Cercospora Identification in Spinach Leaves Through Resnet-50 Based Image Processing

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Abstract - Cercospora is a contagious disease that occurs in plant leaves. Spinach is one of the healthiest food that are preferred by the people nowadays. Thus cercospora is the disease that also occurs in the spinach leaves, it also affects the humans. It causes the serious effect in both the spinach plants and also human and animals consuming it. Therefore the usage of image processing and deep learning is done in order to find out the cercospora affected plant and preventing it from the spreading from one plant to the other. To acquire the process of segmentation the plant image feed is given. This process produces an accurate result and as a outcome the cercospora spread can be controlled at the initial stage. This helps farmers to proceeds the decision faster for providing a needed treatment. In proposed system by using the convolutional neural network (CNN) and the Resnet-50 architecture, through which cercospora is identified from the different classes for the spinach leaf disease were detected and classified from the healthy leaves. The result obtained has a greater accuracy in training and testing from a few datasets and thus using this process the identification and the measures can be taken.

1. Introduction

Agriculture is known to be the mother of all evolutions. This is an era where people prefer to eat green veggies in order to stay healthy and such that spinach is one of the healthiest food. Spinach is rich in vitamins and minerals and thus eating the leafy green veggie it also benefits the human to reduce the blood pressure levels and maintains a balanced diet. It also maintains the good eye health and other health functions [10]. Therefore the farmer concentrates on the improving of the yield of the production without considering its effect in the environment by using of the chemical pesticide and fungicide. Thus the diseases caused due to the over dose of the chemicals it decreases the quality and the quantity of the development of the spinach production. Thus in order to decrease the occurrence of disease in the leaves, the usage of the technology is adopted into the identification of the diseases in the spinach leaves. The image segmentation concept is used in order to segment leaves of the plants and to categorise the disease [1].

Fig.1 Cercospora affected Plant
Cercospora is one of the common disease that is found in the spinach leaves which is of contagious and it also affects the humans and at max leads to the formation of kidney stones. Cercospora first starts with the single plant whereas it gradually spreads up on the whole field which affects the whole harvesting of spinach leaves [9]. Thus the concept of stop eating the pesticide and fertilizers has to be overcome and to reduce the overly used in the plants which also degrades the healthiness of the plant. In order to measure the accuracy, economy and agronomy the technique of image processing is implemented and for the technique used to make the system think like human and to predict the decisions the deep learning concept is used in order to analyse and predict it from the image given as of the input to perform the image classification task [3].

The image processing applications is considered of two categories, in which the first one depends on the techniques related on imaging and the next is based on its applications. In the proposed methodology the invocation of the convolutional neural network (CNN) for the deep learning concept which is one of the main category of the main categories of neural network [4]. The proposed method uses the technique of classification by Resnet-50 method. It does the process of image recognition, image classification and segmentation. Using these methods the concept of analysing and finding out the cercospora affected plant and treatment measures are taken.

![Basic Image processing technique](image-url)
2. Literature Survey

The paper works that are related for the proposed system and different types of techniques are implemented in those paper. In the year of 2019 Rophita Frankes and Dr.C.Seldev Christopher introduces the concept of ANN in finding out the disease in the plant leaf specific of spinach and diagnosed it in order to categorise the type of disease that occurred in the plants [2].

In the year of 2018 Anup Vibhute determined the concept of the image segmentation and used the concept of Image processing through the process of deep learning the data sets are given through which the determined plant with disease is identified and eradicating of the affected plant takes place. The concept of identifying the plant diseases through the visual symptoms by exploring the images in the form of coloured by Camargo et al. The detailing is based on the transformation of RGB image into a grayscale and then analysing the scattering of the intensities in the form of histogram and then the images are segmented. The investigation of the disease identification in the paddy leaves by Auzi Asfarian et in from the Fourier transform using the fractal descriptors. In this technique the HSV colour space is transformed from the lesion images. The fractal descriptors were the PNN classifier the classification is done and the histogram equalization is made. Gittaly Dhingra introduced the concept of the computer vision based on the finding of the leaf disease identification and classification on the neutrosophic approach where the image processing is employed in the device to identify the parameters of the affected leaf areas.

3. Existing System

In the existing system it uses the concept of ANN as artificial neural network which uses the segmentation and classification. In that system it determines the concept of finding out the type of disease in the leaves and differentiates from the healthy leaves.[2]

Disadvantages

The accuracy of the model is low and the outcome of determining a specific disease can also lead to the interrupt. It has the main disadvantage such as the data set applied will also detect the normal spots also as a disease. The traditional way of finding the disease by Farmers, who are still facing the issues and the techniques they are using to detect the disease are time consuming.

4. Proposed System

The proposed system uses the concept of Resnet-50 based Convolution neural network (CNN) in order to classify the images to find out the cercospora level in the affected plant and the remedial measures are taken according to it, to control the spread of the disease in the plants to the other batches of spinach plants in the field. The Resnet-50 determines the level of cercospora and according to the level the amount of pesticide and fungicide to be sprayed is identified. The basic architecture of the proposed
system includes of the association and aggregation in order to alternate the image from the datasets that are given

![Fig.5 System Architecture](image)

5. Methodology

The Modules that are implemented in order to obtain the proposed system.

- Image Acquisition
- Pre-processing the Spinach Leaf images
- Segmentation model and Classification through Resnet-50
- Evaluating the system performance
- Cross validation

5.1 Image Acquisition

The initial stage of the process of Image Acquisition where is of Spinach leaves and it is converted in digital form and to avoid error it is converted into grayscale image and thus it becomes easier for classification. It determines the shape, rotation and parameters of the image. [4]

5.2 Pre-processing the spinach leaf images

The Sharpening operator is used in order to sharpen the edges and thus it actually strengthens the edges where the frequency parts in the images are adjusted. The processing of the image leads to the easier classification of the disease the occurred in the leaf. It also monitors the vein details of the leaf and the spots that occurs in the leaves.

5.3 Segmentation model and Classification through Resnet-50

The digital image is divided into various small fragments such as in the form of pixels and super pixels is of segmentation. The result of this process is a fixed of fragments that mutually protect the whole image or a block of framework obtained. Each and every pixel in the zone is close concerning to some distinguishing or determined attributes like colour, shape and texture. Since cercospora symptom in the leaf includes of spots and it also affects the veins

Resnet-50 Approach

In the process of classification, it involves in separating the obtained data into two sort such as training sets and testing sets. The training set which contains of several attributes for each instance or data and one target value in it. Residual network Resnet-50 CNN architecture where it determine the idea to solve the task in a simpler it manner and thus the outcome has more efficiency and the process of training the data is made easier. It has around 50 layers for the data processing. Therefore the pre-defined data are invoked and the level one of Cercospora embraces of the spot diameter and vein colour detection.
Fig. 6 Resnet-50 Architecture

The input image is introduced into the layers. The first layer is of convolution + RELU (rectified linear unit) which is a unit employing the rectifier. The next layer followed by max pooling layer. The pooling operation is done in which the maximum element is selected from the region of layers covered by the filter. In the residual block each layer output is fed into the next layer and hops also occurs through the identity connections.

The productivity after max-pooling s of a map comprising and featuring the maximum protuberant properties of the preceding map. The arc blue outlines signify the identify chunks that is used to designate the use of preceding layers. The first layer have three identical blocks whereas the second layer consists of four identical block and the third layer has four identical blocks. The last layer is the fully connected classification where the finding up of the level of Cercospora is identified and the result is obtained with greater accuracy.

Step 1: Importing the necessary libraries
Step 2: Read and unzip the file to obtain the datasets
Step 3: Pre-processing images for ResNet-50
Step 4: Make a prediction using the ResNet-50 mode
Step 5: Identify level through the spots and vein.
Step 6: Result displayed and performance efficiency

5.4 Evaluating the system performance

After obtaining the results from the proposed architecture it is compared and likened with the previous system and thus the performance efficiency is distinguished through the accuracy [7]. The pixel level accuracy can be determined through the ground level dataset.

Accuracy = (TP+TN)/(TP+TN+FP+FN)

5.5 Cross validation

This process is used to cross validate the result and then it determines the measures that has to be taken in order to control the spread of cercospora in the spinach field and then the performance efficiency is identified [5]

6. Result And Discussion

The characteristics of the vein and the leaf place which have spots have been identified and thus the process of levelling the cercospora is identified the result according and the performance difference between the existing and the proposed system is determined.
7. Conclusion

Thus the ResNet-50 is a prevailing backbone model which are used much more in the computer vision responsibilities. It also uses skip linking to add the output from an previous layer to a advanced layer. This helps it alleviate the fading gradient difficulty. At last as a futuristic work it can also be used it the agriculture in order to recognise the disease phases in the plants.

8. Reference

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