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Farmer Assistant System for Early Disease Detection in Plants

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ABSTRACT

Food is the most important thing for humans. It provides energy for us. Approximately 700 million people around the world are undernourished. Around 37 percent of the total land on earth is being used for cultivating food. Due to urbanization the cultivating land might become even less in the future. Maximum agricultural productivity is one of the main issues mankind is facing now-a-days. As plants might get affected by various pathogens, insects or other living organisms throughout their crop time since we sow the seed till we get the crop yield.If proper care is not taken throughout the crop time it might cause effects on plants which is serious and because of that crop quality, productivity or quantity would possibly get affected. Detection of disease in plant through some automatic technique will be very useful as it reduces an outsized man work of observance in large crop fields, and at beginning stage itself we will be able to detect the symptoms of diseases in plants when they appear on plants. This paper presents a Convolutional Neural Network model for automatic detection on plants and identifies what kind of disease the plant in the crop is suffering from.

KEYWORDS

Detection in Plants, Human Health, Training Module.

Introduction

Mankind is dependent on agriculture for food. The share of agriculture has been stable around 4% in the global gross domestic product and is providing employment to over 11% of the world population. There are several things such as pathogens, insects that might lead for different diseases in the crop. Therefore detection of plant diseases at beginning stageplays a vital role in agriculture field. World agriculture consists of several crops like wheat, rice, potatoes, sugarcane, maize, oilseeds, potatoes and non-food items like tea, coffee, rubber, cotton.

All these crops growth will be based on its roots, leaves and the climatic conditions in which they are growing and even on some external factors. These might lead to huge losses which can be avoided by early identifying diseases in plants in the beginning stage. Most of the diseases will kill leaves or leads to formation of spots in various colors on leaves in a plant. For farmers it will become difficult in identifying these diseases till it is too late to for the plant to recover from the disease. Farmers will not be able to take precautionary measures on these plants due to unawareness on which disease has affected the crop. At present usage of recent technologies are going to be appropriate, efficient and reliable for disease detection with facilitate of plant leaf pictures. Thus farmers can reduce expenditure and usage of pesticides which in turn affecting human health.

Literature Review

1. Computing Hu moments shape descriptor and Haralick texture and to convert image to HSV image and finally identifying whether a leaf is healthy or not using a random classifier.

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2. Using Artificial Neural network to create a model and using k-means clustering to find distance between different colored regions on the leaf.
3. Using decision tree classifier for identifying crop diseases.
4. Using Recurrent neural networks for and classifying rubber tree leaf diseases using multi layer perceptron network
5. Using hybrid method of noise reduction for identifying the disease on leaf.

Methodology

Images of leaves will be captured by the camera automatically during the entire crop time at regular intervals. As one of the most common symptoms in crop diseases are dying leaves or formation of spots in different colors due to various pathogens. We should create a database in which we have to store huge set of images related to different kinds of diseases and we have to classify each disease as a different class. Then we should create a CNN model. This model will have two modules one for training data and other for testing module. The training module will read all the data from database and should understand that data. Once the training is completed then we can start testing the model with new set of images. While testing the images, the model should compare them with the images in the database and it should predict whether the leaf is affected by any pathogen and got infected with any disease or not. If it is not infected then it should be able to tell that the leaf is not infected by any pathogen. If a new image has been given to the model as an input then it has to add that new image to its training module.

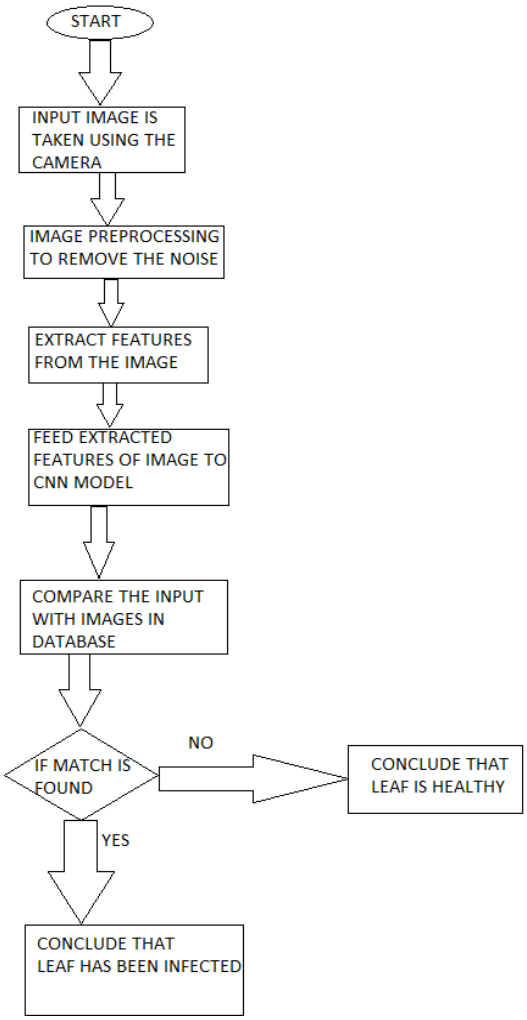

Fig. 1. Flow chart for the Proposed Method

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Dataset Creation

The two datasets arecreated.
Train dataset: This dataset contains 16000 images belonging to 15 classes.
Test dataset: This dataset contains 1254 images belonging to 15 classes. Here we will be using "Categorical" class mode because there are more than 2 classes.

Model Loading

The sequential Model is used in this CNN. The Sequential model API is a way of creating deep learning models where Sequential class is created and model layers are added into the class. Here we add various Convolutional layers with Relu activation function. We pass images through layers multiples times for better feature extraction.

Training

This the most important part of our model. We train our model with 10 epochs this gives more accuracy.

The advantage here is it runs only one time, because an epoch takes Time when we run this and the same step is not repeated again.

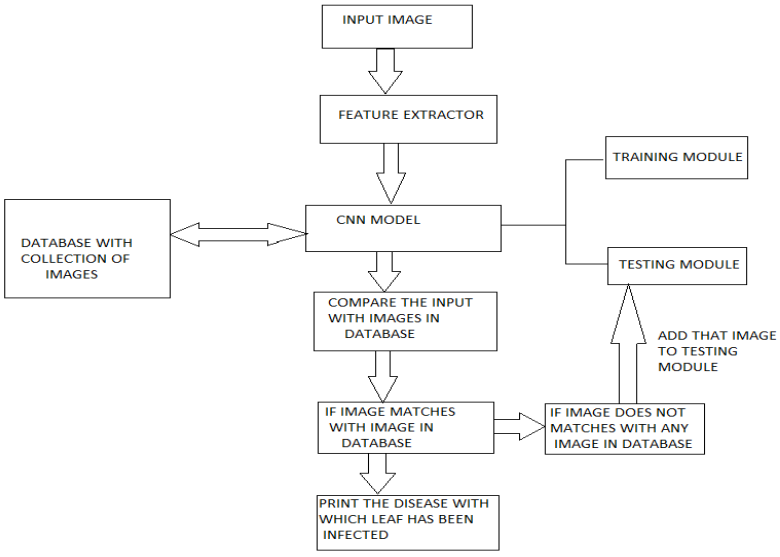

Fig. 2. System Architecture

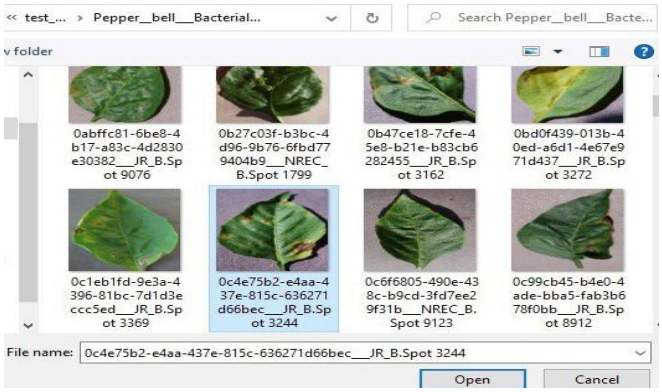

Fig. 3. Selecting the input image through GUI

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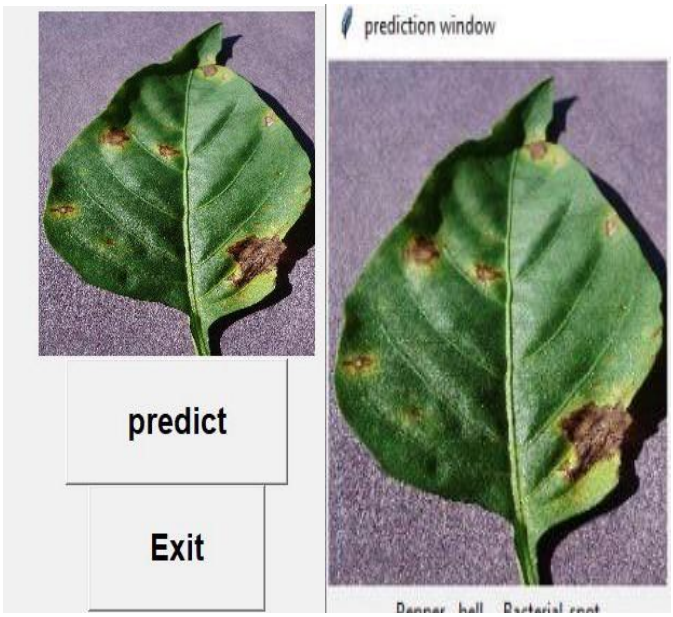

Fig. 4. Predicting the disease

Once the image has been captured then the image will be provided as an input to the CNN model or we can select the image if we want to as shown if fig 3. After the model has been executed a pop up window will appear on the screen where we can see the welcome page where we can select the image or take a photo of the image which we need to check whether it has been infected or not. After selecting the image then we can click on predict button. Then the model will start comparing the image with images which already exist in the database.

Result

Thus a CNN model has been developed for identifying diseases in a plant by taking photos and comparing that with the images which already exist in the database.

Conclusion

The project can beextend by adding other images where the affected part will not be leaves only (say such as trunk, fruits, flowers etc). Android APP may be developed for use as everyone is having a mobile phone with them.

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