DESIGNING ASSEMBLED SYSTEM FOR PLANTDISEASE DIAGNOSIS USING IOT AND ANDROID

Project report submitted in partial fulfillment of the requirement for the degreeof

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERINGa

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May, 2018

DECLARATION BY THE SCHOLAR

We hereby declare that the work reported in the B-Tech thesis entitled **DESIGNING ASSEMBLED SYSTEM FOR PLANT DISEASE DIAGNOSIS USING IOT AND ANDROID** submitted at **Jaypee University of Information Technology, Waknaghat, India,** is an authentic record of my work carried out under the supervision of **Dr. Meenakshi Sood.** We have not submitted this work elsewhere for any other degree or diploma.

Department of Electronics and Communication Engineering

Jaypee University of Information Technology, Waknaghat, India

Date -

CERTIFICATE

This is to certify that the work reported in the B.Tech project report entitled **"DESIGNING ASSEMBLED SYSTEM FOR PLANTDISEASE DIAGNOSIS USING IOT AND ANDROID**" which is being submitted by Rishabh Shahi (141013), Anupam Kaushal(141082), Sunny Guleria(141083),in fulfillment for the award of Bachelor of Technology in Electronics and Communication Engineering by the Jaypee University of Information Technology, is the record of candidate's own work carried out by him/her under my supervision. This work is original and has not been submitted partially or fully anywhere else for any other degree or diploma.

Dr. Meenakshi Sood

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ACKNOWLEDGEMENT

We owe our profound gratitude to our project supervisor **Dr. Meenakshi Sood**, who took keen interest and guided us all along in our project work titled **"DESIGNING ASSEMBLED SYSTEM FOR PLANT DISEASE DIAGNOSIS USING IOT AND ANDROID"** until the completion of our project by providing all the necessary information for developing the project. The project development helped us in research and we have to know many new things in our domain. We really thank her for the constant unstinted support and invaluable guidance throughout the completion of our project.

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LIST OF ABBREVIATIONS

ASM	Angular Second Moment
BPNN	back-propagation neural network
CCM	Color Co-Occurrence Method
GUI	Graphical User Interface
GLCM	Gray-Level Co-Occurrence Matrix
HSI	Hue-Saturation-Intensity
IDM	Inverse Difference Moment
IOT	Internet Of Things
KNN	K-nearest neighbors
NFC	Near-field communication
PNN	probabilistic neural network
RFID	Radio-frequency identification
RGB	red, green, blue)
SVM	Support Vector Machine
WLAN	wireless local area network

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ABSTRACT

With the passage of information and correspondence advancement, the cultivating part is progressing at an exceedingly quick pace with the assistance of new hardware, the scientists are endeavoring hard endeavors to build the efficiency and lessen the harm because of illnesses and creepy crawlies/bothers. Because of the ignorance of ranchers towards the innovation and different practices of their utilization, the reap commonly endures. Ranchers depend for the most part on the already put away learning in light of understanding of our precursors. In any case, the most recent innovations rely upon information obtained on continuous based checking strategies. This report proposes a framework in view of IoT (Internet of Things) alongside Image Processing and Cloud techniques that will help in taking appropriate preventive and indicative measures to diminish the damage in edit misfortunes because of ailment and creepy crawlies/bugs. The android application will give the convenient direction and helpful data to the farmers setting at home.

CHAPTER 1

INTRODUCTION

1.1 INTRODUTION

In India, agribusiness is principle wellspring of work for agriculturists. Varieties in climate conditions, absence of exact assets, edit necessity and created maladies; ranchers largely face a ton of decimation of harvests and experience monetary misfortunes consistently. Distinctive plants have diverse maladies of which for the most part ranchers don't know about. Viral, contagious and bacterial are the significant classifications of plant leaf illnesses that dependably influence the quality and amount of yields and their further development. Some essential ailments are darker yellow fix, early and late singe. With the assistance of specialists, agriculturists and horticulturists having huge learning, these sicknesses can be analyzed. Specialists recognize plant sicknesses with exposed eye perception however that require persistent checking of plants and high cost when done on expansive homesteads. In any case, in some remote domains agriculturist don't have thought or workplaces to contact pros and they need to development far off, which is dull, and of high cost.

Plant infection and creepy crawly bugs have turned out to be real worry as it can cause noteworthy lessening in both quality and amount of harvests. In late decades, the misfortune caused by plant infection and creepy crawly bugs is much more serious than that by plant fires, so plant sickness and bug bugs estimating is of extraordinary noteworthiness and very important. The principle way to deal with location and recognizable proof for plant ailment and creepy crawly bothers by exposed eye.

Modified acknowledgment of the diseases by exposed eye, the sign 89+on the plant leaves makes it less complex and unassuming. Customized area framework require less undertaking, not so much time but instead more correct. We can keep this substantial misfortune in trim by precise recognition and arrangement of infections. Picture of the influenced plant is caught and handled with picture preparing method. Since various

plant have a wide range of infections, a database that contains this data can be created on the cloud. Ranchers will be encouraged by giving them GUI created android and influence them to get to that through cloud.

IoT is an immense expression portraying the reliance of different regular daily existence questions through the web. In IoT, each question (having an extraordinary identifier of it) associates with each other utilizing that exceptionally same identifier to dodge any human-to-human cooperation. IoT is interconnection of regular items having extensive system. The coordination of implanted framework for association builds the omnipresence of articles.

India is an agrarian nation in which 65% of the wage depends on the agribusiness. In Agricultural Department innovation is quickly changing, numerous new advancements are going to the market, which help ranchers to amplify profitability. So this venture is based thoroughly to help the agriculturists and even the little level plant cultivators like those with porch gardens and so forth. Commonly because of absence of information or any misinterpretation of a specific ailment, reap can endure. Today, every individual uses cell phones and it has turned into an essential piece of human life bowlful numerous necessities of people. To keep away from this we need to furnish individuals with a technique to legitimately think about the sickness and it is analysis to keep any misfortune to plant cultivators.

1.2 LEAF DISEASES SYMPTOMS
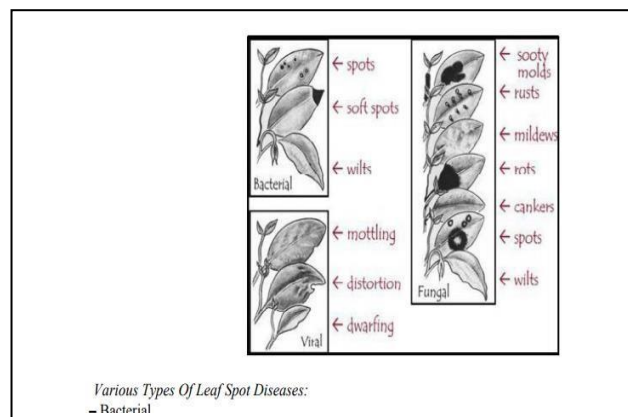
Figure 1.2.1: Various Types of Leaf Diseases

Fungal organisms cause many plant diseases in food and feed crops are originated by viral and bacterial organisms. Undeniable as caridia galli also cause plant disease. Some plant diseases are categorized as non-infectious and include destruction from air pollution and grow under less than most favorable conditions.Plant disease is corporeal proof of the pathogen.

1.2.1 BACTERIAL DISEASE SYMPTOMS:

The disease is called "bacterial leaf spot". Small, yellow green lesions on young leaves are symptoms which normally seen as disfigure and twisted, or as dark, greasy-become visible lesions on older foliage.

Figure 1.2.1: Bacterial Disease Symptom

1.2.2 VIRAL DISEASE SYMPTOM

All virus disease shows some degree of learning in manufacture and life of virus-infected plant is small. Viruses may damage the leaves, fruits and, roots. The Viral disease is most hard to identify.

Figure 1.2.2: Viral Disease Symptom

1.2.3   FUNGAL DISEASE SYMPTOMS:

It's a kind of plant pathogen and is powerful for the significant plant diseases and damage plants by killing cells. Main cause of fungal disease is infected seed, soil, crop, and weeds. It is unrolled by the wind and water and through the motion of soil, animals, workers, machinery, tools. It appears on lower part of leaves as gray green spots, these spots get darken, and then white fungal growth spreads in initial state.

Figure 1.2.3: Fungal disease

1.3 GENERAL SYMPTOMS OF PLANT DISEASES

1.   **Mildew**: pathogens are seen as a broad on the exterior of the host and shown as white, gray, brownish or purplish patches of changing in size of leaves, herbaceous stems, or fruits.

Figure 1.3.1: Mildew

2.   **Rusts**: These are diseases with rusty symptoms and seen as comparatively tiny pustules patches having dusty and red, brown, yellow or black color.

Figure 1.3.2: Cedar rust

3.   **Smuts**: The word "smut" refers as charcoal-like powder. The overdone parts of the plant appear as black or purplish-black dusty mass and seen on floral, stems, leaves and roots.

Figure 1.3.3: Smuts

4.   **Scab**: The term scab is used to represent roughened or crust-like lesions and appears at a certain stage.

Figure 1.3.4: Scab

5.   **Blotch**: This manifestation exists of a shallow development giving the organic product a blotched appearance.

Figure 1.3.5: Blotch

6.   **Tar spots**: These are fairly dark covered organism bodies with the approach of a leveled out drop of tar on takes off.

Figure 1.3.6: Tar spots

7.   **Chlorosis**: Development of yellow hues because of low temperature, supplement lack, abundance of salt and bacterial illnesses is called chlorosis. While yellowing is compel, at that point   called as chlorotic spots.
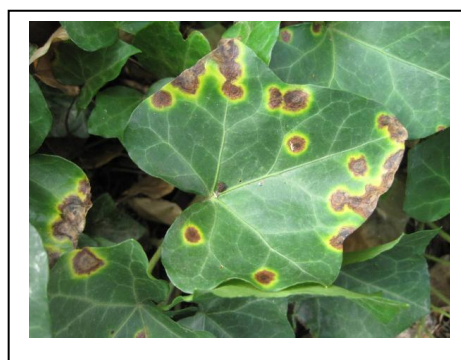
Figure 1.3.7: Chlorosis

1.4 MOTIVATION

India is basically an agricultural country in which 65% of the income is based on the agriculture. In Agricultural Department technology is quickly changing, many new technologies are coming to the market, which help farmers to maximize productivity. So this project is based totally to aid the farmers and even the small level plant cultivators like those with terrace gardens etc. Many times due to lack of knowledge or any misconception of a particular disease, harvest can suffer. Today, every person uses mobile phones and it has become an essential part of human life plateful multiple needs of humans. To avoid this we want to provide people with a method to properly know about the disease and it is diagnosis to prevent any loss to plant cultivators.

1.5 OBJECTIVES

▶ To detect and classify unhealthy region of plant leaves using texture features.

▶ Examine the leaf infection.

▶ The inspected information is forwarded to the farmer.

▶ Design an application using android development and connect with IoT.

CHAPTER 2

LITERATURE SURVEY

Sachin D. Khirade, A.B Patil, "Plant Disease Detection Using Image Processing", International Conference on Computing Communication Control and Automation", 2015. Distinguish the plant ailments which hinders the misfortunes. It required gigantic work and skillfulness in the plant ailments and time.

Y.Sanjana, Ashwath Sivasamy, Sri Jayanth, "Plant Disease Detection Using Image Processing Techniques", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, May 2015. In this photo is click by telephone and send for master exhortation. PC vision strategies are utilized for identification of influenced spots from the picture.

Heeb Al Bashish, Malik Braik, and Sulieman Bani-Ahmad, "A Framework for Detection and Classification of Plant Leaf and Stem Diseases", IEEE 2010. In this paper an image-processing-based approach is proposed and used for leaf and stem disease detection.

Detection of Diseases on Cotton Leaves and practicable recognition by Mr. V. A. Gulhane&Dr A. A. Gurjar, Where the color and spot features are removed by back-propagation neural network.

Geng Ying, Li Miao, Yuan and Hu Zelin[2008] a learning on the Method of Image Pre-Processing for Recognition of Crop Diseases, International Conference on Advanced Computer Control, 2008 IEEE. For acknowledgment of product infection, the creator Geng Ying, et al. examined the strategies for picture preparing. For that motive they utilized cucumber fine mold and fleece molds as tests.

Sachin D. Khirade and A. B. Patil. "Plant Disease Detection Using Image Processing." International Conference on Computing Communication Control and Automation (ICCUBEA), 2015 International Conference on, pp. 768-771. IEEE, 2015, has alluded some division and highlight extraction calculation that might be utilized for the location of plant maladies by utilizing the picture of clears out. It is difficult to recognize the maladies hand-operated due to large need time, information of ailments and measure of work.

Dr. K. Thangadurai and K. Padmavathi suggests computer vision image enhancement for disease identification. It includes color conversion and Histogram equalization. By Histogram equalization image quality get better. RGB to Grayscale conversion is used to retain the luminance information instead of Hue and Saturation information. Histogram Equalization provides the better quality image in Grayscale.

4.1 RELATED LITERATURE AND STUDIES

| AUTHORS	TECHNIQUE	REMARKS
Dr.K.Thangaduraiand K.Padmavathi	Computer vision Image enhancement, Histogram Equalization	To improve the image clarity, color of the affected plant, conversion and histogram equalization is assured.
S. S. Sannakki and V. S. Rajpurohit	Back-propagation Neural Network classifier(BPNN)	The detection and classification of diseases are up to 97.30%.
SmitaNaikwadi, NiketAmoda	k-means clustering	RGB is converted into CCM (color co-occurrence method) for color feature extraction.
YuanTian, ChunjiangZhao, ShenglianLu and XinyuGuo	SVM-based Multiple Classifier System	Proposed method for disease detection in wheat leaf. color, texture and shape features are used as training sets for classifiers.

Table 4.1.1: Literature Reviews

CHAPTER 3

METHODOLOGY

Image processing is used for agricultural applications to identify diseased plant part, to quantify pompous area by disease, shape, color etc. Its basic functionality is that it works on mobile phone having color camera. Professional agriculturists have easier access to the analysis results on the remote cloud or database and the pictures taken by and stored in the phone. The producer can use his phone with installed application when he wants to examine the situation of the plants.

The proposed work is based on methodology depicted in figure 3.1
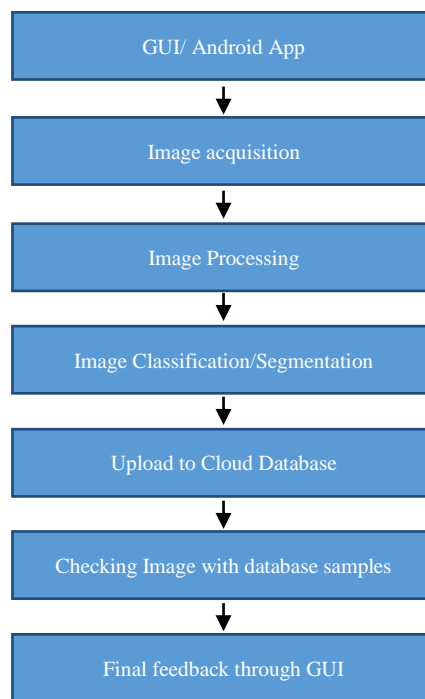
Figure 3.1: Proposed Methodology to Design Assembled System

In Image acquisition, the high quality image is obtained to create the required database of plant diseases. Efficiency of quality of database image depend on this step, so high quality RGB color images are required.

In image processing, image is enhanced and converted into greyscale image. The noise is removed through image enhancement, RGB color image is converted into HSV plane image. Image representation is improved so that image can be analyzed properly.

In Segmentation image is split into different part having similar feature .The segmentation is done by Otsu's method, K means clustering, turning RGB to HSI model etc. Classification of the object based on a set of the features into K no. of classes in K means clustering. The classification of the object is done by reducing the sum of the square of the distance between the object and the corresponding cluster.

In feature extraction, disease portion is extracted from the image after applying segmentation.

In leaf disease detection, various classifiers are used to classify the disease of data. The classification is based on healthy and affected/diseased leaf or other parts of plant.

A. **PROBLEM IDENTIFICATION**

The problem in existing system is that the diseases are mostly judged by experience of farmers. Many times the disease is either detected or diagnosed wrong.

B. **IDENTIFICATION OF PLANT DISEASES**

Diseases in plants are identified based on the symptoms such as color spots on leaves, streaks on leaves, stem and seeds. As disease progresses it is indicated by the visual symptoms as they increase.

C. **REASONS FOR USING IMAGE PROCESSING**

The following are three reasons for the need of image processing in this project:

1. Identifying growth of plant.

2. Pre-disease planning.

3. Post-disease recovery

3.1 TECHNOLOGIES USED

3.1.1 FEATURE EXTRACTED

Various features extracted from normal and diseased plant are discussed in this section.

Color moments illustrate color features that are obtained by applying statistical calculations such as mean (μ), standard deviation (σ), skewness (θ), and kurtosis (γ).

$$\mu = \frac{1}{mn} \sum_{i=1}^{m} \sum_{j=1}^{n} (P_{ij}) \qquad -(1)$$

$$\sigma = \sqrt{\frac{1}{mn} \sum_{i=1}^{m} \sum_{j=1}^{n} (P_{ij} - \mu)^2} \qquad -(2)$$

$$\theta = \frac{\sum_{i=1}^{m} \sum_{j=1}^{n} (P_{ij} - \mu)^3}{mn\sigma^3} \qquad -(3)$$

$$\gamma = \frac{\sum_{i=1}^{m} \sum_{j=1}^{n} (P_{ij} - \mu)^4}{mn\sigma^4} \qquad -(4)$$

3.1.2 Texture Features used GLCM to represent textural information in the leaf.

- Angular Second Moment (ASM)

$$\sum_{i,j=0}^{N-1} P_{i,j}{}^2$$

- Contrast

$$\sum_{i,j=0}^{N-1} P_{i,j}(i-j)^2$$

- Inverse Difference Moment (IDM)

$$\sum_{i,j=0}^{N-1} \frac{1}{1+(i-j)^2} p(i,j)$$

- Entropy

$$\sum_{i,j=0}^{N-1} -\ln(P_{i,j})P_{i,j}$$

- Correlation

$$\sum_{i,j=0}^{N-1} P_{i,j}{}^2 \frac{(i-\mu)(j-\mu)}{\sigma^2}$$

$$P_{i,j}\ is\ ij\ element\ of\ normalised\ symmetrical\ GLCM$$

$$N = No.\ of\ grey\ levels\ in\ the\ image$$

3.2 CLASSIFIER ALGORITHMS

Probabilistic neutral network (PNN) is a feed forward network, which is generally utilized as a part of arrangement and example acknowledgment issues. In the PNN calculation, the parent likelihood dispersion work (PDF) of each class is approximated by a Parzen window and a non-parametric capacity. At that point, utilizing PDF of each class, the class likelihood of another info information is assessed and Bayes' lead is then utilized to apportion the class with most astounding back likelihood to new information. By this strategy, the likelihood of mis-arrangement is limited.

KNN (k-nearest neighbor) machine learning techniques in which we identify the differentiating the closest neighbor's. KNN depends upon the calculation of least distance between the given purpose and the different points.

Fuzzy classifier is a method in which we can find different organic process deficiencies in feather palm plant through various type of color and texture are extracted after the segmentation. It tells the amounts of fertilizers required to cure the deficiencies.

In **Neutral networks**, according to variety of size and colors, each RGB and HIS representation on the segmented image is extracted and then fed to neutral networks and confirm the plant condition as per applied mathematics classifiers.

CHAPTER 4

PLATFORMS USED FOR THE PROJECT

4.1 CLOUD COMPUTING

Distributed computing is connected with the commitment of registering foundation and huge information taking care of technique for different assets, through the social event of assets, and to give a solitary framework see. Distributed computing is a vigorous innovation to execute extensive and complex figuring. It has change the way the figuring foundation is utilized.

Distributed computing is connected with new model for the commitment of figuring framework and huge information preparing technique for different riches. The explanation behind conveyed registering is to entrance a considerable measure of handling power, through the gathering of advantages, and to give a lone system see. Circulated figuring is bringing an overwhelming outline to do sweeping scale and complex preparing. The goal of these advances is to give preparing as a response for dealing with huge data.

4.1.1 Top benefits of cloud computing

Six common benefits by which organizations are turning toward cloud computing:

1. Cost:

Distributed computing takes out the capital cost of purchasing equipment and programming and setting up and running nearby datacenters—the racks of servers, the round-the-clock power for power and cooling, the IT specialists for dealing with the framework. It includes quick.

2. Speed

Most cloud computing services are given self service and on demand, provide lot of flexibility and taking the pressure off capacity planning.

3. Global scale

The advantages of distributed computing administrations incorporate the capacity to scale flexibly. In cloud talk, that implies conveying its perfect measure assets—for instance, pretty much figuring power, stockpiling, data transfer capacity—right when its required and from the privilege geographic area.

4. Efficiency

On location datacenters normally require a considerable measure of "racking and stacking"— equipment set up, programming fixing and other tedious IT administration tasks. Distributed computing expels the requirement for a significant number of these assignments, so IT groups can invest energy in accomplishing more imperative business objectives.

5. Execution

The greatest distributed computing administrations keep running on an overall system of secure datacenters, which are routinely moved up to the most recent age of quick and effective processing equipment. This offers a few advantages over a solitary corporate datacenter, including decreased system idleness for applications and more noteworthy economies of scale.

6. Unwavering quality

Distributed computing makes information reinforcement, catastrophe recuperation and business coherence simpler and more affordable, in light of the fact that information can be reflected at numerous excess destinations on the cloud supplier's system. computing is a hearty innovation to execute huge and complex figuring. It has change the way the figuring foundation is utilized.

4.2 ANDROID

Android is a versatile working framework created by Google, in light of the Linux portion and composed basically for touchscreen cell phones, for example, cell phones and tablets. Android's UI is for the most part in light of direct control, utilizing touch signals that freely compare to certifiable activities, for example, swiping, tapping and squeezing, to control on-screen objects, alongside a virtual console for content information. Notwithstanding touchscreen gadgets, Google has additionally created Android TV for TVs, Android Auto for autos, and Android Wear for wrist watches, each with a particular UI. Variations of Android are additionally utilized on amusement comforts, advanced cameras, PCs and different gadgets. GUI will be created to encourage the client amid the whole procedure of illness recognition and last measures. The application will be utilized to obtain and store the picture locally on the telephone stockpiling. Promote the picture will be transferred to cloud database for preparing, division and conclusion comes about.

4.3 IOT

The Internet of things (IoT) is the arrangement of physical contraptions, vehicles, home mechanical assemblies, and diverse things introduced with equipment, programming, sensors, actuators, and framework accessibility which engage these articles to partner and exchange data. Everything is strikingly identifiable through its embedded enlisting system yet can between work inside the present Internet establishment. Experts check that the IoT will involve around 30 billion challenges by 2020.

Internet of Things (IoT) is a kind of intelligent technology, including identification, sensing etc. IoT includes cloud computing, ubiquitous network and intelligent sensing network.IoT develops to an vast number of smart tags gathering with and transmitting information to each other and with decentralized and central systems. Ubiquitous network including 3/4G, GSM, WLAN, LTE, RFID, ZigBee, NFC, blue tooth and other wireless communication.

CHAPTER 5

REULTS AND DISCUSSIONS

Plant diseases are generally classified into two types. Firstly, infectious diseases, which are caused by natural agencies. Secondly, one is non-infectious disease, which is caused by pathogens. Non-infectious diseases are generally caused due to weather (lightning, wind, drought, and strong sun), nutrient deficiency (yellowing, reddening or spotting) or by toxic substances.

7.1 Type of infections

Localized diseases are limited to definite area of an organ or parts of plant (e.g. leaf spots and anthracnose caused by different fungi).

Figure 7.1.1: Localized symptoms

Systemic diseases are those in which the pathogen spreads from a single infection point (e.g. downy mildews).

Figure 7.1.2: Downy mildews

Endemic diseases are those, which are confined to particular country or district. These diseases are existing in one form or other form years in modest to acute form, in specific country.

Epidemic or epiphytotic diseases are those, which appear in large area, but regularly may be available always in the locality.

Non-infectious (Abiotic) are nutrional deficiencies e.g. khaira disease of rice due to Zn deficiency, unfavorable environment e.g. frost injury, physiological wilt etc.

Polycyclic diseases are those diseases, which have more than one generation in a cropping season. E.g. late blight of potato

Monocyclic diseases are those diseases the increase of which is analogous of increase in money due to simple interest i.e. those diseases which have only generation in one cropping season e.g. loose smut of wheat.

Sporadic diseases are those which appear at very in consist interval and location in a moderate to severe form e.g., leaf blights, wilt.

Pandemic diseases occurring throughout the continent or sub-continent resulting in mass mortality.

TYPE OF DISEASES	SYMPTOMS	WAYS TO CURE THAT PART OF THE PLANT
Cedarapple rust	Small, pale yellow spots on upper part of leaf surfaces in mid- to late spring	Remove galls from infected junipers. In some cases, juniper plants should be removed entirely.
Marssonina leaf blotch	Disease symptoms appears dark green patches on upper surface of leaf.	Mix 1/2 ounce of a copper-solution and spray. Thoroughly apply the solution until the tops and undersides of apple leaves glisten with moisture.
Black rot canker	Leaf symptoms first occur in early spring when the leaves are unfold.	Prune the dead or infected branches from apple trees and grapevines, disinfecting the pruning shears with a 70 percent alcohol solution after each cut.
Powdery mildew	Small patches of white or grey powdery masses on underneath surface of leaves.	Spray infected plants with fungicides. Effective fungicides for powdery mildew treatments or cures include sulfur, lime-sulfur, neem oil.

|		
Alternaria leaf spot/blight	Leaf spots occur on the leaves in late spring & early summer.	Use drip irrigation instead of overhead sprinklers if possible.
Bacterial spot	Mall, dark, raised spots.	Destroy infected plants and apply fungicide.
Bacterial blight	Large, yellow spots on leaves that eventually turn brown.	Remove infected plants and ensure proper spacing between new plants.

Table 7.1.1: Plant Diseases and Symptoms

RESULTS:

(A).   CONTRAST ADJUSTMENT AND HISTOGRAM:-

Contrast of the image is adjusted to minimize the chances of false detection of any image part. Due to contrast adjustment the bright parts of plant leaf (mostly depicting diseases with yellow or red color) can be easily segmented or separated from the rest of the image for further calculations like histogram, entropy etc.

Histogram further shows the data representation of the contrast values. We can notice that the high contrast region is less frequent in the below image but has high energy, whereas the more frequent contrast values have less energy values.
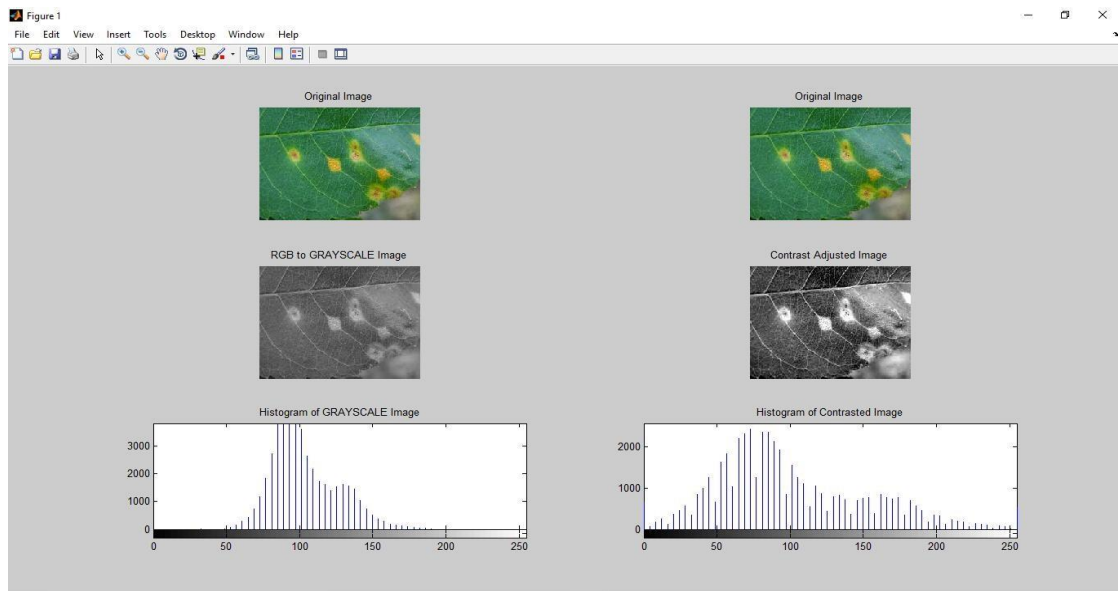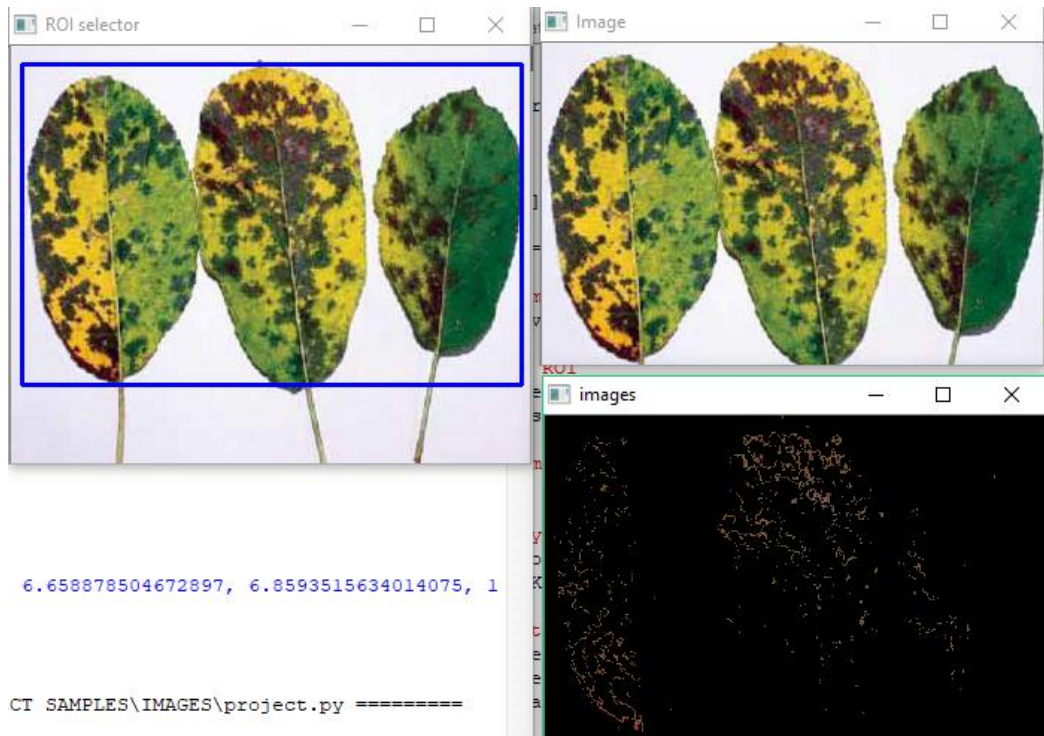
Figure 7.1.3: Contrast Adjustment.
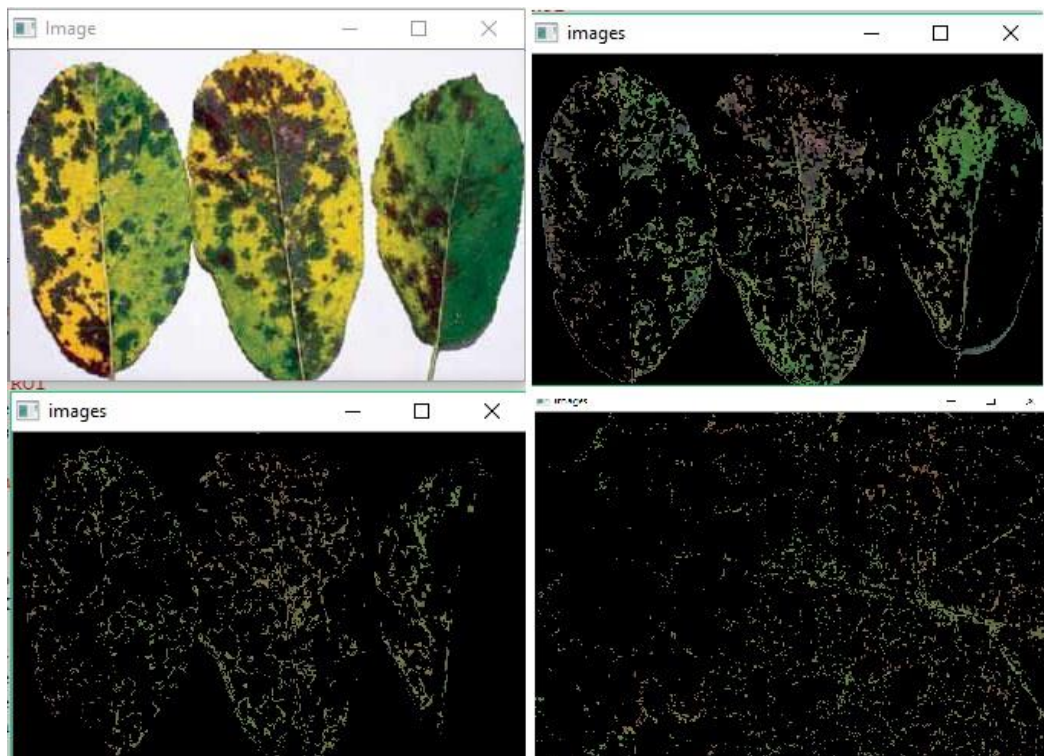
(B). <u>**COLOR DETECTION:-**</u>

The diseased part can further be segmented on the basis of various colors representing diseased parts (e.g. Red for rust diseases, yellow for chlorosis etc.).

We segmented each color separately and then the percentage of diseased/colored part w.r.t. total plant image area is calculated to give us the intensity of disease spread. The total disease percentage will be the sum of all individual percentages of disease part percentages. On the basis of total infection percentage we can determine whether to give immediate attention to the plant or some small preventive measures are enough.
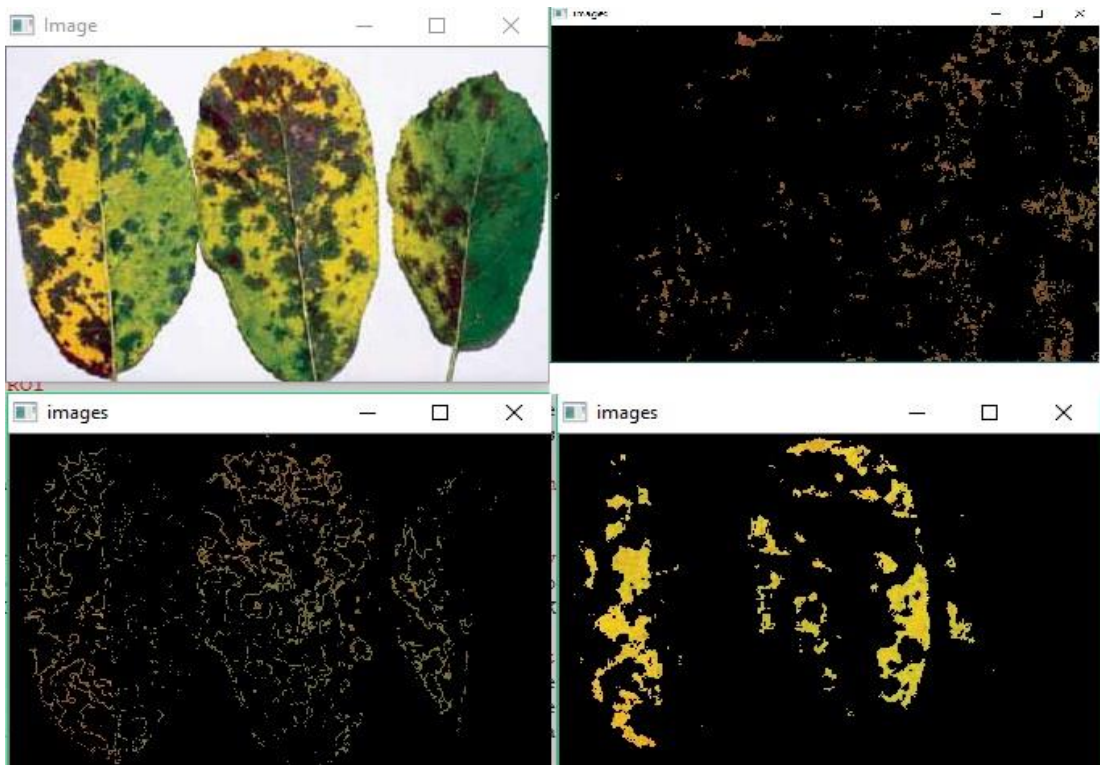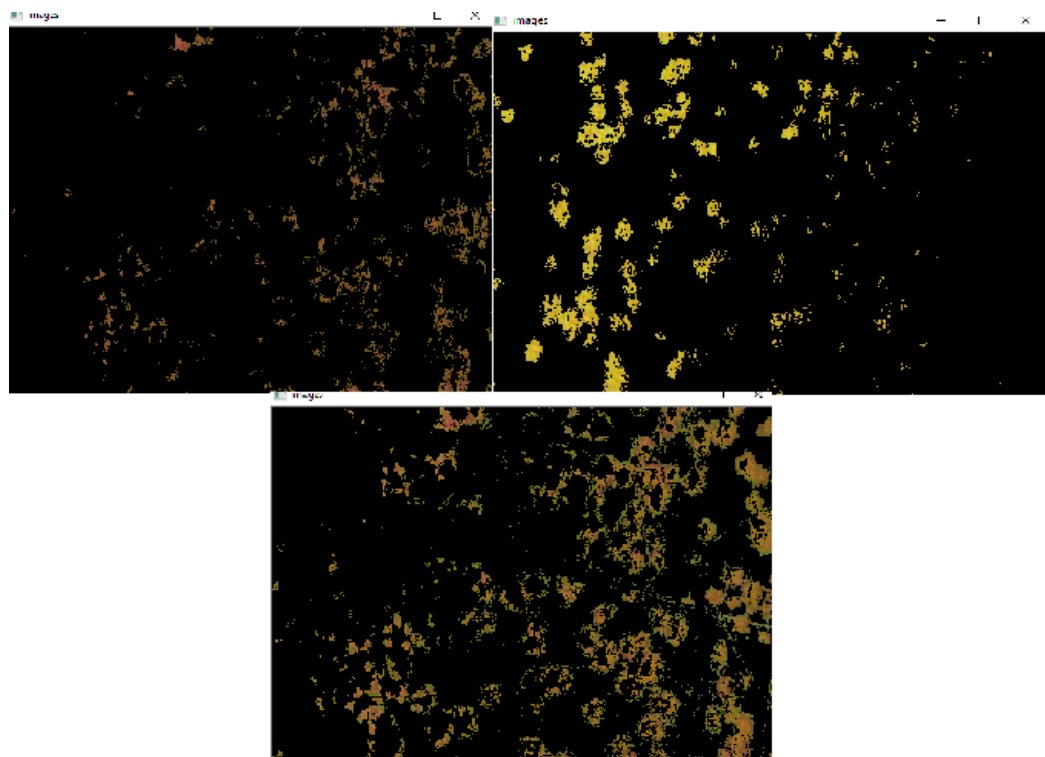
(A)

B)

(C)

(D)

(E)

(D). <u>DISEASED PART DETECTION</u>

The CCM approach comprises of three noteworthy numerical procedures. To begin with, the RGB pictures of leaves are changed over into HSI shading space portrayal. When this procedure is finished, every pixel outline used to create a shading co-event framework, bringing about three CCM networks, one for every one of the H, S and I pixel maps. Tone Saturation Intensity (HSI) space is additionally a well known shading space since it depends on human shading recognition.
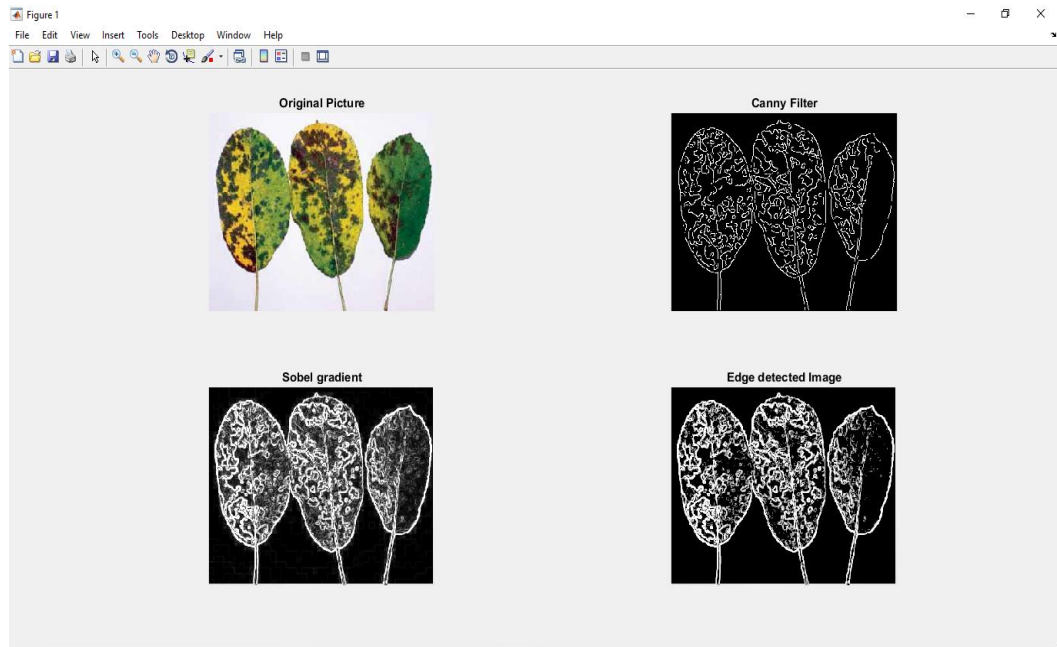
(A)
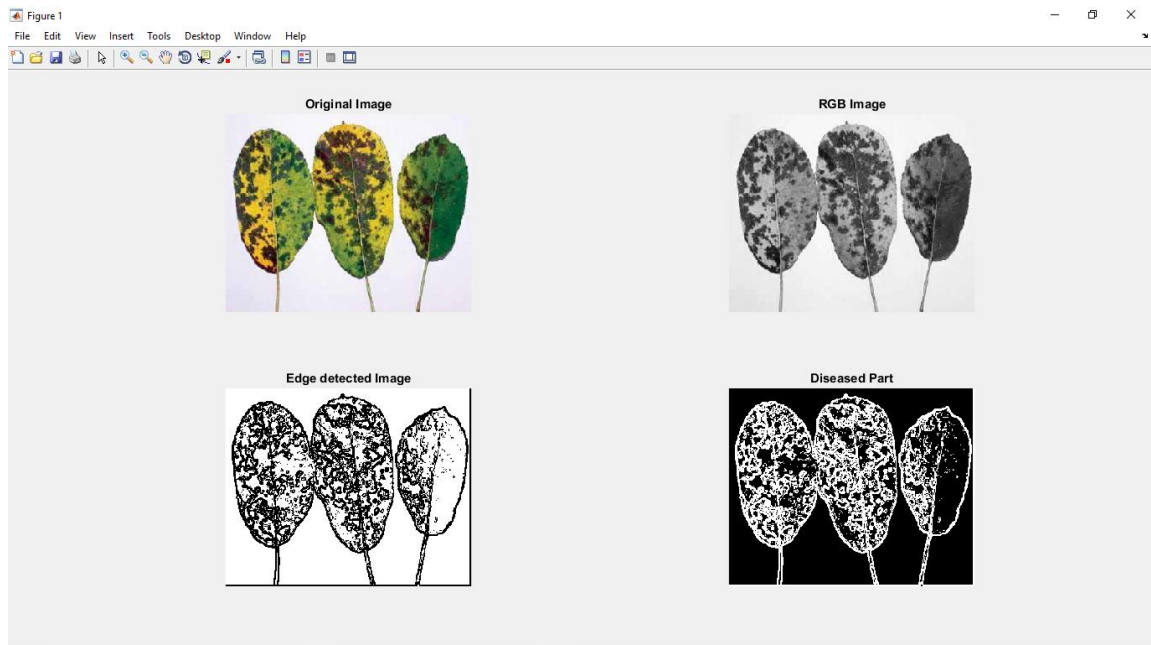
(B)

(E). ENTROPY & ASM

Dark level co-event lattice investigation (GLCM) is a notable scientific strategy for measurement of cell and tissue textural properties, for example, homogeneity, many-sided quality and level of confusion. As of late, it was shown that this technique is fit for assessing fine basic changes in atomic structure that generally are imperceptible amid standard microscopy examination. In this article, we introduce the outcomes showing that entropy, rakish second minute, difference, and surface relationship of lymphocyte atomic structure dictated by GLCM technique are distinctive in thymus cortex when contrasted with medulla.
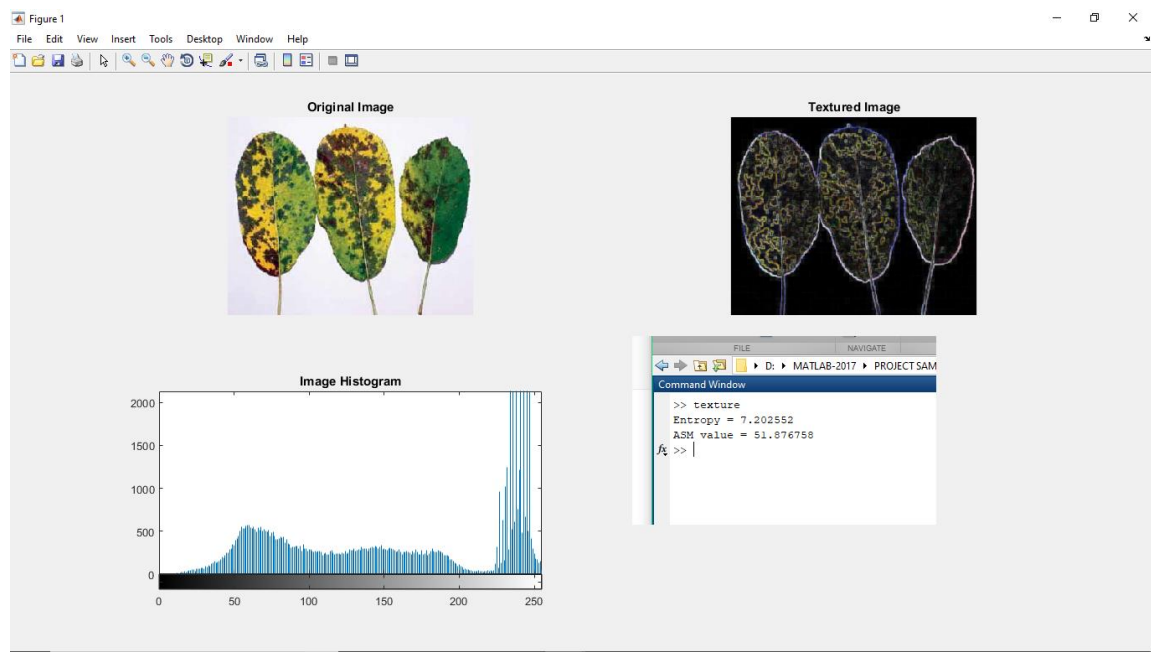
(F). ANDROID APPLICATION:

You can recognize the sicknesses influencing your plant/edit inside couple of moments by clicking photographs through your telephone camera. Transfer photographs of the infected piece of plant on the application and inside seconds distinguish the ailment and its answer.

CHAPTER 6

CONCLUSIONS

5.1 CONCLUSION

There are different traditional methods for identification of plant leaf disease such as recognition method, back propagation, neural network etc. The key to decrease agriculture loss is detection and cure of plant disease. By image processing, the infected or diseased parts of the plant leaf and solution to cure that part of plant.

Every sickness has differing side effects, for example, shading minor departure from the leaves, stem and root. Here, with the assistance of picture handling methods we went for recognizing the consuming and impact sickness which demonstrate indications on takes off. Utilizing Bhattacharyya's separation innovation of histogram we were fruitful in distinguishing these two sorts of infections nearness in the rice edit. In facilitate upgrade this technique can be utilized to locate all sort of ailments in different clears out. This may help the agriculturists in ID of the infection in the leaf in plausible and precise path, in brief time traverse.

5.2 FUTURE SCOPE

Technology based modern agriculture industries are the today's requirement in every part of agriculture in India. The crop losses due to disease are about 20 to 40% .Due to the different atmospheric circumstances periodically farmer does not know what type of disease the plant has and which type of medicine is needed to cure this disease .This application uses the various features of mobile phone along with IOT to tackle plant diseases. This proposes a new architecture for plant disease detection and further diagnosis, which makes a farmer's work much easier.

It is useful for farmer, greenhouse owner etc. to perform their task. With the help of this system user can perform the following tasks:

- Get information about the disease the plant is suffering from.

- Application provide the current disease status of plant.

- Gives the information, suggestion and cure for particular disease.

- Daily remindfarmer about their schedule activity.

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DESIGNING ASSEMBLED SYSTEM FOR PLANT DISEASE DIAGNOSIS USING IOT AND ANDROID

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Abstract—with emergence of various technologies, the agriculture sector is evolving at an exceedingly rapid pace. With the help of various hardware and tools, the researchers are making hard efforts to increase the productivity and reduce the crop losses, which are spreading, from diseases and insects/pests. Due to the unawareness of farmers towards the technology, the harvest many times suffers. However, the latest technologies depend on data acquired on real time based monitoring methods. This research paper proposes a system based on IoT along with Image Processing and Cloud methods that will help in taking proper preventive and diagnostic measures to reduce the crop losses from disease and insects. The android application will provide the timely guidance and useful information to the farmers sitting in their homes.

KEYWORDS—IoT, cloud computing, image processing, android, plant diseases

I. INTRODUCTION

In India, agriculture is main source of livelihood for farmers. Because of variations in weather conditions, lack of accurate resources, crop requirement and developed diseases, farmers generally face a lot of destruction of crops and undergo economic losses every year.

Different plants have different diseases of which generally farmers are not aware about. Viral, fungal and bacterial are the major categories of plant leaf diseases that always affect the quality and quantity of crops and their further growth. Some basic diseases are brown-yellow spots, early and late scorch. With the help of experts, agriculturists and horticulturists having vast knowledge, these diseases can be diagnosed. Experts detect plant diseases with naked eye observation but that requires continuous monitoring of plants and high cost when done on large farms. However, in some remote areas farmer do not have idea or facilities to contact experts and they need to travel far off, which is time consuming, and of high cost.

It is easier and cheap to detect diseases just by seeing the symptoms in the plant diseases. Automatic detection technique requires fewer efforts, less time and is more accurate. We can prevent this heavy loss in crop by accurate detection and

Classification of diseases. Image of the affected plant is captured and processed with image processing technique. Since different plant have many different diseases, a database that contains all this information can be developed on the cloud. Farmers will be facilitated by providing them GUI developed with android and make them access that through cloud.

IoT is a tremendous articulation depicting the association of regular day to day existence assets or questions through the web. In IoT, each protest (having a one of a kind identifier of it) interfaces with each other utilizing that extremely same identifier to dodge any human-to-human correspondence [1]. IoT is interconnection

of regular items having pervasive system. The joining of installed framework for cooperation expands the pervasiveness of items.

RELATED LITERATURE AND STUDIES

TABLE I. LITERATURE REVIEW

Authors	*Techniques*	*Remarks*
Sachin D. Khirade, A.B Patil [2]	K-means clustering	Found the key to prevent the losses in the yield by identifying quantity of the agricultural product.
Dr. K. Thangadurai andK.Padma vathi	Computer vision, Image enhancement, Histogram equalization	To improve the image clarity, color of the affected plant, conversion and histogram equalization is assured.
S.S.Sannakk i and V.S. Rajpurohit[3]	Back-propagation Neural Network classifier	The detection and classification of diseases are up to 97.30%.
SmitaNaikw adi, NiketAmoda [4]	k-means clustering	RGB is converted into CCM (color co-occurrence method) for color feature extraction.
YuanTian, Chunjiang Zhao, ShenglianLu and XinyuGuo[5]	SVM-based Multiple Classifier System	Proposed method for disease detection in wheat leaf. Features like color, texture and shape features are used as training sets for classifiers.

The rest of the paper is arranged in the following sections:-

Section II contains the methodology adopted and Section III details about techniques used to achieve desired result, followed by Section IV that contains the results and discussions.

II. METHODOLOGY

The image processing is used in agricultural applications to detect diseased plant part, to quantify affected area by disease, shape, color etc. Its operates on a single mobile phone equipped having a color camera. Professional agriculturists have easier access to the analysis results on the remote cloud or database and the pictures taken by and stored in the phone. The producer can use his phone, which is having pre-installed plant disease recognition application when he desire to check the condition of the plants. [6]
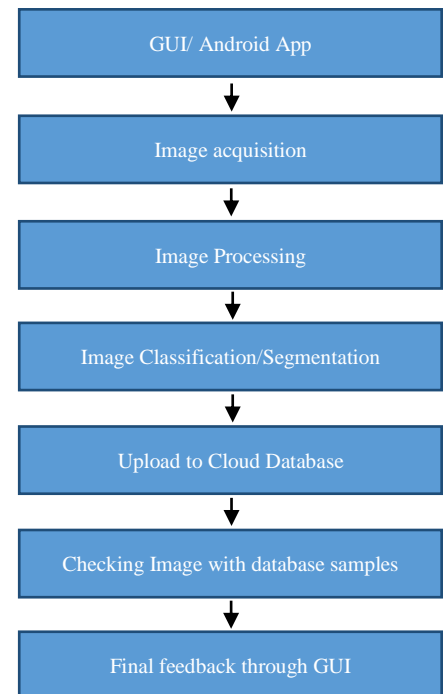

Fig. 1. Proposed methodology to design assembled system.

In image acquisition, the high quality image is obtained to create the required database of plant diseases. Efficiency of quality of database image depends on this step, so high quality RGB color images are required.

In image pre-processing, original image is enhanced by converting into grayscale

image. The noise is removed through image enhancement, RGB color image is converted into HSV plane image. Image representation is improved so that image can be analyzed properly.

Segmentation of images refers to partitioning of images into different parts having some similarity. Further, this technique plays an important role for identification of an object in image segmentation.

In feature extraction, disease portion is extracted from the image after applying segmentation. In leaf disease detection, various classifiers are used to classify the disease of data. The classification is based on healthy and affected/diseased leaf or other parts of plant. The various features that are to be extracted are discussed in coming sections.

III.   TECHNOLOGY USED

A. Feature Extracted

Various features extracted from normal and diseased plant are discussed in this section. Color moments represents color features that are extracted from color information on the leaf by using statistical calculations such as mean (μ), standard deviation (σ), skewness (θ), and kurtosis (γ). [7]

B. Classifier Algorithms

Various classification techniques used to classify are discussed in brief.

- Probabilistic neutral network (PNN) is a feed forward network derived from Bayesian network and a statistical Algorithm called Kernel Fisher discriminant analysis. [7]
- KNN (k-nearest neighbor) is the easiest classifier as compared to other machine learning techniques in which we identify by differentiating the closest neighbor. Efficiency of KNN depends upon the calculation of minimum distance between the chosen purpose and the different points in the image. It is the type of instance – based on learning or lazy

learning – in which we approximate the function locally and defer all computation until classification.
- Fuzzy classifier used to find different organic process deficiencies in feather palm plant. Different parameters as of color and texture options are extracted and submitted to fuzzy classifier after the segmentation. It reveals the amounts of fertilizers required to correct those deficiencies.
- In neutral networks variety of size and colors, each RGB and HIS representation on the segmented image is extracted and then fed to neutral networks and confirm the plant condition as per applied mathematics classifiers.

C. Cloud computing

Cloud computing is related with computing infrastructure and big data processing method for various resources. The purpose of cloud computing is to access large amounts of computing power, through the aggregation of resources, and to provide a single system view. Through cloud computing large and complex computing is done. [8]

D. Android

Android is one of the latest technologies with lots of applications and available widely to most citizens. GUI will be developed to facilitate the user during the entire process of disease detection and final measures. The app will be used to acquire and store the image locally on the phone storage. Further, the image will be uploaded to cloud database for processing, segmentation and diagnosis results.

E. Equations [9]

- Mean

$$\mu = \frac{1}{mn}\sum_{i=1}^{m}\sum_{j=1}^{n}(P_{ij}) \qquad (1)$$

- Standard Deviation

$$\sigma = \sqrt{\frac{1}{mn} \sum_{i=1}^{m} \sum_{j=1}^{n} (P_{ij} - \mu)^2} \qquad (2)$$

- Skewness

$$\theta = \sum_{i=1}^{m} \sum_{j=1}^{n} (p_{ij} - \mu)^3 \qquad (3)$$

- Kurtosis

$$\gamma = \frac{\sum_{i=1}^{m} \sum_{j=1}^{n} (Pij - \mu)^4}{mn\sigma^4} \qquad (4)$$

Texture Features equations used are given below: [10]

- Angular Second Moment (ASM)

$$\sum_{i,j=0}^{N-1} P_{i,j}^{2}$$

- Contrast

$$\sum_{i,j=0}^{N-1} P_{i,j}(i-j)^2$$

- Inverse Difference Moment (IDM)

$$\sum_{i,j=0}^{N-1} \frac{1}{1+(i-j)^2} p(i,j)$$

- Entropy

$$\sum_{i,j=0}^{N-1} -\ln(P_{i,j}) P_{i,j}$$

- Correlation

$$\sum_{i,j=0}^{N-1} P_{i,j}^{2} \frac{(i-\mu)(j-\mu)}{\sigma^2}$$

$P_{i,j}$ is ij element of symmetrical GLCM

$N = No. of\ grey\ levels\ in\ the\ image$

IV. RESULTS AND DISCUSSIONS

Plant diseases are generally classified into two types. Firstly, infectious diseases, which are caused by natural agencies, second one is non- infectious disease, which is caused by pathogens. Non-infectious diseases are generally caused due to weather (lightning, wind, drought, and strong sun), nutrient deficiency (yellowing, reddening or spotting) or by toxic substances. Fungi, bacteria, viruses, nematodes and parasitic plants, can cause infectious disease.

A. Types of Diseases

- Localized diseases: localized diseases are limited to definite area of an organ or parts of plant (e.g. leaf spots and anthracnose caused by different fungi).
- Systemic diseases: systemic diseases are those in which the pathogen spreads from a single infection point (e.g. downy mildews).
- Endemic diseases: endemic diseases are confined to particular country or district. These diseases are present in one form or other or less constantly present form year to year in a moderate to severe form, in particular country.[11]

B. Table and Figure

TABLE II.   PLANT DISEASES AND SYMPTOMS

Type of diseases	Symptoms	Ways to cure that part of the plant
Cedar-apple rust	Small, pale yellow spots on upper part of leaf surfaces in mid- to late spring.	Remove galls from infected junipers. In some cases, juniper plants should be removed entirely.[12]

Black rot canker	Leaf symptoms first occur early in the spring when the leaves are unfolding.	Prune the dead or infected branches from apple trees and grapevines, disinfecting the pruning shears with a 70 percent alcohol solution after each cut.
Powdery mildew	Small patches of white powder over leaves surface.	Can be treated by spraying fungicides (sulfur, lime-sulfur and neem oil).
Alternaria leaf spot/blight	Spots on leaf turn brown in late spring and early summer.	Use drip irrigation instead of overhead sprinklers if possible.

Fig. 2.   Powdery mildew

Fig.3.   Alternaria leaf blind

Fig. 4.   Cedar apple rust

V.   CONCLUSION

There are different traditional methods for identification of plant leaf disease such as back propagation, neural network etc. The key to decrease agriculture loss is detection and cure of plant disease. By image processing, the infected or diseased parts of the plant leaf and the cure to that part of plant can be determined effectively and utilized in a useful manner.

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