A combined approach of IOT and image processing for the detection of Bacteria Blight disease on Pomegranate

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Abstract

Now a days the disease Bacterial Blight which is caused by "Xanthomonas Axonopodis PV. Punicae" is growing rapidly day by day in pomegranate cultivation. This is fungal bacteria and caused by many parameters like environment, air, humidity, temperature. It causes heavy losses in production quality and quantity each year, especially in climates with rainfall and high temperature. Hence, we propose a system that will at priority and an earlier stage notify the farmer about the location of disease occurrence by using a drone that will move through the entire farm capturing the images. These images will be matched with the trained database images using image processing algorithms. This may lead in less damage related to production quality and quantity.
Keywords: Image Processing, Routing Algorithm, Bacterial Blight.

1. INTRODUCTION

Agriculture is the backbone of Economic System of a Given Country. The reason that we have permanent civilizations owing to agriculture. This sector, at present, provides resource to 65 to 70 per cent of the whole population. The world provides employment to 58.4 per cent of country's workforce and is that the single largest private sector occupation. Efforts are being made to boost the productivity and cut back losses. In today's world using smart agriculture technologies such as Internet of Things (IOT) results into cheap and effective ways of agriculture that successively can ensure enough rise to higher quality production. Internet of Things is a recent shared network of objects or things which may act with one another provided the Internet connection. IOT plays an important role in agriculture field. It contributes
considerably towards innovating farming ways. Farming challenges caused by increase and global
climate change have created it utilization of IOT among primary industries. The combination of wireless sensors with agricultural mobile apps and cloud platforms help in aggregation of important data referring to the environmental conditions. In India, horticultural field plays a vital role in the development of India. The classical approach has the naked eye observation by the experts for detection and identification of fruit diseases. This classical approach is expensive and time-consuming. Hence, there is a need of automatic fruit disease detection and prevention system in the early stage of the disease. Crops are being affected by uneven climatic conditions leading to decreased agricultural yield. One of the most important fruits or crop in an agricultural field of our country is Pomegranate. The pomegranate fruit is widely
affected by bacterial blight disease (also called as "Telya"). Due to this disease the yield production is
reduced to 90% Bacterial blight caused by Xanthomonas Axonopodis PV. Punicae (Vauterin et al., 1995) is a major threat. This disease affects steam, leaf, and fruits.

Fig 1.1: Black oily spot and crack on pomegranate fruit

The symptoms of bacterial blight is first detected on stem part which gradually pervades to leaves of pomegranate having small black spot surrounded by bacterial ooze then it spread over the plant. It mainly causes on pomegranate fruit. On pomegranate fruit the bacterial blight having symptoms like small black spot on fruit, round and surrounded by bacterial ooze, later spots enlarge to become raised, dark brown lesions with indefinite margins that cause the fruit to crack. The black spots seem oily as shown in Fig 1.1.

2. RELATED WORK

The author Khot.S.T et al. [1] detect pomegranate diseases and also suggest the solution on them. The proposed system, consist of image pre-processing, segmentation, extraction of feature and classification. In image pre-processing, images are resized. In segmentation, color segmentation is carried out. Color, morphology and texture features (Gabor filter) are extracted from the images. Minimum distance classifier is used for classification purpose. This system consists of a minimum distance classifier which is insensitive to differences in variance among categories. Manisha Bhange, H.A.Hingoliwala [2] propose a web based tool that helps farmers for identifying fruit disease by uploading fruit image to the system. The system has an already trained dataset of images for the pomegranate fruit. Input image given by the user undergoes several processing steps to detect the severity of disease by comparing with the trained dataset images. First the image is resized and then its features are extracted on parameters such as color, morphology, and CCV and clustering is done by using k-means algorithm. Next, SVM is used for classification to classify the image as infected or non-infected. An intent search technique is also provided which is very useful to find the user intension. The experimental evaluation of the proposed approach is effective and 82% accurate to identify pomegranate disease. The author Jagdeesh D. Pujari [3], proposed the statistical methods for fruit fungal disease detection. Pomegranate, grapes and mangoes are selected to carry out the experiments. Block wise feature extraction is used. The phases namely image pre-processing, image thinning and bounding box generation are used for image pre-processing. Grey level co-occurrence matrix is used for textual feature extraction. This is very time consuming process. Algorithms used in these experiments are very eloquent. In [4] Monika Jhuria, Ashwini Kumar (2013) suggested an image processing approach for detection of disease and fruit grading. The major goal of research work is to analyze disease on fruit/leaf and provide alternative solutions. The work has done on fruits namely Apple and grapes. Image processing techniques are used for fruit disease detection and for calculation of weight of fruit. Color, Texture and morphology features are considered for feature extraction. Artificial Neural network is used for image classification. Back propagation technique is used for weight adjustment of images stored in training database. The fruit grade is deciding on the basis of disease spreading and weight of fruit. New concept is used by this system it decides fruit grade on the basis of disease spreading and weight of fruit.

Shiv Ram Dubey [5] suggested an image processing based way for detection and identification of fruit disease. The fruit selected is apple and diseases considered are namely apple rot, apple blotch for conducting the experiments. For image segmentation, K-means clustering is used. Color coherence vector, Histogram, Local Bi- nary patterns, complete local binary patterns are used for extracting the features. For fruit disease detection, multiclass support vector machine is used. Ilaria Pertot [6] suggested multilingual web based tool that provided for plant disease detection. Strawberry fruit is considered as case study. The farmer in the farm will observe symptoms and these symptoms will compare with images provided in the system. The outcome will be identification of fruit disease. The web based systemconsists user and super user. Super user has authority to add / modify / delete images and diseases. And user can use disease detection method /tool for disease detection. In this system capturing the affected plant image is done manually by users or farmers. They enlarge the capture image for processing output due to that pixels gets scatter. The author A.H.Kulkarni et al. [7] work begins with capturing the image using scanners or cameras. These images are made to undergo pre-processing steps like filtering and segmentation. Then different texture and color features are extracted from the processed image. Finally, the feature values are fed as input to the artificial neural network (ANN) classifier to classify the given image. They have not concentrated on morphology of image. Wireless sensor network (WSN) system is developed by Prakashgoud Patil et al. [8] for use in precision agriculture applications, where real time data of weather and crop parameters like leaf wetness, environmental temperature, etc. were sensed from the WSN deployed in pomegranate orchard and sent to the base station and stored in the database. The Infection Index computations were carried out based on sample data but for any package of recommended practices as guidelines for entrepreneurs, data for 3-4 seasons is required. The farmers and scientist can assess and forecast the disease based on the value of Infection Index and can take necessary measures to manage the disease. The design and the implementation of a Wireless Sensor Network that monitors the air temperature, humidity and leaf wetness in a crop field. The sensor data is wirelessly transmitted to a centrally located computer terminal that logs the field data within seconds. The data collected can aid the farmers in achieving maximal crop productiveness by managing the disease. This system is does not used an image processing system hence are unable to concentrated only on the leaf and fruit of pomegranate.

3. PROPOSED WORK

The proposed system captures the live images through high resolution camera which is placed on drone. The drone route the farm area with the help of routing algorithm. The image processing is done on live captured images. The live captured images match with trained database images, if disease is detected then further action like sending notification or message to farmer is done and finally control the disease through pest sprinkling. The image processing is done on captured images having following process

3.1. Image Acquisition through Drone

Drone having routing algorithm to route the farm and high resolution Webcam attach to the drone for capturing the images. The first step in system is to capture live images from high resolution webcam and extract features. The acquired live images from Webcam are then stored in database. The images are captured by digital camera, so image size is very large. In image pre-processing module, image resizing is done. All images are resized to 300 *300 pixels.

3.2. Routing algorithm

To route the farm position-based routing algorithm is used. Position based routing algorithm use geographic position information. It uses location service (GPS) to find neighboring node. Position based routing is mainly focuses on location service and forwarding strategy. Location service is used by the current node to find the position of the next node and to include it in the next node address and the forwarding strategy used to travel to the next node or neighboring node. The routing decision at each node is then based on the destination's position within the packet and the position of the forwarding node's neighbors. The advantage of position-based routing algorithm is that it cut off the requirement of establishment or maintenance of routes and also reduces the effort for node to store or update the routing table.

3.3. Feature Extraction

It is the method of generating the features to be utilized in classification. Color and morphology are the feature vectors used for feature extraction.

3.3.1 Color

In image processing there are four color models namely RGB, HIS, CMY, YIQ. A color feature is widely used visual feature. We have used RGB model for analysis. Red, Green and Blue part of the image sample is extracted. Here we extract the total count of Red, Green and Blue pixels occupied by entire pomegranate, which further gives the total area of pomegranate.

3.3.2 Morphology

Morphology is tool used for extracting and describing image components regions and it is mainly applied on binary images. These image components are useful in representation of region shape such as boundaries. By using morphology, we will extract disease shape vector from healthy fruit and leaf. We are using erosion concept which is fundamental operation of morphology for obtaining the boundaries of images.

3.4. Training By SVM

Support vector machine is a binary classifier used to classify the input dataset into two classes, diseased or non-diseased. K-means clustering algorithm is used for segmentation and classification is done by
the support vector machine.

3.5. Classification

Classification of remotely sensed data is used to assign corresponding levels with respect to groups with homogeneous characteristics, with the aim of discriminating multiple objects from each other within the image.

3.6 Alert System

When disease will be detected then immediately message will send to farmer android mobile phone.

IV. ALGORITHM

1. Start.

2. Route the drone in farm through routing algorithm.

3. Capture real time images through webcam attach to drone.

```
cap=cv2.VideoCapture(0)

while True:

 ret,img2 = cap.read()

 cv2.imshow('VIDEO', img2)

 ch = 0xFF & cv2.waitKey(1)

 if ch == ord(' '):

 cv2.imwrite('Capturedimage.jpg',img2)
```



```
 cv2.imshow('Captured Image',img2)
```

4. Store real time images in database.

```
path1 = "./database/" # give a path of folder
overhere

listing = os.listdir(path1)

path2 = "./database1/" # give a path of folder
overhere

listing = os.listdir(path2)

n=1

for file in listing:

 im=cv2.imread(path1 + file)

 cv2.imshow('req',im)

 #cv2.waitKey(0)
```

5. Do image processing on real time captured images.

. Image pre-processing Improvement of input and output is pre-processing.
Feature extraction

```
needle_g = cv2.cvtColor(needle, cv2.CV_32FC1)

haystack_g = cv2.cvtColor(haystack, cv2.CV_32FC1)
```

Training by SVM and classification

```
#match image
d = cv2.matchTemplate(needle_g, haystack_g,
cv2.TM_SQDIFF_NORMED)

 # we want the minimum squared difference

 mn,_,mnLoc,_ = cv2.minMaxLoc(d)

 #Print it, for comparison

#print mn

 if mn <=0.1:

 #Draw the rectangle

MPx,MPy = mnLoc

 trows,tcols = needle_g.shape[:2]

# Normed methods give better results, ie
matchvalue = [1,3,5], others sometimes
```


shows errors

```
cv2.rectangle(haystack,
(MPx,MPy),(MPx+tcols,MPy+trows),(0,0,255),2)
 cv2.imshow('Disease Identified',haystack)
#cv2.imshow("Input", needle)

cv2.waitKey(0)

cv2.destroyAllWindows()

 print 'Disease identified'
```

6. Send alert message or notification to farmer.

V. RESULT

We have given offline images as input to system from which images are compared with trained database image, if disease detected then earlier alert message or notification is send to the farmer.

VI. CONCLUSION

This system concludes that the design of a routing algorithm applied to drone that monitors the environment of pomegranate farm. It is proposed to make use of Webcam to take the live images of the plant. The images obtained by the Webcam are accessed by the farmer through web interface which helps to understand the severity of the disease. The disease-free planting materials are the only effective way to avoid the spread of the disease to new orchards.

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