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FRUIT DISEASE DETECTION USING IMAGE PROCESSING

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Abstract: This study will use a technique to identify fruit-related illnesses and even identify specific disease kinds that target fruits based on similarities. Because of this, the method makes use of CNNs (Convolutional Neural Networks), a deep learning algorithm that is most frequently used to analyze visual imagery. The algorithm takes in images as input and uses various aspects and parameters to differentiate the images. Farmers will undoubtedly benefit from this in the near future since it will improve crop growth. Python has been selected for further examination in this technique. The accuracy level attained by using the suggested approach is 99%.

I. INTRODUCTION

In India, agriculture provides a living for 58% of the people. Hence, there is a decrease in agricultural output due to the impact of certain illnesses and the ever-changing climate. India is the second most populous country on the list, and its population is continually growing. It will thus naturally result in an increase in food consumption, which will force people to produce more food. India grows and exports fruits in addition to food crops. In most of these locations, the process of classifying excellent and poor fruits is still mostly done by hand. As a result, there are more mistakes made while rating fruits for export. Over time, there has been an exponential rise in global population. Thus, the need for wholesome, high-quality food is growing. This made it necessary to monitor the general increase in food output. A number of variables, including soil and climatic conditions, incorrect use of fertilizers and pesticides, plant diseases, and reduced production, all contribute to low-quality food. Human and other living things' health has been negatively impacted by the food's declining quality. Fruit disease has been the main cause of the decline in fruit yield. Early fruit disease identification is thus essential, and this has been a source of worry for researchers. Figure 1 illustrates how research has increased exponentially over time. To assist farmers in raising the quality of their produce, researchers have been attempting to investigate the detection of diseases in plants, fruits, and vegetables. The development of tools capable of early illness detection is now possible because to technological advancements.

Therefore, in order to enhance the quality of classification when exporting fruits, researchers have presented an image detection approach to distinguish between sick and excellent fruits. This method aims to address the shortcomings that arise during the human classification process. Convolutional neural networks, or CNNs, are used in this method to identify the fruit's quality layer by layer.

II. LITERATURE SURVEY

V. S. Magomadov, 2019Smart agriculture and deep learningFarming involves developing land, raising crops, and raising animals. A nation's economy depends on agriculture. About 58% of a nation's income comes from farming. Farmers used traditional methods till now. These inaccurate methods lowered production and took time. Precise farming increases production by calculating seasonal phases. Precision farming involves predicting weather, assessing soil, proposing crops, and determining fertilizer and pesticide needs. Advanced technologies

like IOT, Data Mining, Data Analytics, and Machine Learning help Precise Farming gather data, train systems, and forecast outcomes. With technology, Manual effort is reduced and production increased via precise farming. Farmers have been struggling with crop failure owing to little rainfall, soil infertility, and more. Due to environmental changes, the suggested effort helps identify smart crop management and harvesting. It provides wise agricultural advice. This effort helps a person grow crops effectively and attain great yield at minimal expense. It also estimates cultivation costs. This would assist a farmer schedule actions before cultivation for an integrated solution.

Guobin Shi, Rakesh Ranjan, Lav R. Khot., 2020 Strong image processing method for computationally restricted smart apple sunburn sensor. Description: Heat and light stress sunburns developing apple fruits, reducing crop productivity and quality. When fruit surface temperature (FST) climbs over critical limits for a long time, it may cause physiological diseases like sunburn. Our Washington State University group is creating a noncontact smart sensing system with heat infrared and visual imaging sensors for real-time FST monitoring to control apple sunburn. The relevant system must analyze in-field images data on a single-board computer with low computing resources. The main goal of this work was to create a single-board computer-optimized image processing method. Before fruit segmentation and FST estimation, algorithm logic incorporates color space transformation, k-means++ classification, and morphological operators. The method achieved 57.78% segmentation accuracy (missing error: 12.09%, segmentation error: 0.13%). This enabled accurate apple FST estimate at 10-18 °C higher than ambient air temperature. The technique lowered smart sensing system picture processing time from 87 to 44 seconds by image reduction.

Mukesh Kumar Tripathi, Dhananjay D. Maktedar, 2020 Survey of computer vision in fruits and vegetables in agriculture. Description: Computer vision is a reliable and powerful image processing method with great promise. Computer vision is widely used in agriculture and other fields. The existing survey paper on the role of computer vision in fruits and vegetables among various horticulture products of agriculture fields has not focused properly on mathematical framework, feature descriptor, and defect detection on multiple datasets. We conducted a thorough survey because of this. This study examines fruits and vegetables among horticultural products of farm fields, a specific model, data pre-processing, data analysis technique, and performance accuracy using a particular performance indicator. We investigate fruit and vegetable diseases as well. We also compared machine learning approaches on the same dataset using various performance criteria. SVM outperforms all other machine learning methods in classification accuracy. A broad framework for grading fruit and vegetable quality and defect identification is also presented in this investigation. This study reviews ninety-eight agricultural computer vision studies. According to the report, computer vision is crucial and has great potential to solve agricultural problems.

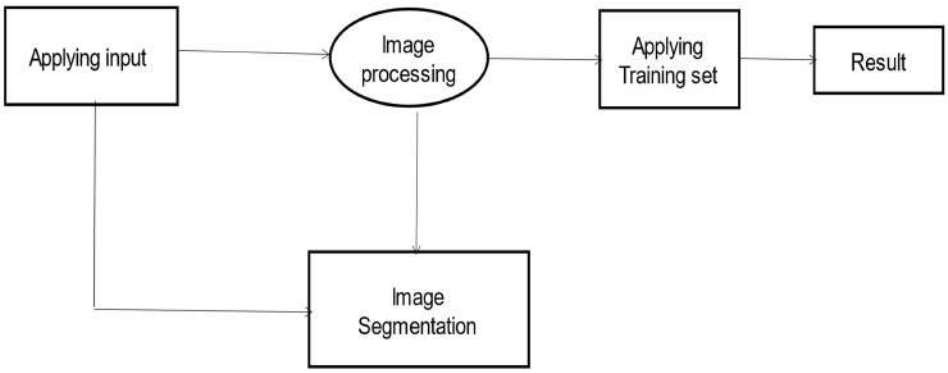
Fiona, Rex, and Anitha. 2019 Image Processing-Based Plant Disease Detection and Crop Analysis in Agriculture: A Survey. Description: Agriculture academics and practitioners are becoming interested in image processing. After its success in other industries, image processing has entered agriculture. This work examines image processing applications in agriculture, including crop analysis, plant disease detection, and identification.

Bakar, MN Abu et al. 2018 Multi-level color image thresholding for rice leaf blast disease identification. Description: Rice diseases have devastated agricultural productivity and profits. Early illness identification helps manage and mitigate attacks. Early disease identification may save pesticide usage, preserve output, and

boost economic development. This study introduces Rice Leaf Blast (RLB), an image processing-based leaf disease detection approach. It uses HSV color space for picture pre-processing, segmentation, and analysis. Image segmentation—the most important work in image processing—and Multi-Level Thresholding pattern recognition are used to extract the area of interest. Thus, RLB illness severity is divided into infection, spreading, and worst stages.

III. PROPOSED SYSTEM

BLOCK DIAGRAM



Proposed System Technique Used or Algorithm Used:

- Convolutional Neural Network (CNN)
- CNNs excel at capturing spatial relationships between pixels in an image
- CNNs can learn to detect these patterns and make accurate predictions based on the learned spatial representations.
- CNNs leverage the power of deep learning by employing multiple layers of convolutional and pooling operations. This enables them to learn hierarchical representations of features, capturing both low-level and high-level visual cues associated with fruit diseases.

Algorithm:

Step 1.A bulk of input dataset is given for training

Step 2.A set of Test Dataset is given to test the accuracy of the training model.

Step 3.Perform feature extraction using colour features.

Step 4.Perform feature-level fusion using colour and texture features.

Step 5.Apply Convolution neural network classifier on the segmented image.

Step 6.If the fruit is infected by any disease then go to step 7, otherwise, go to step

Step 7.Apply K-means clustering for image segmentation.

8.Print "Given fruit is Healthy".

9.Print the result with classified fruit disease.

10.Fetch the Proposed Remedy for the problem from the database.

IV. HARDWARE REQUIREMENTS

The hardware requirements play a crucial role in establishing a contractual agreement for the system implementation. As such, they should include a comprehensive and coherent definition of the whole system. System design often begins with the use of templates by software developers. The focus of the discussion should be on the functionality of the system rather than its implementation details.

- PROCESSOR : DUAL CORE 2 DUOS
- RAM : 4GB DD RAM
- HARD DISK : 250 GB

Software Requirements

The software requirements paper specifies the system. It should define and specify needs. It specifies what the system should perform, not how. Creating the software requirements specification starts with the requirements. It helps estimate cost, schedule team activities, complete tasks, and measure team progress throughout development.

- Operating System : Windows 7/8/10
- Platform : Spyder3
- Programming Language : Python
- Front End : Spyder3

V. SOFTWARE TESTING

GENERAL

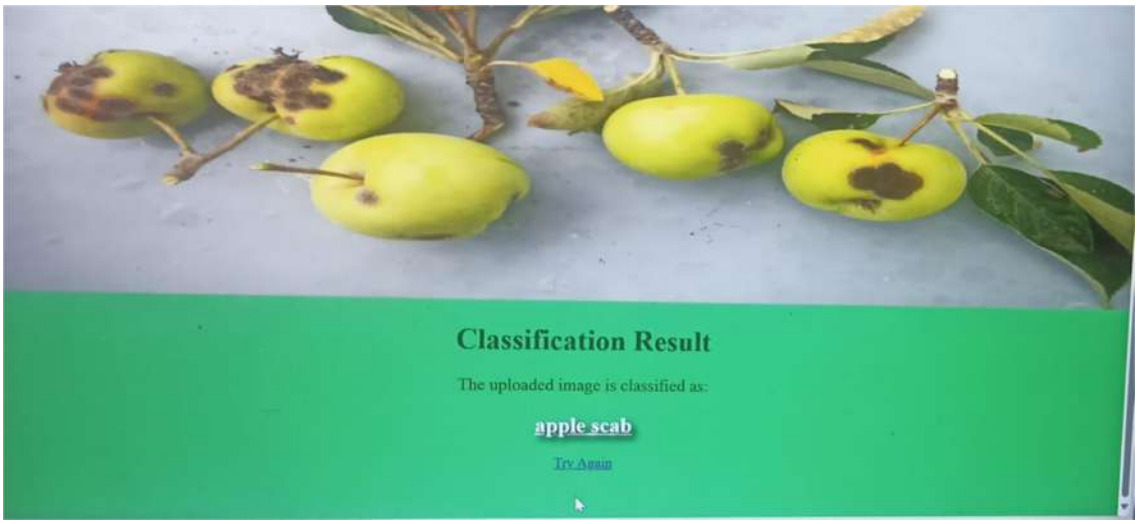
The primary objective of testing is to identify and uncover flaws or defects. Testing refers to the systematic procedure used to identify and uncover any potential flaws or vulnerabilities present within a given work output. This method offers a means to assess the operational effectiveness of various components, sub-assemblies, assemblies, and/or a final product. Software testing is the systematic practice of evaluating software to verify that it fulfills its specified criteria and satisfies the expectations of its users, while also guaranteeing that it does not exhibit any undesirable failures. There are several classifications of tests. Each sort of test is designed to fulfill a unique testing need.

VI. DEVELOPING METHODOLOGIES

The testing procedure starts with the formulation of a thorough strategy aimed at evaluating the overall functioning and distinctive attributes over a diverse range of platform combinations. Rigorous quality control protocols are used. The process of verification ensures that the application conforms to the specifications given in the system requirements document and is devoid of any bugs. The following factors were taken into account in formulating the framework for the development of testing procedures.

VII. RESULTS

This project involves the implementation of an application using the Python programming language. The server process is managed using the SOCKET and SERVERSOCKET modules, while the design aspect is handled via Cascading Style Sheets (CSS).



VIII. CONCLUSION

The grown plants should be free from diseases and pests to enable individuals to make significant contributions to the global economy and assist farmers and agriculturalists in leading prosperous and healthy lives. The aforementioned objectives may be effectively accomplished via the use of image processing techniques in conjunction with the suggested method. The use of Convolutional Neural Network (CNN) algorithms facilitates a streamlined approach for disease detection in fruits, enabling the classification of diseased fruits from healthy ones. This methodology utilizes several approaches and algorithms to effectively recognize and categorize fruits via the use of image processing techniques. The primary aim of our initiative is to enhance the efficacy of fruit disease detection.

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