AN EFFICIENT LEAF DISEASE DETECTION USING MACHINE LEARNING

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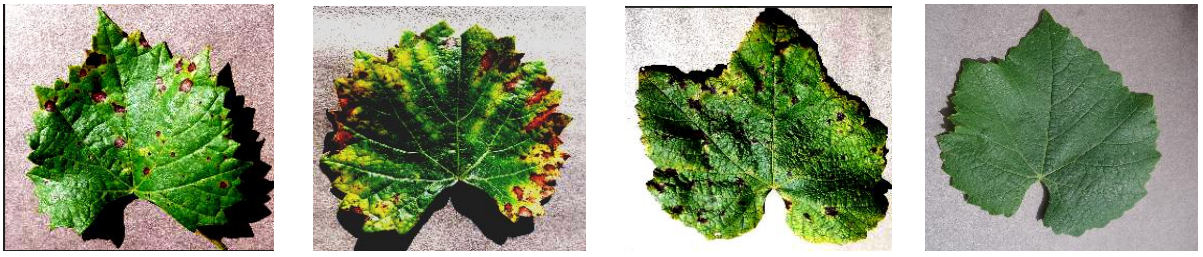
***Abstract*- India is a country which highly depends on agriculture. Agriculture plays a key role in our national GDP. India is still in a developing state due to the minimal export being carried out. One factor for this situation is that the plant diseases are not identified at the right time. The reason behind this issue is that disease identification is being carried out in a manual way at a slower pace, which affects the quality and quantity of agricultural products. So, to overcome this difficulty, this process is automated using machine learning techniques. There are five major methods involved in disease detection such as image acquisition, image pre-processing, feature extraction, classification and diagnosis. Image acquisition is a collection of high-resolution images which are used to train the model. It is achieved by suitable devices. In this project, the images are taken from a dataset to train the model. The remaining methods are carried out by a tool called Teachable Machine Learning in which separate classes are created for each disease. Then the images are uploaded to each class, after which the model is ready to be trained. After training the model, a TensorFlow Lite(tflite) file and a text file with labels are generated. This tflite file is embedded into the Android application, which predicts the disease.**

Keywords -Plant Disease Detection: Image Acquisition, Training, TensorFlowLite, Android Studio

1.INTRODUCTION

Agriculture is one of the most important sources of income for farmers in our country. Farmers can grow a variety of plants but diseases affect the growth of plants. Disease attacks may reduce the productivity of plants from 10%-95%[1]. Currently there are different strategies to get rid of plant diseases such as removing the affected plants manually, mechanical cultivation and last is using different pesticides. Getting opinions from agriculture experts makes this process even easier. But this manual detection of diseases consumes a lot of time and manual effort. Classification of diseased plants using Digital Image Processing and Machine Learning approach can help to control growth of diseases on plants. Automatic identification of plant diseases is an important task as it may prove beneficial for farmers to monitor large fields of plants, and identify the disease using machine learning approaches.



Leaf blight, black measles, black rot, healthy images

2. LITERATURE SURVEY

[2] describes classification and detection techniques that can be used for plant leaf disease classification. Here preprocessing is done before feature extraction. RGB images are converted into grey level images to extract the image of the vein from each leaf. After performing basic morphological operations, the image is converted into a binary image. If the binary pixel value is 0,it is converted to corresponding RGB value. Finally by using Pearson correlation, Dominating Feature Set and Naive Bayesian classifier, disease is detected.

In [3] there are four steps. The first one is gathering images from several parts of the country for training and testing. The second one is applying a Gaussian filter to the images which is used to remove all the noise. Thresholding is done to obtain all the green color components. K-means clustering is used for segmentation. Finally all the RGB images are converted into HSV for extracting features.

[4] describes the technique of detecting jute plant disease using image processing. Images are captured and then they are resized to match the size of the image to be stored in the database. Then the quality of the image is enhanced and noises are removed. Hue based segmentation algorithm is used on the image with customized thresholding formula. Then the image is converted from RGB into HSV as it helps extract the region of interest (ROI). This approach is highly suitable for detecting stem oriented diseases for jute plants.

In [5] detection of unhealthy plant leaves include some steps like RGB image acquisition, converting the input image from RGB to HSI format, masking and removing the green pixels, segmenting the ROI using Ostu's method, calculating the texture features using color-co-occurrence methodology and finally classification is done using Genetic Algorithm.

[6] includes tomato disease detection using computer vision. A grayscale image is converted into a binary image based on a certain threshold value. Image segmentation is done using threshold algorithms. The threshold values are assigned color indices like red, green, blue. The thresholding method is not reliable as this technique only distinguishes red tomatoes.. It becomes difficult to distinguish ripe and unripe tomatoes. For this issue, the K-means clustering algorithm is used to overcome the drawbacks. The K-means algorithm creates a particular number of non-hierarchical clusters. This method follows numerical, unsupervised, non-deterministic and iterative approaches. Then after separating the infected parts from the leaf, the RGB image was converted into YCbCr to enhance the feature of the image. The final step is calculating the percentage of infection and distinguishing the ripe and unripe tomatoes.

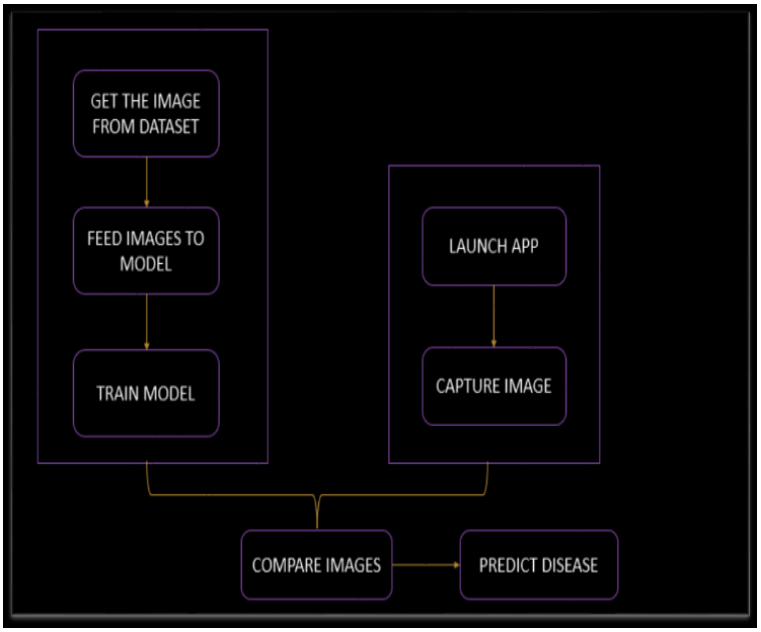
The approaches for detecting cucumber disease is presented in [7]. The methodology includes image acquisition, image pre-processing, feature extraction with Gray Level Co-occurrence Matrix (GLCM) and finally classified using suitable algorithms like KNN,CNN etc

Paddy is a major crop in continental region. In [8] RGB images are converted into gray scale images using color conversion technique. Various techniques like histogram equalization and contrast adjustment are used for enhancing the image quality. Different types of classification algorithms like SVM, ANN, FUZZY classification are used in this paper. Feature extraction uses different types of feature metrics like texture feature, structure feature and geometric feature.The diseases in paddy can be identified by using ANN and FUZZY classification.

In [9] popular methods have been used for machine learning, image processing and classification based approaches to identify and detect the disease of agricultural products.

In [10] image processing techniques are used to detect citrus leaf disease. This system includes: Image pre-processing, Segmentation of the leaf using K-means clustering to determine the diseased areas, It uses Gray-Level Co-Occurrence matrix (GLCM) for feature extraction and classification is done using support vector machine (SVM).

3.PROPOSED SYSTEM



The proposed system is an application that assists the user in identifying the diseases in a short period of time. This application is developed using Android Studio and Teachable Machine Learning. In Teachable Machine Learning, images are collected from a dataset and are classified into separate classes. These classes denote the categories of disease. Then this tool trains the model and generates a tfLite file and a label text file. In Android Studio, the user interface is created which contains a home page with a button that allows the user to capture the leaf image. This captured image is compared against the train data based on the pixels. The closest match is found out and the corresponding disease name is fetched from the label text file and is displayed to the user. Further the user can get to know more information about the disease by clicking the hyperlink displayed below the disease name. This app is compatible from version 8 of Android.

4.RESULTS AND DISCUSSION

FIG. 1

FIG. 2

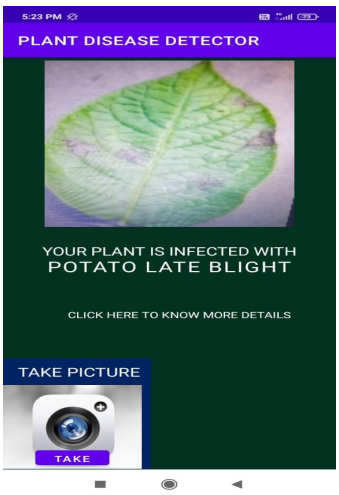


FIG. 3

FIG. 4

Fig 1 shows the homepage of the application. It has a button “Take” using which the image can be captured. After the image is captured, the corresponding disease is displayed on the screen which is shown in Fig 2,3 and 4. The user can get the information about the disease by pressing “Click here to know more details”. This will redirect the user to the respective Google page of the disease. Manual testing was carried out and the results were precise.

5. CONCLUSION

As agriculture plays a key role in our national GDP, the plant diseases must be identified at the right time**.** But currently there is a delay observed in that process because it is being carried out in a manual way at a slower pace .This affects the quality and quantity of agricultural products. So, to overcome this difficulty, this application was developed . This application is tested manually by feeding images of three varieties of crops: Tomato, Potato and Pepperbell. In each category, more than two types of diseases are taken. In addition to this, healthy leaves of each category are also taken. The result is that the app detected the images correctly. This app can be further improved by scaling the training dataset. Also, the interface can be made more user-friendly and security features can be implemented.

6. REFERENCES

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