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DISEASE DETECTION IN FRUITS USING IMAGE PROCESSING

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Abstract- In present days as there is restrictive interest the farming industry, successful development and enhanced production of fruit is fundamental and imperative. For this reason, agriculturists require manual observation of fruits. But all the time manual observing won't give satisfactory results and they generally require guidance from the master. So there is a requirement for proposing an effective cultivating method that helps for better production and advancement with very less human effort, Image processing strategies are utilized for the implementation of the proposed system. For image segmentation, a K-means clustering method is applied. Four feature vectors are used in the proposed system those are color, morphology, texture, and structure of the hole on the fruit. The system utilizes two image databases, one for the training of already stored disease images and one more for the implementation of query images.

Keywords: K-means clustering, Artificial Neural Network.

INTRODUCTION

Almost 60% of India's population relies on agriculture for their livelihood. Due to the continuously changing climate and diseases, the yield of crops has decreased. This is a major concern for the country as it is ranked second among the world's most populated nations. Due to the increasing consumption of food, the country's population will have to increase its food production. This will lead to a situation where the government will have to provide more food to the people. India is also a major producer of fruits and vegetables. Unfortunately, the classification of these fruits is not done manually in most parts of the country. This leads to numerous errors in the grading and classification of fruits while they are being exported. To avoid these issues, researchers have proposed using an image detection method for improving the quality of fruits being exported.

The Internet of Things (IoT) concept is a game changer when it comes to the monitoring and analysis of plant diseases. The use of IoT-enabled sensors, networks, and software to detect, monitor and analyze diseases in crops can dramatically reduce the amount of work and time required for this task. IoT technology can be used to collect data from plants, such as temperature, humidity, leaf wetness, and other environmental conditions, which can be used to detect diseases early and to formulate the appropriate treatments. Additionally, the data collected from the plants can be used to monitor the effects of treatments, so that changes can be made as necessary. With the help of IoT, farmers can track and analyze the diseases of their crops in real time, and this can lead to increased crop yields. IoT technology has the potential to revolutionize the way plant diseases are monitored and studied, making it a critical tool for successful cultivation.

The leaves exhibit symptoms before the stem or fruit does. The third-most exported agricultural fruit from Sri Lanka is the pineapple, which is in high demand on the international market. According to Hector Kobbekaduwa Agrarian Research and Training Institute's research, the demand for pineapple on the export market is still not being met. Although one of the main goals of this research is to maintain and improve fruit quality while maximizing the harvest, the suggested system might be implemented and reprogrammed to work with the majority of agricultural fields growing various kinds of crops. This paper's primary objectives are to utilize a network of sensors to keep an eye on the plant's many characteristics and the surrounding environment.

LITERATURE SURVEY

Md. Helal Sheikh et al. [1] In this paper they have taken the images of these obsolete Fruits leaves and implemented image processing algorithm and Deep learning methods on them. After the completion of this research, they have accomplished an accuracy of 92.56%. This Research is going to help the farmers to cultivate and promote These obsolete

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fruits more in a broad way by reducing Diseases. It is an eco-friendly system that detects diseases Without much effort only by clicking attacked images in the system and the system will give an output of Which disease the plant is attacked by.

Hardik Patel, Rashmin Prajapati, and Milin Patel [2] This study demonstrates an orange size and a framework for identifying and evaluating Bacteria Spot Defects that depends on the quality of the image preparation. New tools for estimating size, color, and texture are needed for early orange quality evaluation. After capturing the image of the orange from the side, various fruit characters are eliminated by using and identifying the calculations. These characters suggest that reviewing is understood. It will have a good chance of being used in areas for identifying and assessing orange fruit quality. Estimates for Orange Fruits are based on reliable, predictable, and quantifiable data that are kept apart from handling large numbers that can be difficult for human graders to handle.

N. Saranya et al. [3] A number of plant illnesses are spread from one plant to another by insects, which infect agricultural plants and leaves.

In the meanwhile, these contagious diseases can lower the farm's production yield. Therefore, early disease detection in the leaves and fruits is necessary. As a result, it becomes harder to detect infections in banana plants in the agricultural sector.

Vinay Kukreja, Poonam Dhiman [4] The quality evaluation of agricultural goods, which supports their marketability and regulates waste management, is one of the most important factors. Deep learning algorithms have been applied to perform citrus disease detection and classify the fruits into healthy and defective classes. This study seeks to identify and offer an efficient approach for identifying the apparent citrus fruit faults using the dense CNN algorithm. To identify and classify the picture dataset, citrus fruit photographs are gathered and divided into two categories: good and damaged ones.

R. Ramya, Dr. P. Kumar, K. Sivanandam and M. Babykala. [5] Early diagnosis of fruit diseases is essential since they have an impact on agriculture. available in the plant regions, with data about the agriculture sector and farmer information stored in databases and data recovery using cloud computing. There are additional fruit diseases that develop as a result of environmental factors, mineral content, farm area insects, and other causes. Image processing determines and records the discovered data from the plant area in a database.

Hardik Modi et al. [6] The aim of this article is to detect and identify the disease accurately from the image. The things needed in the process are image segmentation, pre-processing, feature extraction, and identification. The infection Considered is viral fungal, bacterial, or disease by insects and by climate. Here they are going to detect the disease in the Fruits. For identification of a particular disease they are going to use features of fruit such as their axis including the major axis, Minor axis etcetera extracted from fruit image, and by Classification techniques, they can identify the infection.

METHODOLOGY

There are five phases in this methodology. Those are Image Acquisition, Image Pre-processing, Image Segmentation, Applying training dataset, Experimental results.

Image Acquisition:
This is the first step, and during the first phase, sample photographs were gathered. These images were used to develop the classifier model and to train the classifier algorithm. A reddish fruit variety is chosen in order to collect sample photos. Using commonly used mobile phone cameras, healthy and diseased fruit photographs were collected, and those images served as the training set and test set for the classification algorithm. All of those pictures were taken from a variety of perspectives, in varied settings, and with diverse lighting setups. These photographs are saved and utilised in the widely used "JPG" format. Both the test set and the training set for this classifier approach were collected from agricultural fields in various regions.

Image pre-processing:
Following the process of acquiring the images, another activity known as image processing is performed to enhance the image's quality. There was a single shared folder that contained all of the original fruit photos. Any name we choose can be used to store these photographs. Another recommendation is to rotate some horizontally shot photographs 90 degrees and resize them to 200x300 pixels. The photos must also be adjusted to a size of 250x250 pixels if their height and width were the same when they were acquired. Only when the image size is large will processing be slightly delayed. An image restoration technique is used to minimise the distortion of the image once image scaling is finished, improving that

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image's clarity and reducing noise. All of these photographs are then saved in the same folder after this process is finished.

Image segmentation:
After image pre-processing, the third step in this illness identification process will be carried out. The first stage in this process is to convert all previously processed photos to the L*a*b, HSV, and Grey colour models before keeping them in RGB format. Since one of the suggested outcomes of this strategy is to identify the most appropriate colour modelled image for the pre-processing procedure. Following this procedure, an image conversion to binary format was carried out. The CNN method is used to cluster these formatting values. Using the algorithm employed, image segmentation was completed.

Morphological Image Processing:
Morphology is a technology used in image processing to distinguish or enhance visual information. for binary image analysis. In addition to grayscale images, we can also employ morphological operators like erosion and dilation for binary images. Operators used in morphology are not linear. It's got Filtering, edge identification, feature detection, item counting in images, picture segmentation, noise reduction, and locating an object's midline are all frequent applications. The field of mathematics makes a significant contribution to image processing through a variety of operations that are all based on a few straightforward set theory notions and, in the case of binary image logic operations, mathematical operations like "and", "or", "xor", and "not".

Feature Extraction:
We must first separate the characteristic from the entire image before we can fully comprehend its true meaning. According to many studies, the most crucial factor in identifying the fruit area is feel. Fruit shapes are determined via boundary-based segmentation. Fruit colours are a good choice for brightness and vibrancy. We chose the section that has components that are affected by the brown and black colours in the region where our case is different from theirs. We can distinguish between afflicted and unaffected fruit portions using edge detection.

Many different techniques, including Sobel, Canny, Prewitt, and Log, are used to detect edges. We apply the Sobel algorithm in this case.

Applying Training Set:
In the fourth phase, the algorithm is trained using a set of photos. Feature extraction was used to provide segmented output. Three sets of photos were taken for this experiment. It was necessary to prepare a few sets of photos, and that procedure is also shown here.

Experimental Results:
Three base folders were used to categorise the fruit diseases according to their names after applying the training set photos. An alternative method is described as counting the number of affected locations. To improve the model's accuracy during training and testing, rows of training files were randomly swapped. The average of these precisions was calculated. Three different disease categories were discovered using these databases. such as sooty blotches, powdery mildew, and bitter rot.

BLOCK DIAGRAM

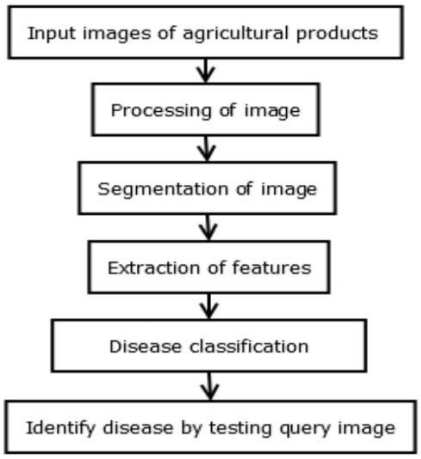

Figure: Block diagram.

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ALGORITHM

There are seven steps in the algorithm, and they are as follows:
Step 1: First, enter the photographs.
Step 2: The photos are arranged into an array.
Step 3: Set a value for each feature.
Step 4: Utilise picture pre-processing techniques after reading the image from the training directory.
Step 5: CNN feature extraction.
Step 6: Sort photographs into categories for healthy and damaged ones.
Step 7: Produce results for the proposed model and contrast Generate and compare the proposed model results with them with those of another dense CNN model that has been put into operation but has not made use of any data augmentation or pre-processing.

WORKING PRINCIPLE

The image of the fruits, which are used for giving input for detecting the diseases were taken from the image repository.
Step 1: At the first step of the proposed method, the image of the fruit is given as input (either fresh or diseased). The image which is given as the input will be displayed first.

Figure: Input image.

Step 2: Then the image of fruit which we take as an input image is segmented and resized by some function. After that using the function the contrast of image is enhanced and display as constant enhanced image.

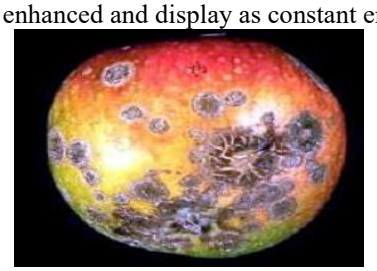

Figure: Contrast enhanced.

Step 3: After that k mean clustering is applied on enhanced image. K means cluster technique is used to divide the image in number of parts and after that we have to choose the appropriate part from that with the help of this technique we can detect exact part from whole image.

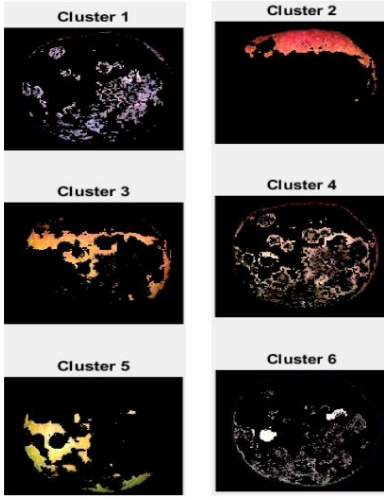

Figure: Clusters.

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Step 4: From the number of cluster we select the cluster which contain region of interest (ROI). ROI means area which contain disease. Next part is to convert the image in gray scale form RGB. And display as gray scale image.

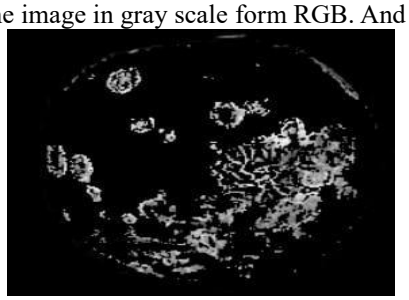

Figure: Grey scale image.

Step 5: After the conversion of RGB image into gray, image converted in black and white image and display as below.

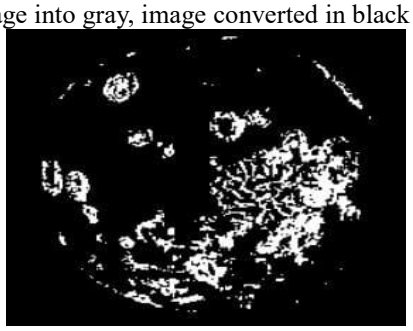

Figure: Black and white image.

Step 6**:** Below figure show us the detected part of diseases from black and white image.

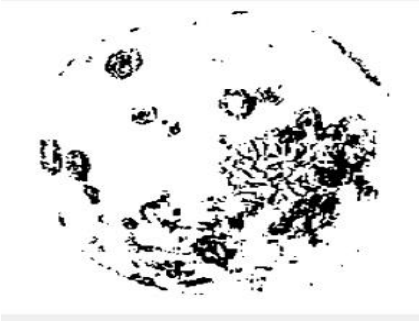

Figure: diseases extracted image.

Step 7: To study the image more comfortably we use different mask, first we apply gradient mask and after that Delighted gradient mask.

Here the next figure shown us binary gradient mask.

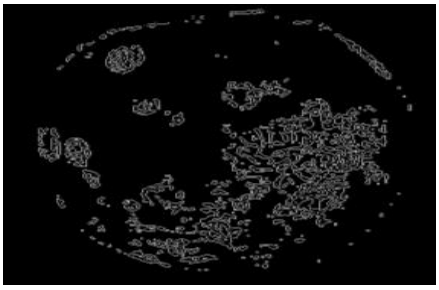

Figure: binary gradient mask.

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Step 8: Here the next figure shown us dilated gradient mask.

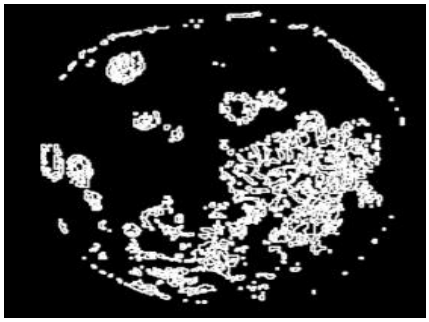

Figure: dilated gradient mask.

Step 9: After that we use morphological function first step is erosion which is followed by dilation and after that reverse dilation. The next figure shows us morphological opening performed on the diseases extracted image.

Figure: Morphological opening.

Step 10: The next figure shows us morphological closing performed on morphological opening image.

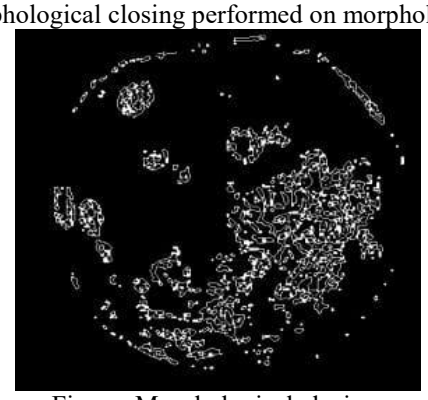

Figure: Morphological closing.

Step 11: Below figure show red and green lines in which green line show the boundary of region and red line show defected part of the fruit.

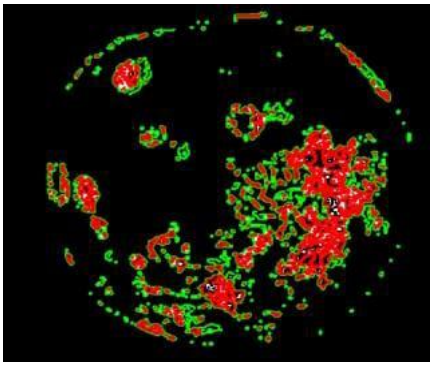

Figure: Diseases detected.

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CONCLUSION

The plants that are being grown should be free of disease and pests so that individuals can make a significant contribution to the global economy and enable farmers and agriculturalists to live healthy and prosperous lives. With the use of image processing and the suggested algorithm, these things can practically be accomplished. The use of CNN algorithms makes it simple to spot disease on fruits and assists in separating diseased fruit from good fruit. This strategy may quickly detect and categorise the fruits using image processing techniques based on these approaches and algorithms. Our project's main goal is to increase the value of fruit disease diagnosis.

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