SMART FARMING TO DIAGNOSIS DISEASE IN PEAR USING MACHINE LEARNING

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Abstract

Effective plant growth and yield enhancement are critical given the rising demand in the farming sector. Uneven climatic conditions are having an impact on crops, which reduces agricultural productivity. The world agriculture economy is impacted by this. Furthermore, when crops contract a disease, the situation gets even worse. Also, a growing population puts pressure on farmers to boost production. In order to detect and prevent this, sophisticated agricultural techniques and systems are required to keeping certain diseases from infecting the crops. that work, we provides the website based app that useful for people to upload pictures of the damaged fruit, assisting them in identifying fruit illnesses. A trained dataset of image data for the pear fruit already exists for the system. The input photo from the user must go through a number of processing steps before it can be compared to pictures from the trained dataset to determine how severe the sickness is. The input photo from the user must go through a number of processing steps before it can be compared to pictures from the trained dataset to determine how severe the sickness is. Once the image has been shrunk in size, the features are next grouped using the k-means technique are extracted based on factors like colour, shape, and CCV. The picture is subsequently examined for infection using SVM. A highly beneficial intent search approach is offered to help in determining user intentions even more. We discovered that by applying shape, among the three recovered features, we had the best results. In 82% of the python programming language experimental trials, the suggested technique correctly and reliably acknowledged pear sickness.

Keywords:colour, shape, hue coherence vector; SVM; k-means algorithm; intent search; Genetic algorithm

1.Introduction :

Typically, fruit diseases have visible symptoms that farmers may see. A lab diagnostic test or an expert diagnosis of the condition are also options. The majority of the approaches now used in India for fruit disease detection systems include a domain expert just observing with their own eyes. Professional specialists, price significant consultation fees, and getting their assistance at a remote place on time is extremely difficult. Thus, an automated approach for spotting fruit diseases in their earliest stages is necessary.To find diseases, we have chosen pears as the fruit. These days, Fire rot is primarily affecting this fruit: This bacterial disease can affect various parts of the pear tree, including the fruit. It can cause the fruit to turn black and shrivel up. Pear scab: On the fruit, this fungus-related illness results in black scabby sores. Moreover, the trees twigs and leaves may be impacted. Plum rust: This fungal disease can cause yellow-orange spots on the leaves and fruit of the pear tree. Brown rot: Fruit that contracts this fungus rots and develops a fuzzy dark mould on it. On the fruit, this fungus disease causes black spots to develop, which can cause it to rot and become unusable. Pear Psylla: This insect pest can damage the fruit by causing it to become distorted and stunted. It can also cause premature fruit drop.

Fig 1: pear fruit brown rot disease

Fig: 2 pear fruit black spot disease

Pears are widely cultivated and grown in many parts of the world, but some of the top pear-producing countries include China, the United States, Italy, Argentina, and Turkey. In the United States, the top pear-producing states are Washington, California, and Oregon, while in Europe, Italy is the leading producer of pears. China is the largest producer of pears in the world, with the country accounting for over half of the world's total pear production. The ideal conditions for pear trees include a temperate climate with well-drained soil, moderate rainfall, and plenty of sunlight. However, different varieties of pears have different requirements, so the best location for pear cultivation may depend on the specific type of pear being grown. Overall pears can be grown successfully in a wide range of regions and climates, provided that the trees are properly cared for and managed. While pears are grown in a India, the states of Jammu and Kashmir, Himachal Pradesh, and Uttarakhand produce the majority of pears fruit. These regions supply a temperate the atmosphere that is suitable for cultivating pears. These states mountains provide the requisite frigid climate and well-drained soils for growing pears.In Jammu & Kashmir, pear cultivation is concentrated in the districts of Anantnag, Pulwama, Budgam, Baramulla, and Srinagar. In Himachal Pradesh, pear cultivation is mostly concentrated in the districts of Shimla, Kullu, and Kinnaur. In Uttarakhand, pears are grown in the districts of Dehradun, Nainital, and Pauri Garhwal.There are several varieties of pears grown in India, including Beurre Bosc, Conference, D.Anjou,and Williams Bon Chretien. Pears from India are mostly consumed within the country, but they are also exported to countries in the Middle East, Southeast Asia, and Europe Discovering pear fruit disease is the purpose of this essay. To determine if a piece of fruit is contaminated or not, this system uses an image of the fruit as input. The intent search technique suggests pertinent photos to database queries, assisting farmers in accurately diagnosing disease.

2.Related Work

An photo processing-based method for fruit disease diagnosis was presented byauthor Monica Jhuria[1]. Fruit disease detection is the aim of research activity. Mangoes, apples, and grapes have been chosen as the experimental subjects. The feature extraction process uses feature vectors for morphology, colour, and texture. Compared to other feature vectors, the morphology feature provides 90% reliable results. Image processing methods are employed for fruit weight calculation and illness diagnosis. For weight adjustments on images kept in learning databases, back propagation is used. The grading of fruit has been determined based on the spread of disease.An photo Analysis-based method for the detect and diagnosis of pear disease was proposed by author Shiv Ram Dubey[2]. For the experiments, an apple was chosen as the fruit, and the illnesses apple rot and apple blotch were taken into consideration. Cluster algorithm is used to segment images. color coherence, Histogram, and Local BinaryFor extracting the features, entire local binary patterns are used. Multiclass support vector machine is used to identify fruit diseases. Inspiring by [1] [3] [5] [10] and others, we provide methods for identifying diseases that affect the crops stem, leaves, and fruits as well as treatments for them. We suggest and experimentally test a software system for the automatic identification and classification of plant leaf diseases and fruits.Multilingual web-based tool was suggested by author Ilaria Pertot [3]. The online tool for identifying plant diseases. A case study is the strawberry fruit. The farmer will monitor symptoms on the farm, and these symptoms will be compared to the systems provided photographs. Fruit disease will be identified as a result. There are users and super users in the web-based system. The super user has the power to add, change, and remove illnesses and images.Using the k-means clustering technique, the genetic algorithm, and the python programming language to identify sickness in the image

3.Structure of the System

The user necessities, which are present serve as the foundation for the system architecture. When a user accesses a web-based system from their workplace such as laboratory, or farm (when in proximity to problematic pear), the system is provided with information in the shape of a photo of a diseased fruit. Permission to the computer was allowed to "applicant" and "Super applicant." Users may use the system to find ailments

4.Disease diagnosis work

The framework of the suggested system of the purpose of fruit disease identification, two picture databases are required, one for training and the other for testing. The acquisition of the input picture occurs first in the training phase, followed by the resizing of the picture using photo pre-analysis. Following that, feature extraction is done. The K-means grouping algorithm is then used for grouping, and SVM is used for classification at the end. In the testing phase, the user will supply the input images, which will then undergoes pre-processing, feature extraction, and classification as either affected or not with an illness

4.1 photo initial-processing

Image pre-processing occurs after getting the input photo dataset. The initial processing of images includes picture scaling. The photos are quite big because they were taken using a digital camera. All images have been downsized to 300*300 inches because processing time for larger images may be longer.

4.2 Extraction of Characteristics

We used colour, shape, and CCV vectors of characteristics for extraction of features in the proposed method. These gathered features have been employed in the grouping process.

4.3 Colour

A colour is a common visual element that is most used to identify and to compare the photographs .A hue contour shows distribute of hues in a photo. When calculating the pixel size of various hues to a picture, a large hue space is broken down into a number of little intervals. A discrete time period is given by using the word bin. The number of particles in each of the bins is subsequently determined to generate the images hue histogram. We generated a hue histogram for each image in the dataset and saved it in the database so as for comparison the query image with the photos in the dataset. Typically, sum of squared differences is used to compare the colour histograms of two photographs. For RGB colour space, a three bin histogram is constructed here.

4.4 shape

The study of morph is an approach for dissecting parts of sight. These image elements can be used to extract boundaries, define areas, and show their shapes. Thus, the outer edges of the visuals are set via the idea of erosion, a fundamental morphological action. we get the image border. We can differentiate the disease generating vector from healthy pear by its shape.

5.Proposed System Framework

5.1Vector of Hue Coherence

The CCV is a histogram-based photo comparison tool which includes geographic data. The method used classify each pixel as either coherent or incoherent inside a certain colour bucket. Each individual pixel is classified basedon the fact that it is an integral component of a significant region of pixels with a similar hue. Coherent pixels are a part of an enormous uninterrupted region, in contrast to incoherent pixels which do not belong to any major region. CCV is obtained by distorting the first image. The image is then discretized to guarantee that there are only n different hues in it. It is utilized as a constant in this example, and its value is assumed to be 1% of the image. Every device that is connected with a pixel resolution greater than or equal to coherent pixel. The training dataset is divided into parts according to its attributes using the K-means grouping algorithm. K-means grouping method performs more effectively when dealing with larger datasets. Dataset (an image of a pear fruit), K desired clusters .K-sets are employed to construct groupings.

1. Start the cluster count and decide at random the initial centroid.
2. Each object is assigned to the cluster that is nearest to it. which is based on the squared average distance between each image and each cluster.
3. Each seed value has been modified to the centroid for that cluster after calculating the new centre for each cluster.
4. The picture is assigned a grouping with the closest distance among an object and each cluster after calculating the distance measured by Euclid between each cluster. This process will continue up until every iteration of the image are located in the same cluster. The clusters produced by the use of the K-means grouping method are displayed in Fig:1

Fig:3 CLUSTERS FOR PERA FRUIT

5.2Educating and Classifying:

The neural network (SVM) technique is used for both detection and training. To locate the horizontal divergent super axis that enhances reserve and can be applied to sorting, support vector computers can be used. Nonlinear data into higher dimensions is employed in SVM. Based on a dimension boundary, tuples are separated into an array of groups. Support vector machines are highly precise, despite the extended training period they demand. Groups will be split into two distinct categories after SVM analysis, with labels that indicated isease-infected photos and non-affected pictures. Fruit photos with a bacterial disease belong in the class of contaminated pictures, but fruit photos absent blight are featured in the group of non-affected pictures.

5.3Intent Search:

While looking for a fruits ailment, the intent search technique aids in determining the users intentions. The user has the opportunity to choose this method. The user will have this choice when uploading an image for illness detection.When a visual identification or text-based enquiry is unclear, this option will be very helpful. When the user chooses this option, theuser will see recommendations of photos from the database that closely match the query images.The user will choose a photo by visually juxtaposing with the picture of his fruit condition. After that, the selected picture will be used as the requested picture for additional processing. As a result, this approach contributes to a significantly higher precision of the detection results.

Src image as input

Results: A selection of the most important images

Step1:computehistogram(src picture, r, g, b);

Step2:Enter the value that represents the dist vect.

Step3: For every di in the data set image, calculate r, g, and b. contourHistres d = computeHist(di,R) and Histgs D = computeHist.(di,G).(di,B), The final formula is Differ vector[Di] = computeEuclidianDistance(histres,histres D) + computeEuclidianDistance(histgs,histgs D) + computeEuclidianDistance.(histB,histB D)

Step4:From lowest to highest, sort the dist vector (i=1..... ......n).

Step5:Pick the source image from the k-nearest instances.

Step6: Show the k means instances.

Step7:stop

Empirical Results and Notes Building

The information collection:

With an assistance of a domain expert, we produced a collection of pear photos to illustrate the suggested approach (professor from agricultural college). ten mega pixel digital camera is used to take pictures with various cameras.

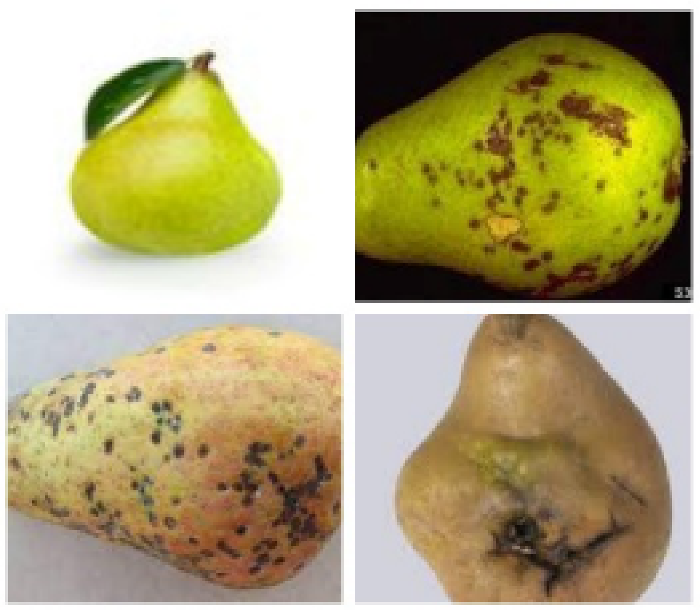


FIG:4

Examples of information collections picture (A) Non-affected (B) First infection phase(C) Second infection phase(D) Third infection phase

290 photos of pear fruits,270 of which are diseased and (20) of which are healthy are included in the data collection. Frist infection(60), second infection(90), and third infection(120)are three subcategories under the infected category. When a fruit is infected at stage 1, the illness is still at an early stage and only affects the

fruits surface, leaving behind tiny dot-like formations. The fruit surface spots on the infected stage-II fruit get darker, larger, and have a small crack inside. The fruit splits almost fully in half at stage III infection because the surface of the fruit becomes even more black and the fissures get so big.

Result Discussion:

Table 1:Table1 shows the accuracy for identifying diseases for various disease phases. we discovered lower accuracy for altered phase-I because at this time, tiny dots or spots establish on fruit, making identification by machine learning approaches problematic. Tables 1 and Table 2 illustrate the level of illness detection precision achieved using hue, shape, and CCV feature vectors.

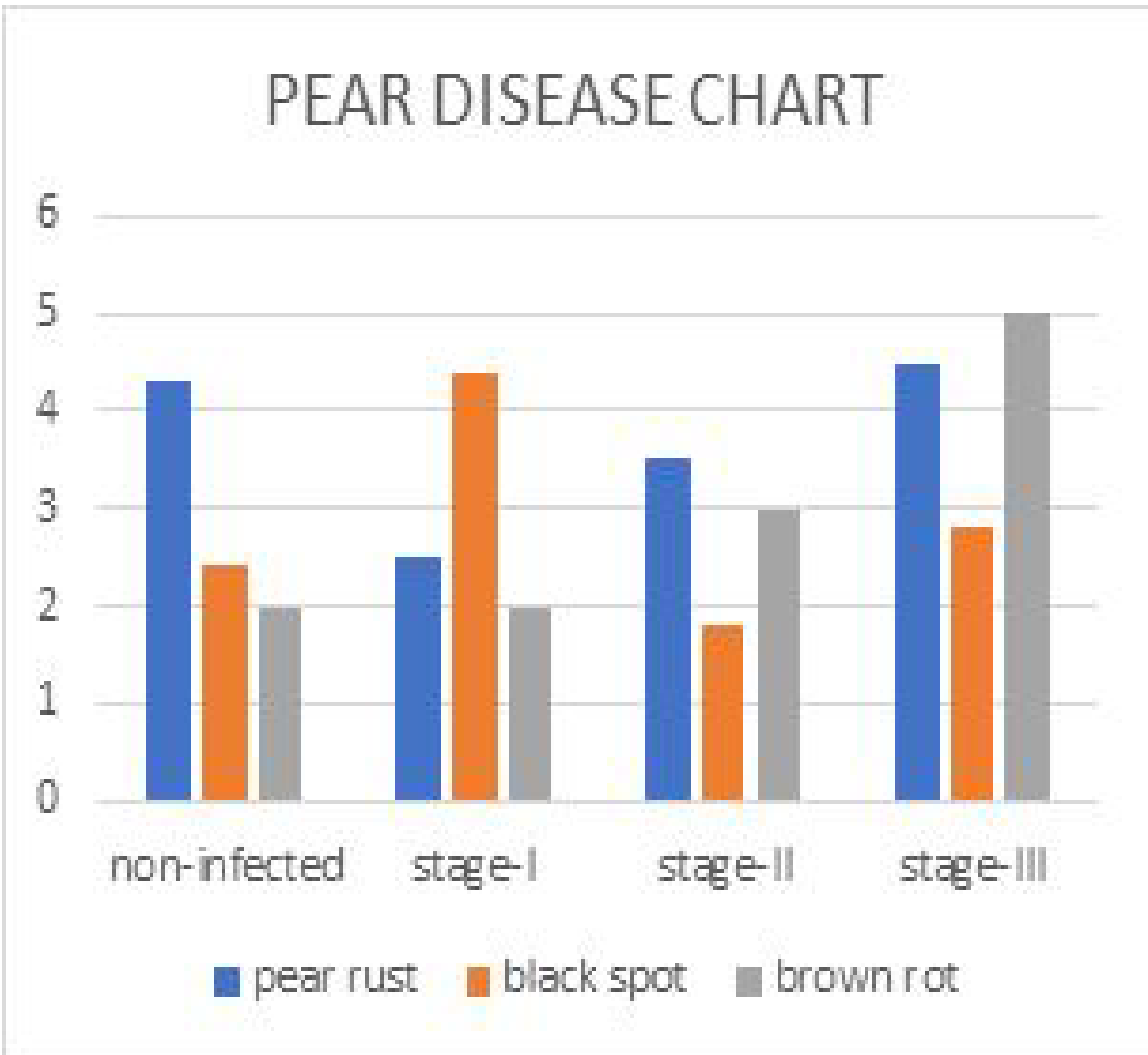
Table 1 shows the accuracy of disease detection at various disease phases.

choose a category for your images.	number of photos	Percentage of Diseases Found
Non-infected	20	89%
phase-I	60	67%
phase-II	90	78%
phase-III	120	88%

All photos are digitally taken for training purposes. None of the for testing purposes, we have taken into account both digital camera and mobile device camera photos. We can took into account mobile device cameras because farmers also use them to take pictures based on their need.

Table 2. Detection of diseases Accuracy of photos taken using various cameras

input picture taken by the apparatus	number of photos	Percentage of Diseases Found
Digitized Camera (10 mega pixel)	90	82%
Smartphone (5 megapixel)	50	80%
Tablet (3 megapixel)	100	75%
High phone(5 mega pixel)	50	85%



BAR CHART FOR PEAR DISEASE

FRUIT DISEAESE INPUT IMAGES AND GRAPHICAL OUTPUT IMAGES

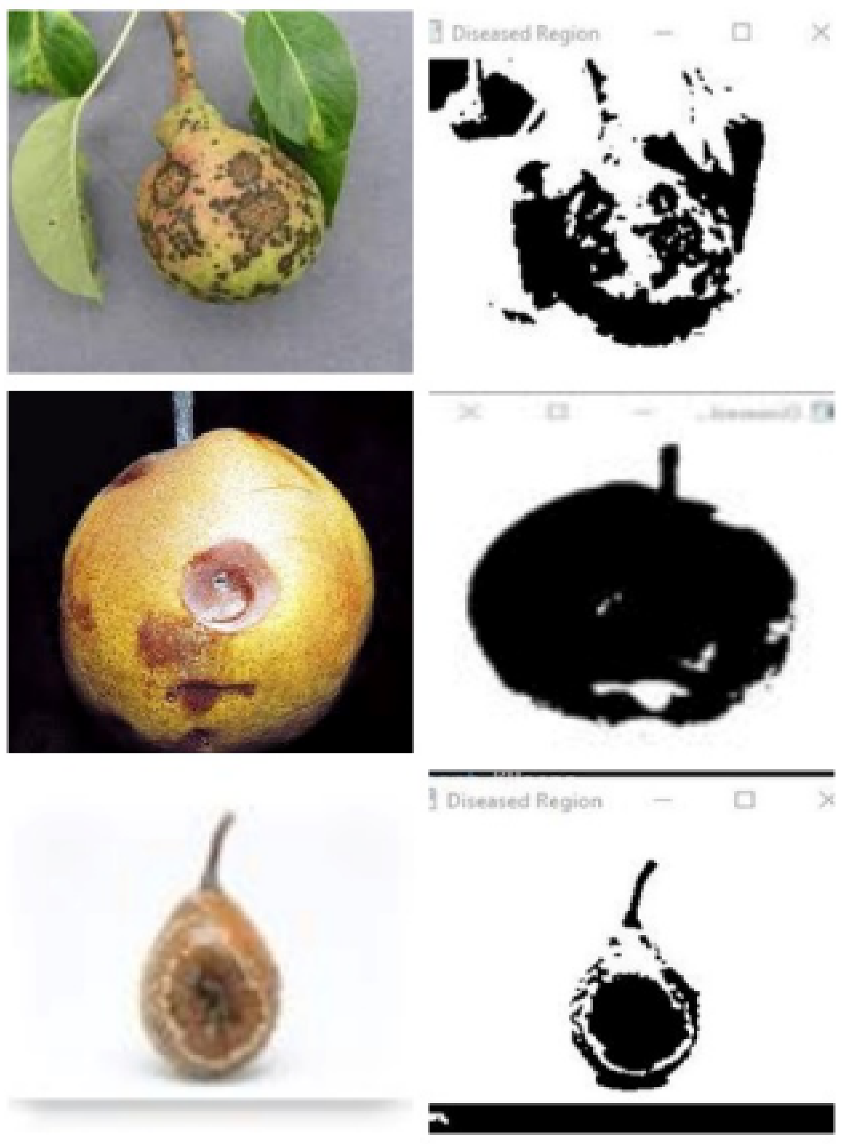


FIG:5

FRUIT DISEAESE INPUT IMAGES AND TXET OUTPUT IMAGES

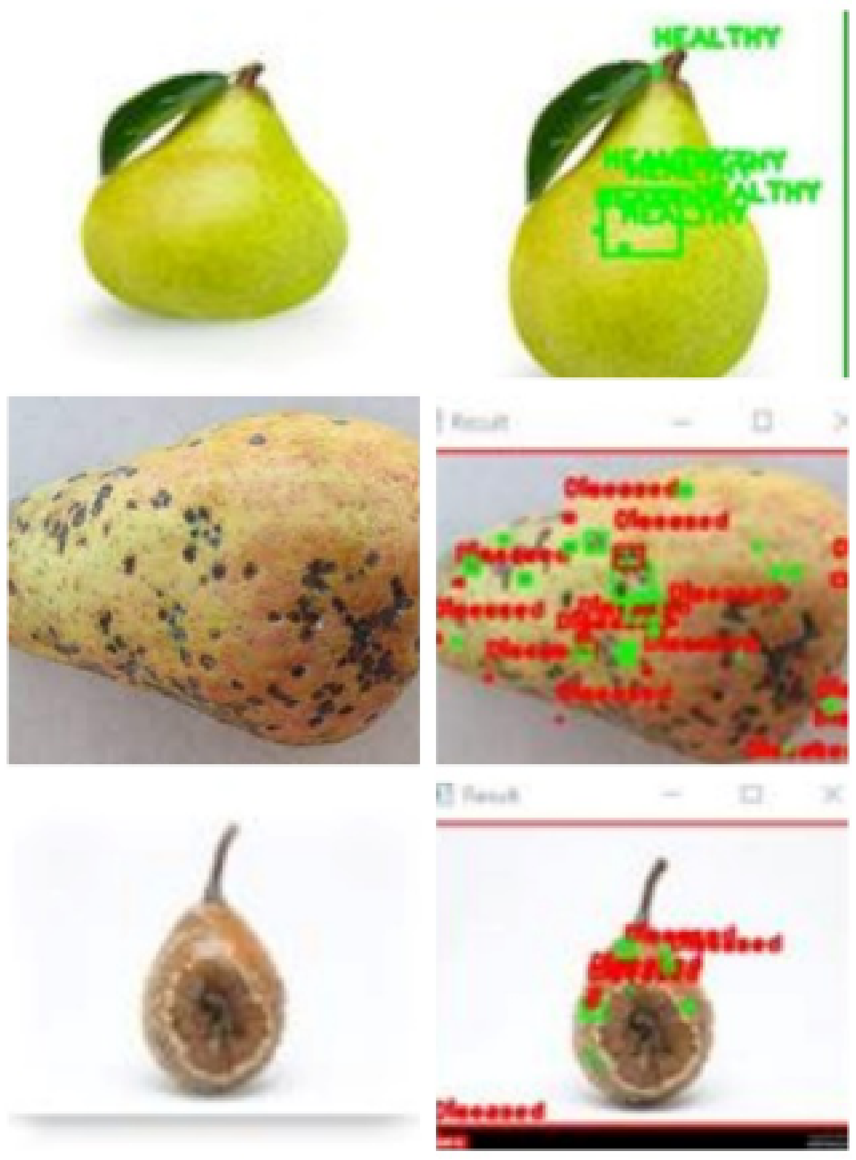


FIG:6

Conclusion

The survey of several disease classification strategies for pear fruit disease detection is presented in this research, along with an algorithm for picture segmentation that can be utilised for both automatic detection and classification of pear fruit illness. According to this study, a web-based image processing technique can be used to treat the pear fruit disease known as brown rot and black spot. The input picture is initially pre-processed, following which its features are extracted based on three parameters, colour, shape, and CCV and the same is then trained and classed. The suggested system provides the user with both intent-based and non-intent-based search options. Two ways to indentify the disease affection for the input picture of a pear. Empirical results demonstrate an array of disease recognition precision that depend on the quality of the input picture and the infected stages. full system efficiency is projected to 86%. Therefore, that technique offers farmers and their capacity to conduct intelligent farming to the forefront.

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