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PLANT LEAF DISEASE DETECTION USING CNN AND RASPBERRY Pi

G. Rama Mohan Reddy, Nettam Sai Sumanth, N. Sai Preetham Kumar

JRF, Sathyabama Institute of Science and Technology, Tamilnadu, India.[1]
Dept of Computer Science and Engineering, Sathyabama Institute of Science and Technology, Tamilnadu, India.[2,3]
rammohan3g@gmail.com[1] , nettamsaisumanth333@gmail.com[2]

Abstract: - ***For identifying diseases for plants we use naked eye. But it is not accurate so SVM is used for prediction which is less accurate 70 % even if dataset is good.so, this paper we use Raspberry pi for identification of the diseases. Here we use the convolutional neural networks for processing of images. CNN uses various focal points to identify the diseases in the plants. In research purposes it is very useful because by this we can identify diseases of leaf correctly using the CNN algorithm. Disease refers to type of the plant effected. Here we use the best algorithm to identify and predict the plant lead disease. Easily identification of diseases will be very helpful because it will increase the productivity and reduce chemicals on the plants. It will increase agriculture yield with minimum cost which is very helpful now a days and we can get accuracy of 90% if dataset is good.***

Keywords— *CNN, Raspberry Pi, Python*

I INTRODUCTION

India is known famous for agriculture. Many people will depend upon agriculture. Farmers use different types of cultivation options in their field. So by combing with technology the yield and production can be increased. This can improve quality and also increase the productivity. Leaves are the fundamental parts for identifying the disease. Affected leaves are seen by us for identification. However, whole leaf is affected by the spots when plant is fully affected by leaf. In India farming is backbone major of income comes from agriculture. Because of the industrialization many are migrating from agricultures. So, we have to increase the usage of agriculture and have to increase the productivity which is very useful for farmers in India. Presently we use the traditional approaches which are from olden ages.

But now a day's technology is changing and many farmers are migrating from agriculture to another jobs because of lack of productivity. By using the current technology in the agriculture will help the farmers to increase the productivity at very less cost and give the profits for them.by using this we can also save the environment by applying proper chemicals to the plants and giving saving them there by reducing the pollution for environment.by saving the plants we can save the animals and insects like bees.

We have to bring the technology into the agriculture. Recognizing the correct disease leads to correct usage of chemical there by reducing the cost and saving money and time. Identifying a state of plant is a crucial thing. In previous time we can do it manually by observing the leaf but it may or may not be accurate. Now we can use camera and machine learning algorithm to identify the diseases and identify the plant diseases accurately which will be very useful. Here now we will use the best algorithm to identify the diseases in the plants.

II LITERATURE REVIEW

Sannakki et al.[12] used feedback generating Neural Network based approach for evaluating and ordering grape leaf diseases. Creator has utilized the picture s of grape leaf with complex foundation for the finding as info. Further anisotropic dissemination is utilized to expel the clamor of the picture which is additionally divided utilizing k-implies grouping. At long last outcomes are watched utilizing neural system. Results are investigated wool mold and fine buildup pictures with reproduction in MATLAB. Disarray network is considered with the genuine positive and false positive parameters for the approval of results. The creator professed.

Kutty et al.[13] used the neural system structure to order Downey Mildew and Anthracnose watermelon leaf diseases

.Creator has calculated the true positive rate, the actual negative e rate and, in general, the accuracy of the proposed idea. This structure relies on the shading highlight extraction from the RG B shading model that is obtained from the intrigue district recognized pixels. The general execution is represented with an AU C estimate of 0.5 on ROC bend. The accurate characterization result also delineates the 75.9 percent estimate is acquired from the recognized pixels in the district of intrigue. The general execution is portrayed with ROC bend having AUC estimation of 0.5. The genuine characterization result like75.9%.

An description of the position of Plant Leaves Disease Research using Kiran R. Gavhale and U. Image Processing Tech niques. Gawande, Gavhale, and Gawande

(2014) initiated audits and details image preparation procedures for a few classes of plant animals that were used to interpret plant diseases. Back Propagation Neural Network (BPNN),Support Vector Machine (SVM), Kclosest neighbor (KNN), and Spatial Gray level Dependence Matrices (SGDM) are the main structures for recognizing plant infections. Similar methods are used for the examination of the l eaves of strong and ailing plants[8].

Astute Wheat Disease Diagnostic Program Based by Y on Android Mobile. Q. Xia, Y. Li & C. Li, In 2015, Xia and Li proposed the method for studying the android structure of shrewd wheat ailments. Through this method, customers collect images o f wheat disease using Android phones and send images via the International Journal of Pure and Applied Mathematics Volume 1 19 No. 14 2018, 879884 ISSN: 13143395 (online adaptation) url :http:/www.ijpam.eu Special Issue ijpam. In the illness determination server,.eu 879. After accepting illness images, the server conducts image division by switching from RGB shading space to HSI shading space over the photos. The shading and surface highlights of the sicknesses are to be managed by using the minute shading system and the coevent grid of dark dimension. The preferred highlights are contribution to the recognition support vector system, and the obvious proof results are urged back to the customer[9].

Khirade et al.[11] investigated some division and highlighted the measurement of the extraction which can be used to identify plant diseases by using the image of their leave. The physical identification of plant diseases is difficult due to the requirement of excessive time, plant disease learning and a lot of job calculation. The designer has divided the entire method for the location of plant leaf infections into five stages: image securing, preprocessing, segmentation, extraction of features and final disease arrangement. Picture procurement used the RGB leaf image shift framework. Image is prepared to evacuate the commotion at that point and to update the differentiated photo. Division is achieved using kimplies sorting, Otsu channels and so on to parcel the image into separate component sections. Additionally, this fragmented image is used for highlight extraction and after that last or der is rendered using different arrangement procedures. Infections of plants can be proficiently discerned along these lines.

Rothe et al.[14] have suggested pattern identification techniques fo r the discovery and order of Alternarnia, Myrothecium, and Bacter ial Blight cotton leaf diseases. The images of the dataset are taken from the Central Institute of Cotton Research Nagpur region.

Calculation of complex form based division is used to break unsafe spots. Maker has also suggested other part bearings for the comparable idea of wheat, fruit, citrus, and maize harvests, and soon.

Pearson, Roger C et al.[15] Of all plant leaf sicknesses, those caused by infections are the most difficult to examine, infections do not give any symptoms that can be detected promptly and routinely effectively mistook for lack of nutrients and herbicide injury. Exam Mosaic fungus, yellow spot scan or foliage spot scan, may be wrinkled, twisted and growth may be impeded.

Existing System:

In existing system, we can identify the disease of the plant by using our own eye that is with help of human. This process is not accurate because many diseased leaves have same features and applying wrong remedy leads to the loss of the entire plant. We can also take picture of leaf and apply the K means algorithm and then check whether the leaf is diseased or not by using SVM but that is not accurate because it can achieve only less accuracy for a good dataset.so we have to improve the model or use the different algorithm so we use the CNN algorithm.

Proposed System:

In the proposed system we use the CNN algorithm for the plant leaf disease detection because by using the CNN we can achieve the maximum accuracy if the dataset is the good. In this proposed system we capture the image by using the raspberry pi with the camera module and them process it and get the prediction whether leaf is diseased or not and the name of the disease. here dataset is taken and the data is preprocessed before training and then the data is trained here the images of the diseased plants are in separate folder because we can easily train the model and predict the model if it is in this type and the trained data is separated into two ways one for validation and another for verification that is into training and testing data that to in the 80:20 ratio. After the data is trained a model is generated and then we use the raspberry pi to capture the picture of the image and then we use the CNN algorithm and the given trained model for the prediction of disease. We can achieve the 90 percent accuracy by this CNN.

III DISEASES

Many insects affect plants. They eat top and bottom of leaf.

Figure 1. Leaf minor disease

Since there is so much effect, it is harmed. There will be more parasites on leaf. It can affect the whole plant and leaf and affect yields.

Figure 2: Disease of yellow spot

Here we use picture for identification of diseases by using this method we can get the exact rate for leaf disease detection. When it is identified by our observation, we can use the required medicine for the plant. We can get the medicine by using the sign of the leaf in a plant. Sign can be in many forms like changing the shape of the leaf and color of the leaf and form of the leaf. So by this we can identify the feature of the leaf and their diseases. this method can be used to identify whether leaf is diseased or not and I can identify which type of disease with in very less time so it is very useful now a days and we can use whatever medicine required to cure the disease of the plant.

IV SYSTEM DIAGRAM

4.1 Block Diagram

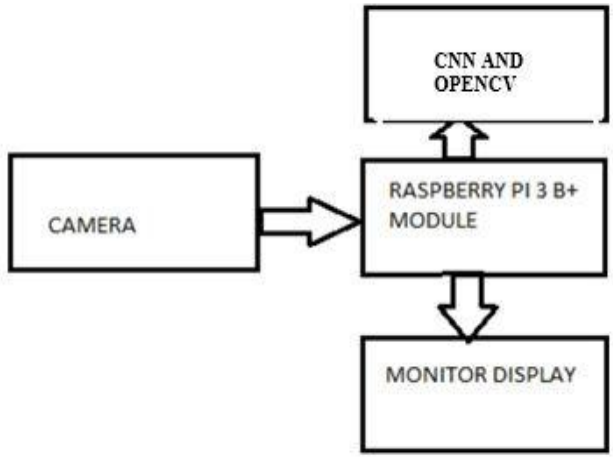

Figure 3: Block diagram of system.

A. Block Diagram Explanation.

1. Power Supply for pi

We use 5V and 1A power supply for this project because it is used for the charging purpose of the raspberry pi

2. Camera module

Camera is used to capture a picture; it is connected to raspberry. There are two ways to connect the camera to the raspberry pi. The first method is to connect the camera through USB cable and the second method is 15 pin headers for the interface of raspberry pi.

3. Raspberry PI

Raspberry Pi is like a mini CPU. The camera will capture the picture and send it to the Raspberry Pi.it identifies a plant leaf disease using the Open CV and the CNN algorithms for identification. It is a microprocessor. It very small in size, it is in size of credit card. We can carry it easily anywhere.

4. Screen as presentation

In the screen we will se the name of the disease that plant has been infected and its confidence.

5. CNN and Open CV

CNN means convolutional neural network and Open CV means open computer vision. Open CV is used to read the leaf using the camera and used to process the image. CNN is used to train the sample dataset leaves and is used to train the model and used to predict whether the leaf is diseased or not and to show the type of the disease.

4.2 Flow Diagram:

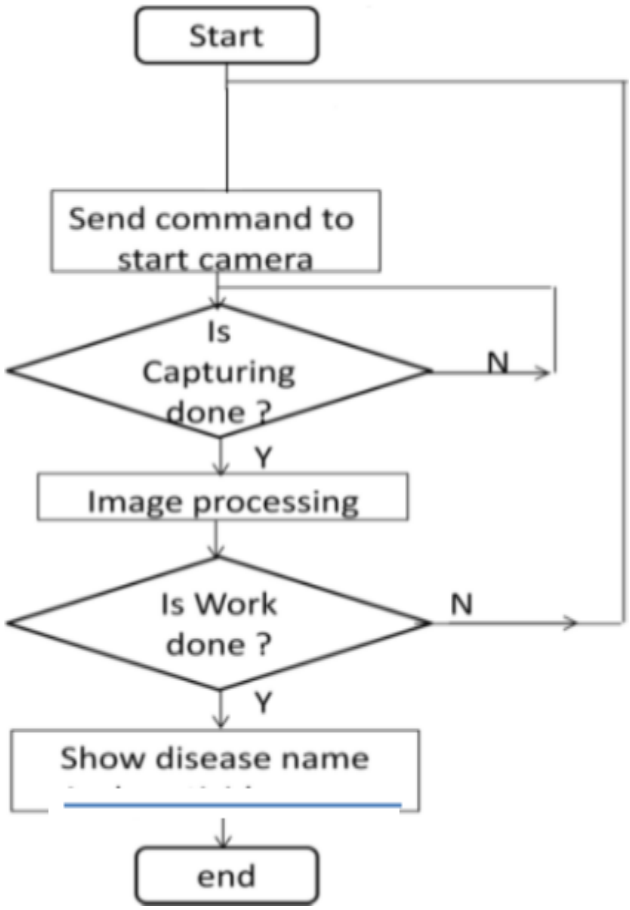

Figure 4: flow chart

V ALGORITHM

1. Capture the image in RGB format.
2. Dataset
3. Augmentation
4. Image Processing and labelling
5. Convolutional neural networks
6. Hyper parameters.
7. Equipment.

A good dataset is required to identify the diseases. Entire model accuracy is depending upon the dataset we collect A total of 500images are gathered from various places like Plant Village and through Google, and also different diseases of the plant for which are gathered into several categories.

We apply python code for cleaning of the downloaded images for the sake of comparison procedure. By using the date, name and size we remove unwanted images. after all this is over the images are taken care by various human experts.

CNN algorithm training requires more data. If we give the more data to the CNN then more features can be extracted by the CNN algorithm. The data which will give to train the CNN is not required to predict the accurate output. So we perform some operation on the data like rotating the images to train the CNN because by this it can train good and more features can be extracted. So the given data images data are rotated by various degrees and mirror image is also generated. We will cut the input data to the center of image by same size and converting the all the images into grayscale. This procedure is done because of to avoid over fitting.

We increase the feature extraction and consistency by the images in the data set for the deep CNN classifier are preprocessed before the model is trained. One of the most significant operation sis the normalization of image size and format. here by using the Open CV framework and CNN algorithm the images are converted in some pixel size and some dots per inch. To improve the accuracy, we can group all same type of diseased leaves into the one category that is we store all it into one of same folder. We only use the accurate images for dividing the images into the training and validation dataset. By using this we can improve the accuracy.

VI TECHNOLOGIES:

A. OpenCV

OpenCV is abbreviated as Computer vision open source. this framework is very useful in Machine learning and in AI programming. It is used for handling of the pictures. C or C++ is used for the creating of Open CV. Mainly we use the C++ for the creation of the Open CV. Camera is used to take the picture.

B. Python

Python is a programming language. It is easy and simple to learn. Raspberry pi related programming use the Python language. Various modules and languages are supported by the python. It executes line by line since it is an interpreter. It is available in all platforms like windows, IOS, etc. and it is also open source it means anyone can use it. It is widely used im Machine learning and in AI related programming because simple to write and easy to understand. It supports various number of modules.

C. Raspberry Pi

Raspberry Pi is like a mini CPU. The camera will capture the picture and send it to the Raspberry Pi.it identifies a plant leaf disease using the Open CV and the CNN algorithms for identification. It is a microprocessor. It very small in size, it is in size of credit card. We can carry it easily anywhere. We can deploy whatever program we want into the Raspberry Pi with using the memory card.

We can connect it to various other devices for using it. Like in this Plant leaf disease detection using CNN we can connect it to the drone if we want to improve our project.

D. CNN

It uses C++ language and Deep Learning mainly uses CNN and It is flexible and have faster updates. It can be used in training testing the model and data. It uses both Central processing units(CPU) and Graphical processing units(GPU) for training the given model. It is more accurate since it uses deep learning approach that accuracy is also depend upon the dataset.

VII EXPECTED RESULT

Here we will get the type of the disease effected from the given image.

The following figures shows the ill ness of the plant and the given converted image after the process of the segmentation which is shown in the Fig 6 and the same image in form of gray scale. And the last image is the feature extracted image.

Figure 5: Downy mildew

Figure 6: segmented image

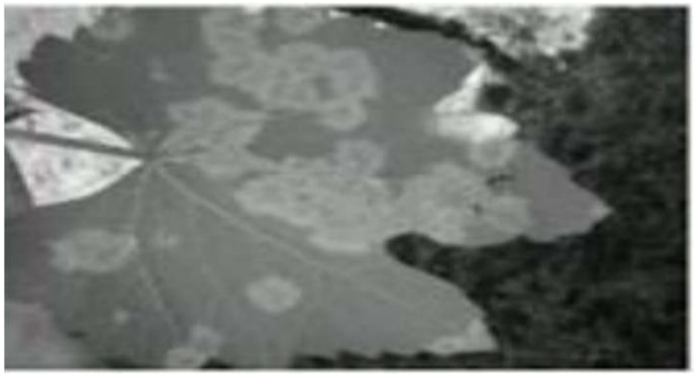

Figure 7: Grayscale image

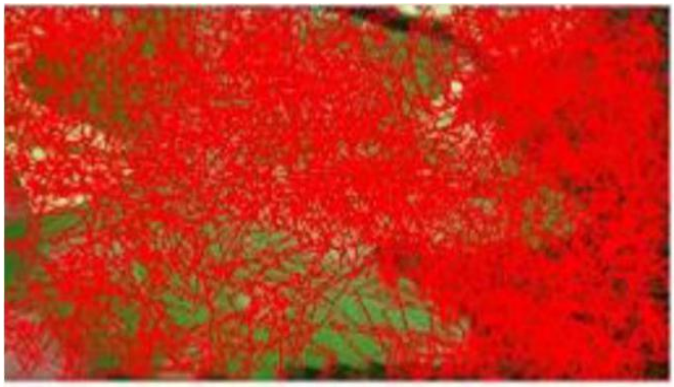

Figure 8: Feature extracted image

VIII CONCLUSION

By this we can conclude that plant leaf disease detection is done successfully with the help of the CNN and the open CV through the raspberry pi. We can achieve with in in very less time. Work will be reduced when we use drone across the field to identify the leaf diseases. for any other handling we can use the server. The core goal of the given project is to detect the plant leaf diseases and display it on the device and accurately identify the diseases and yield more output and prevent plants from the diseases.

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