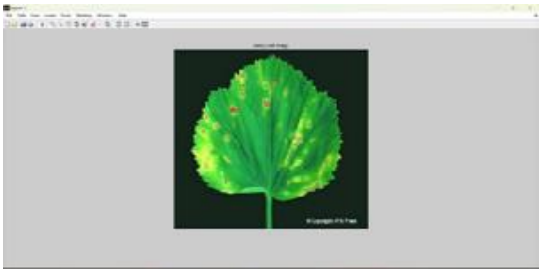

FIG 4 QUERY LEAF IMAGE

Query image: It is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image.

FIG 5 CONTRAST

ENHANCED IMAGE

Contrasted enhanced image: The relative brightness and darkness of objects in the scene to improve the visibility. The contrast and tone of the image can be changed by mapping the gray levels in the image to new values through a gray leveltransform

CONCLUSION:

This study summarizes major image processing used for identification of leaf diseases are k-means clustering, SVM. This approach can significantly support an accurate detection of leaf disease. There are five steps for the leaf disease identification which are said to be image acquisition, image pre-processing, segmentation, feature extraction, classification. By computing amount of disease present in the leaf, we can use sufficient amount of pesticides to effectively control the pests in turn the crop yield will be increased. We can extend this approach by using different algorithms for segmentation, classification.By using this concept the disease identification is done for all kinds of leafs and also the user can know the affected area of leaf in percentage by identifying the disease properly the user can rectify the problem very easy and with less cost.

FUTURE SCOPE:

MOBILE APP:

As a future work and to improve our project, the idea is to create a mobile application that willbe connected to MATLAB. The farmer will use the application to detect the type of the leaf disease. He will be the one to upload the leaf image that will be sent to MATLAB as an input after being saved into a database. Meanwhile, the farmer will be receiving a notification saying that the upload was done successfully. Once the image is processed and the detection is executed, the farmers will receive a message specifying the type of disease along with the type and the quantity of pesticide to use. The image that is uploaded to the mobile application will undergo the process of MATLAB throughout its image processing toolboxes.

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