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Detection and Classification of Fruit Diseases Using Image Processing

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ABSTRACT:

Fruit disease detection is crucial at early stage as it would harm the agricultural land. In this paper, primarily examine the detection and analysis of fruit infections which is available in the plant regions and storage of data about the agricultural sector and details of farmers in database and retrieving the data using Cloud computing. Insects, environmental circumstances, mineral levels, and other elements in the agricultural environment all have a role in the area of various fruit diseases. The detected data from the plant area is determined by image processing and stored in the database.

Keywords image processing; segmentation; feature analysis; K-Means; neural network; MATLAB; SVM.

I. INTRODUCTION

Agriculture has been the basis for every people. More than 70% of Indians rely on agriculture for their primary source of income, making this issue critical. Nowadays the development of production of plants, crops and fruits are generally affected by the diseases. An agricultural land plagued by the disease is a serious issue. Bacteria and viruses cause disease in the majority of plants' leaves and fruits. For the detection of plant infection on the leaves, fruits or the stem, a technique similar to this is used. In order to develop an automated database for the suggested way of investigating infections. The information in the database pertains to plant leaves, fruit conditions, and disease signs that may be present.

The fruit details and the detection of disease from the feature extraction are stored in the database. The complete database is inspected and the recorded image is compared to it. The smartphone app was created to aid in the processing of the data and to communicate updates to the farmers. In this way, the database's image variation also reveals disease in the fruits.

II. LITERATURE REVIEW

Plant Disease Detection Using Leaf Pattern: A Review(2015).

Author :Vishnu S, A. Ranjith Ram.

In this paper, they discuss a various methodologies for plant disease detection. Studies show that relying on the pure naked-eye observation of experts to detect and classify the diseases can be time consuming and expensive, especially in the rural areas and developing countries. So they present fast, automatic, cheap and the accurate image processing based solution.

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Solution is composed of the four main phases; in the first phase we create a color transformation structure for the RGB leaf image and then, they apply an colour space transformation for the colour transformation structure. Next, in the second phase, the images are segmented using a K-means clustering technique. In third phase, they calculate an texture features for the segmented infected objects. Finally, in the fourth phase the extracted features are passed through the pre-trained neural network.

Detection of Diseases on Cotton Leaves Using K Mean ClusteringMethod(2015).

Pawan P. Warne, Dr. S. R. Ganorkar .

In this paper,presents an approach for the careful detection of diseases, diagnosis and the timely handling to prevent crops from the heavy losses. The diseases on the cotton are critical issue which makes the sharp decrease in production of cotton. So for the study of interest is the leaf rather than the whole cotton plant because about 8595 of the diseases occurred on the cotton leaves like Alternaria, Cercospora and Red Leaf Spot. In this proposal initially a pre-processing the input image using the histogram equalization is applied to increase the contrast in the low contrast image, K means clustering algorithm is used for an segmentation which classifies objects based on a set of features into K number of classes and finally classification is performed using Neural network.Thusimage processing technique is used for detecting diseases on cotton leaves early and accurately. It is used to analyze the cotton diseases which will be useful to the farmers.

Combining Local and Global Image Features for Object ClassRecognition(2016).

Author :Dimitri A. Lisin, Marwan A. Mattar, Matthe w B.Blaschko.

In this paper, the Object recognition is an central problem in the computer vision research. Most object recognition Systems have taken one of the two approaches, using either global or Local features exclusively. This may be in part due to the difficulty of combining an single global feature vector with a set of local features in a suitable manner. In this paper , they show that combining local and the global features is beneficial in an application where rough segmentations of objects are available . They present a method for the classification with the local features using a non-parametric Density estimation. Subsequently, they present the Two methods For combining the Local and Global features. They first used a “stacking” ensemble technique, and the Second uses an hierarchical classification system. Results show the superior performance of these combined methods over an component classifiers, with the reduction of over 20 in an error rate on the challenging marine science application.

A Study and Implementation of Active Contour Model For Feature Extraction: With Diseased Cotton Leaf as Example(2016).

P.R.Rothe A and R. V. Kshirsagar A.

In this paper, the Feature extraction is an significant constituent of the pattern recognition system. It carries out the two assignments: converting input parameter vector into the feature vector and or reducing its dimensionality. The distinct feature extraction algorithm makes a classification process more effectual and efficient. The allocation and recognition of the

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cotton leaf diseases are of the major importance as they have a cogent and the momentous impact on the quality and production of the cotton . In this work, they present the snake based approach for the segmentation of images of the diseased cotton leaves. They extract Hu's moments which can be used as the shape descriptors for the classification. A theory of the two-dimensional moment invariants for the planar geometric figures is also presented. Three diseases have been considered, namely the Bacterial Blight,

Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques(2017).

:P.Revathi, M.Hemalatha.

In this Paper, an advance computing technology that has been developed to help the farmer to take the superior decision about many aspects of the crop development process. Suitable evaluation and an diagnosis of the crop disease in the field is very critical for the increased production. Foliar is a major important fungal disease of the cotton and occurs in all the growing Indian regions. In this work ,they express the new technological strategies using the mobile captured symptoms of the cotton leaf spot images and categorize the diseases using the HPCCDD Proposed Algorithm . The classifier is being trained to achieve an intelligent farming, including early Identification of a diseases in the groves, selective fungicide application, etc. This proposed work is based on the Image RGB feature ranging techniques used to identify the diseases (using Ranging values) in which, the captured images are processed for the enhancement first. Then color image segmentation is carried out to get the target regions (disease spots). Next Homogenize techniques like the Sobel and the Canny filter are used to Identify the edges ,these extracted edge features are used in the classification to identify the disease spots. Finally, the pest recommendation is given to the farmers to ensure that their crop and reduce the yeild loss.

III. BLOCK DIAGRAM

By use of a MATLAB simulation, the presence of an infection in fruit is identified, and the associated disease name and details are entered into a data.

An illustration of the whole system architecture for infection detection is provided in Fig.3.1

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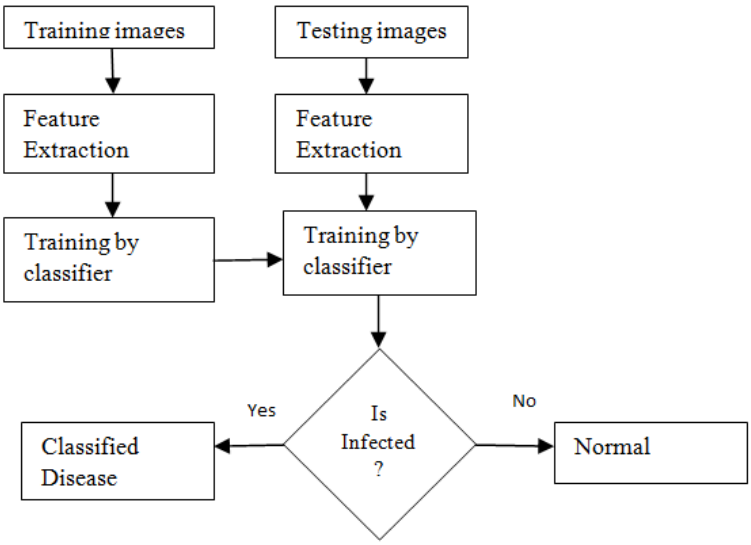
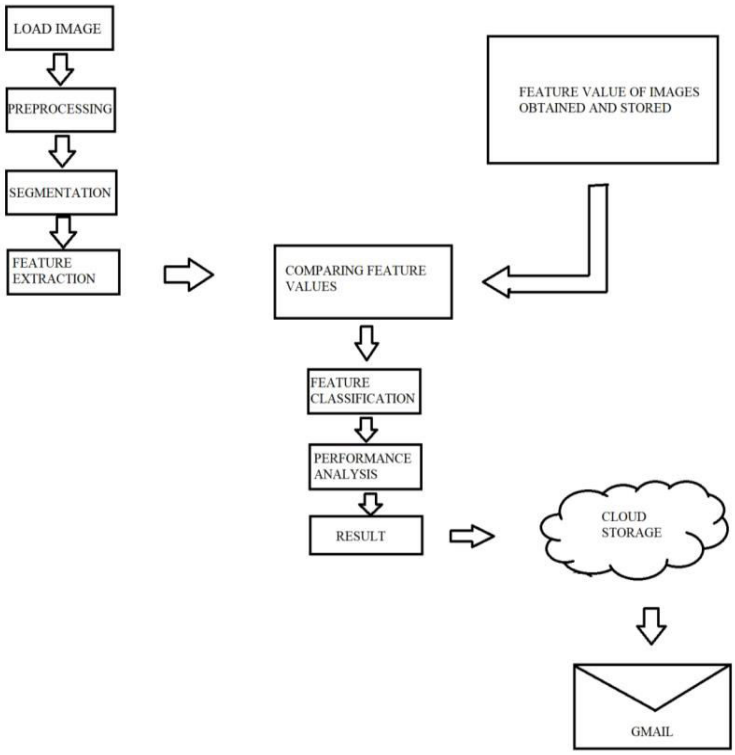


Figure 3.1: System Design for Detection of Disease

To begin, the images are fed into a neural network and trained there. The features are extracted and trained using classifier.

The images are stored in a database once they've been used for training. The test images are sent to the classifier and the images are tested and compared with trained images. If it is affected by disease it provides the categorised disease in that fruit image.

IV. INFECTION DETECTION



Initially if the fruit is identified by the disease or not using MATLAB programme in various processes which displays in the block diagram as fig 4.1.

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A. Image Processing

Image processing is one of the methods used to process the natural image into digital image and also to execute several operations like segmentation, feature extraction, etc., in order to gain the information about the image. The system receives an image of plant parts as input and returns a clustered image representing the features extracted from the images.

B.Image Acquisition

Image acquisition is the process of acquiring the image from hardware source or by collecting the database accessible about the plant diseases. In this case, the image is obtained either directly from the camera or via a database of standard images.

C.Preprocessing

Noise reduction, edge detection, and shape refining are all part of this process for improving the input image's quality.

Segmentation, D.

Image segmentation is a technique for dividing an image into smaller, more manageable chunks. It is performed to ease the classification and analysis of features in the images. The border, area, edge and other features of the image are identified in the image.

E.Feature Extraction

Feature extraction is the enhancing of images for portraying interesting elements of the image. The features such as spots, colour, shape, area and other features are examined in the input images.

Here, we propose to employ colour features such as mean and standard deviation to distinguish between diseases. Color is a key attribute.

Furthermore, each disease may have various shape.

Texture features such as Kurtosis, skewness, cluster prominence, and cluster shadow. It is usually performed to decrease the complexity in processing the image.

The feature differences in the fruit images indicate infection, and the disease is identified based on the threshold value of the disease.

F. Classification

K-Mean, Neural Network, and SVM classification algorithms are used to examine and classify the images, as well as the numerical characteristics of numerous features. Use Support vector machine for the classification. SVM is supervised learning method. It classifies the training data based on the classes supplied as training class labels. Feature classification from extracted image features is the focus of this technique.

V. RESULTS AND DISCUSSION

The sample for the processing is provided by the images of infected and healthy fruits.

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As a starting input, the system is provided a natural image of fruit. The image is engaged in pre-processing, segmentation and the features are identified from the image. The disease detection is performed out if the feature value of the test image differs from the original image. The values of number of samples, True & False Positives, True & False negatives, Accuracy and Specification are analysed and displayed as output along with specific disease name.

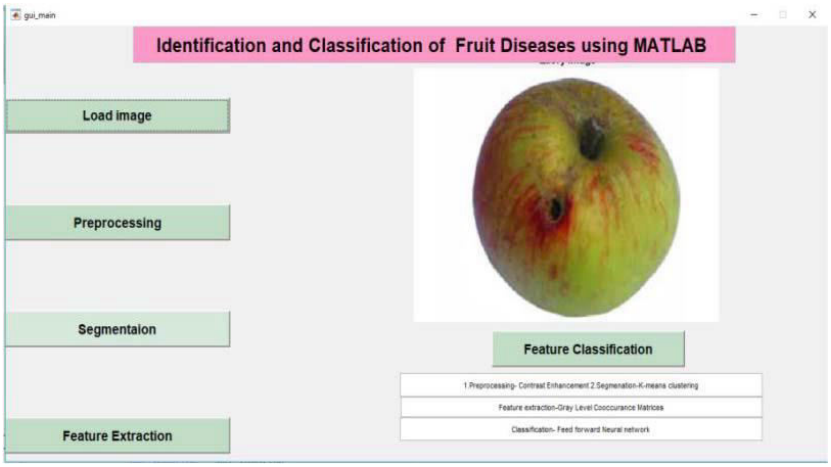

Figure 5.1: Page for image processing

Figure5.1 depicts the loading of the source image and the pre-processing that takes place after that. The contrast of the image is improved and the segmentation of the fruit image is performed.

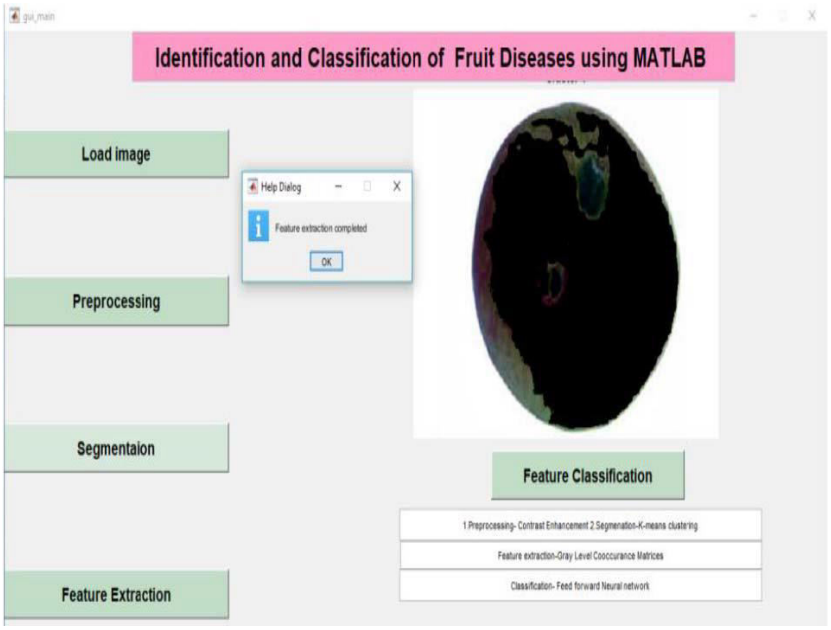

Figure 5.2. Process of doing feature Extraction

The feature values are extracted and compared with the values extracted and the disease is identified as shown in Figure 5.2.

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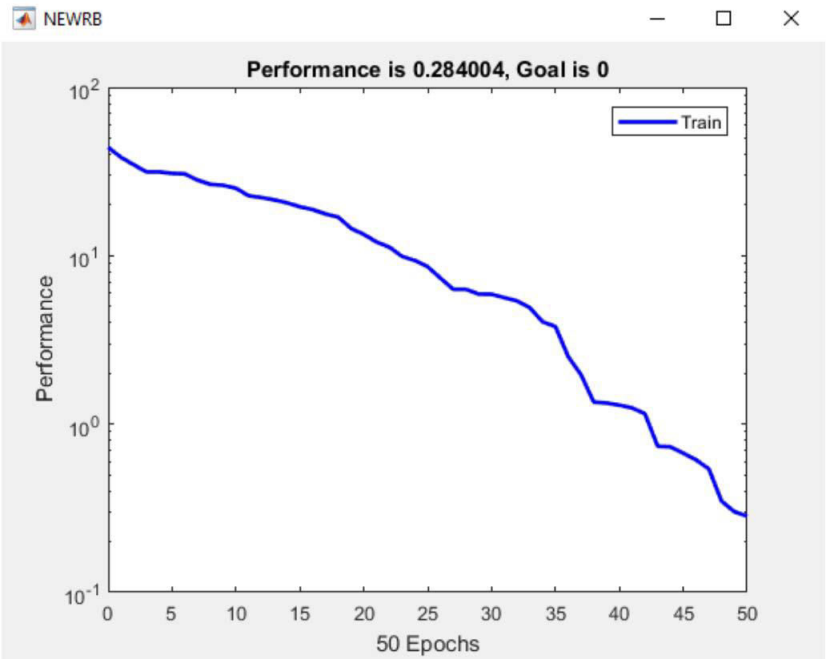

Figure 5.3 Performance Analysis

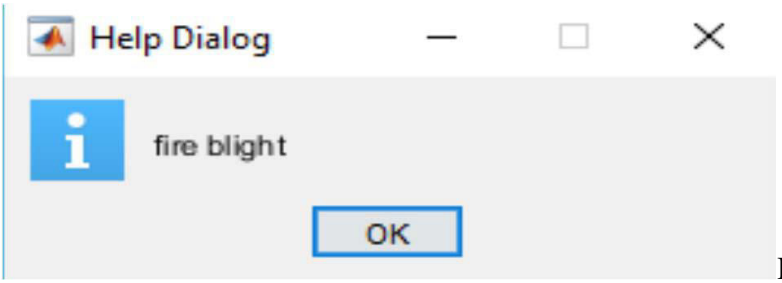

Figure 5.4 Disease identification

The performance of features extracted is analysed and the precise disease name is displayed as the output dialog box as illustrated in Figure 5.3 and 5.4.

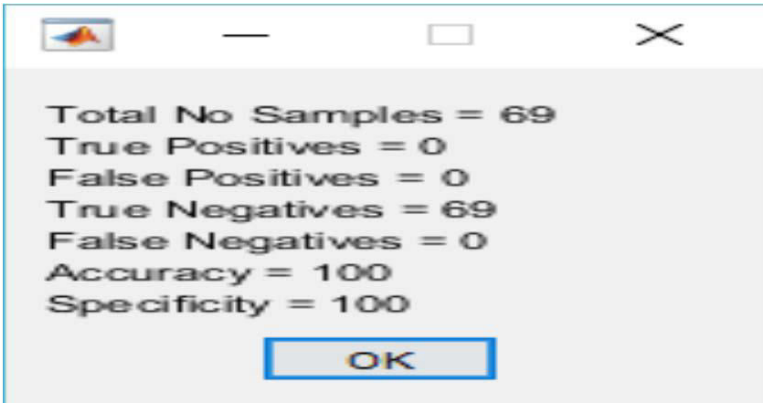

Figure 5.5. Accuracy Specification

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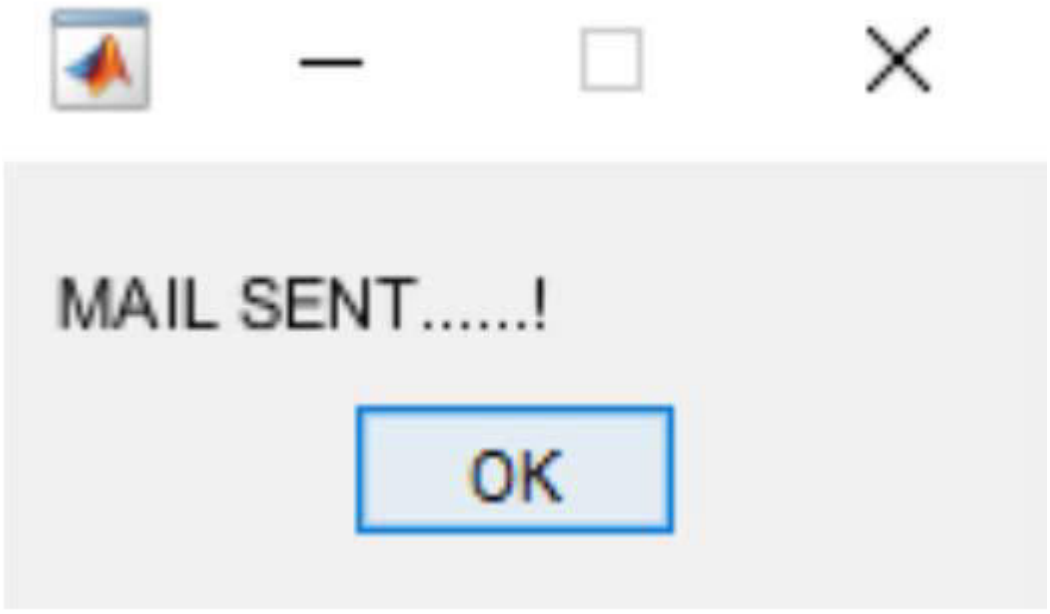
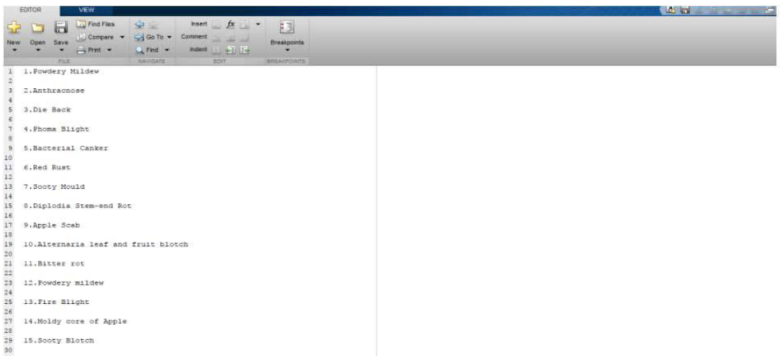


FIGURE 5.6: Message Indication

The accuracy and Specification of disease identification is analysed from the samples provided.

The mail output of the disease name and the Control measures to avoid the infection is provided.



A Sample of Fruit Diseases (Fig. 5.7)

A fruit disease sample, as illustrated in Figure 5.7, was used to determine the source of the infection and to devise a treatment plan.

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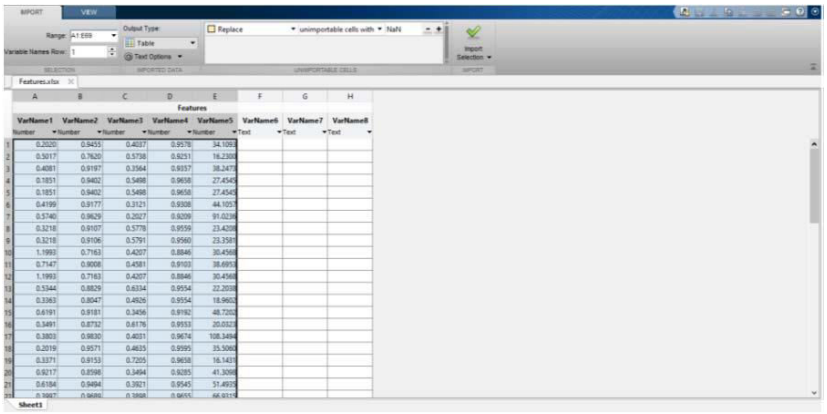

Figure 5.8. Feature Values of Sample Images

Pictured in Figure 5.8 is a list of possible diseases and the steps that may be taken to prevent their spread.

Figure 5.9: Output from an Email

Disease CONTROL MEASURES DATABASE FOR FRUIT

The sample fruit images for testing and evaluating the infection in the fruit are presented in the table 5.1 with its control measures

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Table 5.1: Various example images of disease name with its control measures

SAMPLE IMAGE DISEASE NAME CONTROL MEASURES

Powdery Mildew

Alternate spraying of Wettablesulphur 0.2 percent(2g ulfex/litre), Tridemorph 0.1 per cent (1 ml Calixin/litre) and Bavistin @ 0.1 percent at 15 days interval are recommended for total control of the disease

Anthracnose

During blooming, spraying twice with Carbendazirn (Bavistin 0.1 percent) at 15-day intervals reduces the risk of bloom infection. Spraying of copper fungicides (0.3 percent)is recommended for the control of foliar infection.

Postharvest disease of mango induced by anthracnose might be controlled by dip treatment of fruits with Carbendazim (0.1 percent) in hot water at 520C for 15 minutes.

Black Mold Spraying Wettasulf (0.2 percent) + Metacid (0.1 percent) + gum acacia (0.3 percent) after the affected branches have been pruned and promptly destroyed helps control the disease.

VI CONCLUSION

The creation of cloud based plan for helping Indian farmers and agricultural, helps toanalyze the agriculture data in a better manner to minimisethe hoardings and in putting up a wealthy safeand India's tranquil agricultural society. Theclassification and segmentation of fruit pictures wereUsed K-Means Algorithm and Support Vector Machinestechnique. The varied properties of several fruits werefirst extracted and segment the related photos.Feature values were used to compare each of theseA database of illness names is searched for the best match.for the picture is detected and the ailment is indicatedThis may be shown as a message in an alert boxthe use of a smartphone app. The total number ofsamples presented, the genuine and false places, thetrue and false negatives, as well as accuracy and relevance,An warning box also indicates the specificity. to bootcomplete database of fruit illnesses and the controlPrevention strategies are kept in a safe place.cloud database and the data may be obtained via theapplication.

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