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Automatic Detection of Plant Leaf Disease Detection

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Abstract**:** *Identification of the plant diseases is the key to prevent the losses in the yield and quantity of the agricultural product. The studies of the plant diseases mean the studies of visually observable patterns seen on the plant. Health monitoring and disease detection on plant is very critical for sustainable agriculture. It is very difficult to monitor the plant diseases manually. It requires tremendous amount of work, expertise in the plant diseases, and also require the excessive processing time. Hence, image processing is used for the detection of plant diseases by capturing the images of the leaves and comparing it with the data sets. The data set consist of different plant in the image format. Apart from detection, this aims to support and help the green house farmers in an efficient way. Plant disease identification by visual way is more laborious task and at the same time, less accurate and can be done only in limited areas. Whereas if automatic detection technique is used it will take less efforts, less time and become more accurate.*

I. INTRODUCTION

Modern technologies have given human society the ability to produce enough food to meet the demand of more than 7 billion people. However, food security remains threatened by a number of factors including climate change (Tai et al., 2014), the decline in pollinators (Report of the Plenary of the Intergovernmental Science-PolicyPlatform on Biodiversity Ecosystem and Services on the work of its fourth session, 2016), plant diseases (Strange and Scott, 2005), and others. Plant diseases are not only a threat to food security at the global scale, but can also have disastrous consequences for smallholder farmers whose livelihoods depend on healthy crops. In the developing world, more than 80 percent of the agricultural production is generated by smallholder farmers (UNEP, 2013), and reports of yield loss of more than 50% due to pests and diseases are common (Harvey et al., 2014). Furthermore, the largest fraction of hungry people (50%) live in smallholder farming households (Sanchez and Swaminathan, 2005), making smallholder farmers a group that's particularly vulnerable to pathogen-derived disruptions in food supply.Various efforts have been developed to prevent crop loss due to diseases. Historical approaches of widespread application of pesticides have in the past decade increasingly been supplemented by integrated pest management (IPM) approaches (Ehler, 2006). Independent of the approach, identifying a disease correctly when it first appears is a crucial step for efficient disease management.

i.e . Basic Structure

II. PROBLEM STATEMENT

The problem is the manual and time-consuming process of visually inspecting plant leaves for diseases, which is prone to human error. An automated solution is needed to accurately analyze leaf images, detect diseases, and classify them. This requires integrating computer vision, machine learning, and pattern recognition techniques. Such a system would enable timely intervention, effective disease management, and resource optimization in agriculture. By automating plant leaf disease detection, farmers can mitigate crop losses, promote sustainable practices, and ensure food security.

III. 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 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.

IV. REQUIRED TOOLS

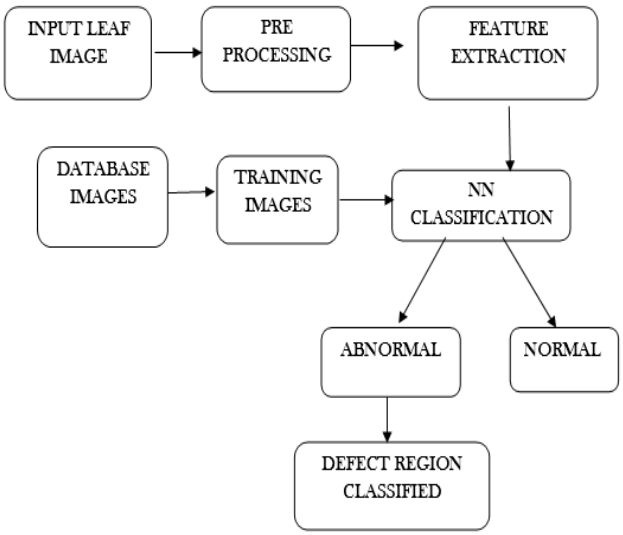
- Power Supply for pi
- Camera module
- Python
- Jupyter Notebook,PyCharm
- Raspberry PI
- CNN and Open CV
- TenserFlow

V. METHODOLOGY

The methodology for automatic plant leaf disease detection involves collecting a diverse dataset of plant leaf images, preprocessing them to enhance quality, extracting meaningful features, training a machine learning or deep learning model on the extracted features, evaluating the model's performance using validation metrics,tuning,hyperparametersfor optimization, testing the model on an independent dataset, and deploying it in a suitable environment. Iterative refinement and regular updates may be required. This methodology enables accurate disease detection, allowing for timely interventions and contributing to sustainable agriculture practices.Once the model is trained and validated,test it on an

independent test dataset to evalueate its generalization ability.Finally,deploy the model in a suitable environment,such as web application or a mobile application or a mobile app,to make it accessible for real-world use.

Fig:5.2



VI. EXPERIMENT RESULTS

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.

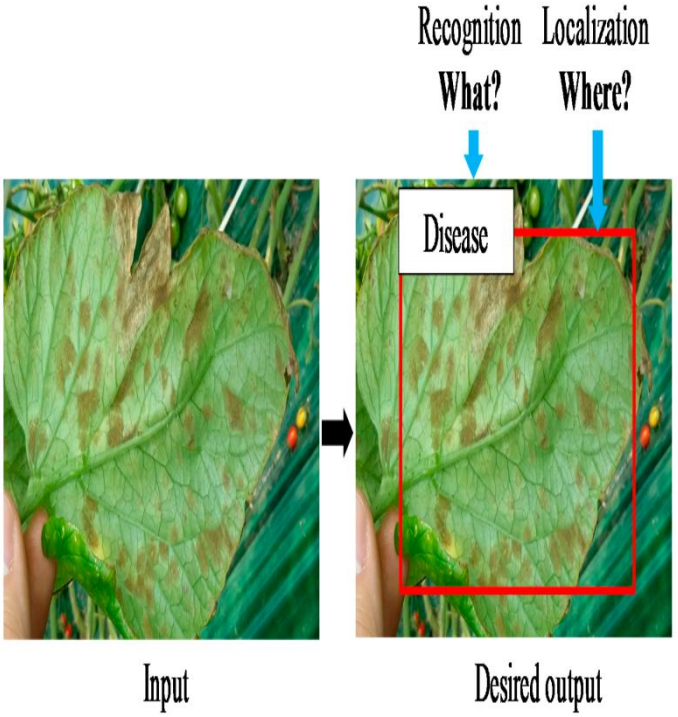
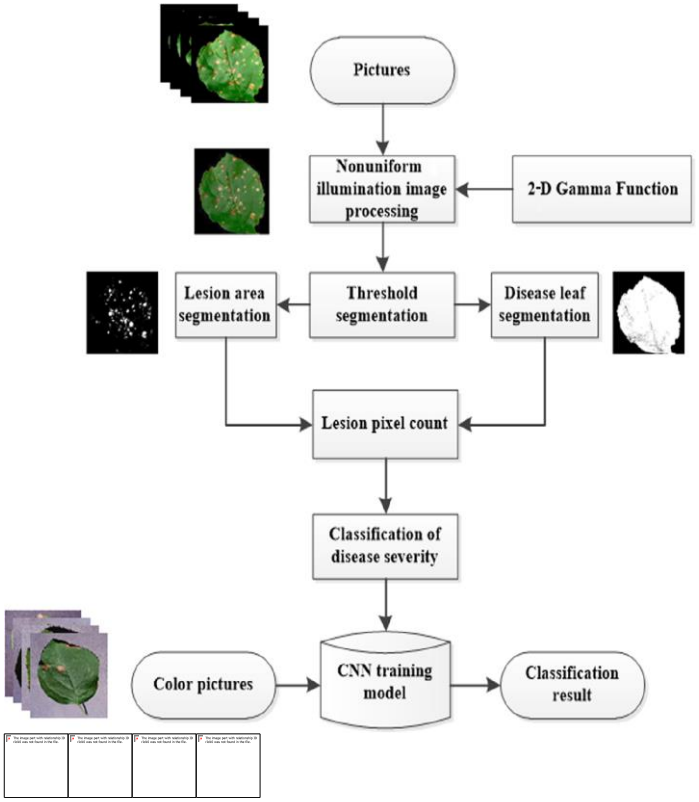


Fig: Decoding page

VII. ARCHITECTURE DIAGRAM FOR PROPOSED METHOD



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.

IX. Future Enhancement:

Future enhancements in research papers related to automatic plant leaf disease detection can explore several areas to improve the accuracy, efficiency, and practicality of the detection systems. Here are some potential avenues for future research

- Incorporation of Multimodal Data
- Transfer Learning and Domain Adaptation
- Real-Time and Edge Computing
- Dataset Expansion and Annotation

- Explainability and Interpretability
- Incorporation of Advanced AI Techniques

These future research directions can contribute to the advancement of automatic plant leaf disease detection systems and enable more accurate, efficient, and scalable solutions for disease management in agriculture..

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