# Detection of Leaf Diseases and Monitoring the Agricultural Resources using Android App

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**ABSTRACT**: The technology based modern agriculture industries are the today's requirement in every part of agriculture in India. In this technology, the disease of plants is precisely controlled. Due to the variable atmospheric circumstances these conditions sometimes may farmer doesn't know what type of disease on the plant and which type of medicine provide them to avoid from the this disease, and also how much water is supply to the one plant. This all are methodology today farmer applying manually. It is observed that an android phone -control the Irrigation system, which could give the facilities of maintaining uniform environmental conditions are proposed. The Android Software Development Kit (Android SDK) provides the tools and Application Programmable Interface (API) necessary to start developing applications on the Android platform using the Java programming language. Today are every person are using the mobile phone for some work and almost persons have the smart phones and it become an integral part of human life serving multiple needs of humans. This application uses the GPRS [General Packet Radio Service] feature of mobile phone as a resolution for irrigation control system. This application also uses the GSM (Global System for Mobile Communication) for the communication. This communication is established using the miss call and SMS.

Remote control systems are a very useful way to control and monitor devices quickly and smoothly. This paper proposes a new architecture for remote control of agriculture devices and also detecting the disease of plant which makes a farmer's work much easier and less dependent of the conditions present.

**KEYWORDS**: GSM, irrigation, accusation, agriculture, disease, application, HIS.

## I.  INTRODUCTION

An India is basically an agricultural country, and the near about 65% of the income is based on the agricultural production, and all its resources depend on the agricultural output. In Agricultural Department technology are rapidly changing, many automatic technology are came in the market, ex. Automatic cutter machine, etc. which is help to farmer to produce maximum product. The total rainfall in a particular area may be either insufficient, or ill-timed. In order to get the maximum production yield, it is essential to supply the accurate quantity and quantity of water as well as medicine, and maintain correct timing of water and medicine. This is possible only through a systematic irrigation system-by controlling and secluding the motors. The different methods of supplying water to the farm are Surface irrigation; Sub-surface irrigation and Sprinkler irrigation, also some method for supplying the medicine to the plant is spray-by handle pump, automatic pump and sub-surface irrigation.

In irrigation the water plays main role if we gives the more than sufficient water there may be chance to effect on the plant, then if plant get disease then how the farmer knows the which type of disease are effected to the plant and in what percent the plant is effected by the disease

The image processing can be used in agricultural applications for following purposes:
1. To detect diseased leaf, stem, fruit
2. To quantify affected area by disease.
3. To find shape of affected area.
4. To determine colour of affected area
5. To determine size & shape of fruits.
Etc.

Disease management is a major task. Mostly diseases are seen on the leaves or stems of the plant. Precise quantification of these visually observed diseases, traits has not studied yet because of the complexity of visual patterns. Hence there has been increasing demand for more specific image pattern understanding [9]
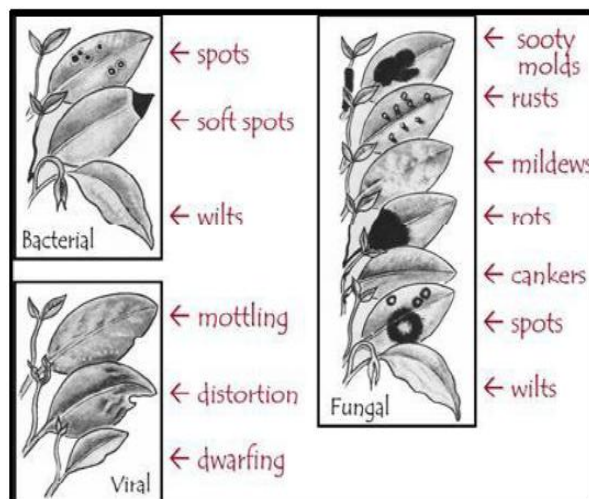


*Various Types Of Leaf Spot Diseases:*
– Bacterial
– Fungal
– Viral.

Figure 1: Various type of disease

## II. NEED

Irrigation is a crucial thing in much agricultural cropping system in humid and dry areas and efficient water application and management are major matter. The crop losses due to disease are approximately 20 to 40%, and this ration is increasing day by day we read all this ratios in papers. Farmer judge the disease by their experience but this is not accurate and proper way sometime this technique fails and farmer get loss. The disease mostly effect the leaf and on stream of plant. The disease is viral, bacteria, fungal, disease due to insects, rust, nematodes, etc. [6] on the plant; it is important job for farmer to find out this disease as early as possible. Following examples show that how disease on grape plant reduces the productivity or quality.  These are 20 to 30% of grape loss due to disease on plant [6].
Approximate, automatic, effective and rapid method for detecting the disease is required.

Figure 2: Infected leaf of grape plant

### III. LITERATURE REVIEW

Various different papers describes to detecting the disease and technique suggesting the implementation ways as illustration and discuses here.

Detection of Disease on grape leaves and its possible diagnosis by Mr. M. M. Kumbhar, S. N. Patil, [8]. Where the color and spot features could be obtained using self organizing feature together with a back- reproduction neural network. Digital image processing and image analysis technology based on the advances in microelectronics and computers has many applications in biology and it circumvents the problems that are associated with traditional photography. This new tool helps to improve the images from microscopic to telescopic range and also offers a scope for their analysis. It, therefore, has many applications in biology. Zulkifli Bin Husin and Abdul Hallis Bin Abdul Aziz developed fast and accurate method in which the chilli leaf diseases are detected using colour clustering method. Here graphical user interface is used, Yinmao Song, ZhihuaDiao, Yunpeng Wang, Huan Wang developed feature extraction methods of crop disease based on computer image processing technology. Based on color, texture and shape feature extraction method in three aspects features and their respective problems were introduced start from the perspective of lesion leaves [8].

In research [5] Feasibility study on field data acquisition system is complete. Objective of study was to develop a short packet format for able transformation of environmental parameters to some central location. The system gives better results of Authentication of data, performance of developing the packet format and correctness of data. The system is implemented for monitoring the weather data for checking accuracy of developed packet format.

In this paper consists of two phases to identify the infected type of the disease. Initially Edge detection based Image segmentation is applied, and finally image analysis and classification of diseases is performed using our proposed Homogeneous Pixel Counting Technique for Cotton Diseases Detection (HPCCDD) Algorithm. The goal of this research is identify the disease infected part of cotton leaf sport by using the image accusation technique. This work find out the computer systems which analyze the input images using the RGB pixel counting values features used and identify disease wise and next using homogenization technique and Canny using edge detection to identify the infected parts of the leaf spot to identify the diseases boundary is white lighting and then result is recognition of the diseases as result [9].

Scheduling and monitoring the agricultural resources by Mukesh Chaoudhary, Sumeet Dhote [1]. Where the actual controlling of resources in farm is control by an embedded system with the help of GSM-SMS protocol.

1. GSM-SMS protocols using GSM module independently or in grouping with internet Technologies
2. Monitoring using the Wireless technology such as Bluetooth, Zigbee, WI-FI and Radio Frequency Devices.
3. Monitoring using Wireless Sensor Networks [1]**.**

## IV. PROPOSED SYSTEM ARCHITECTURE

 For android or GSM user to control the agriculture devices an android application is downloaded which is running on smart phone. In this it includes the application for water pump motor on/off and medicine pump on/off, pesticide controller and user can schedule their tasks using this application. In this system we are using internet for connecting user with the server machine. This server has a java application which gives commands to the microcontroller to capture the image daily and send it to the user application. for capturing the photo of leaf on in farm we are using cameras. All these devices such as microcontroller, cameras are connected with the server through USB cables and connecting wires.
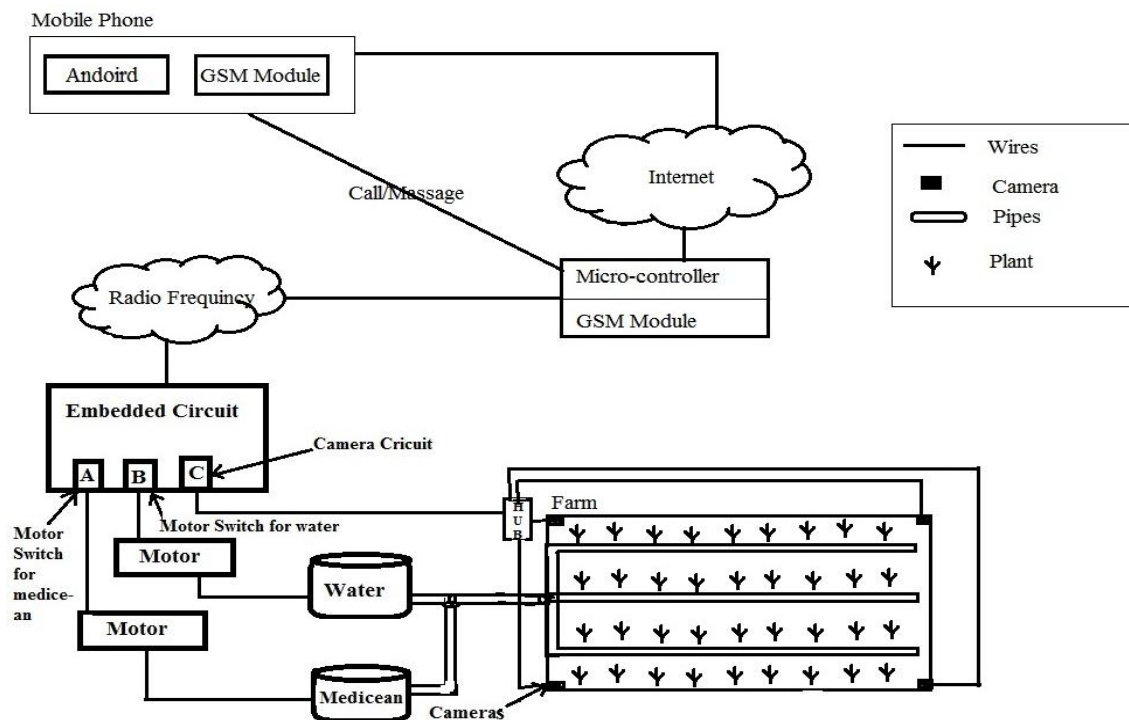


Figure 3: Architecture of proposed system

A.  Communication Technique.

a.   Short Message Service(SMS)
The user sends text messages or SMS to the receiver or GMS Module which is fitted in farm. GSM receiver receive messages sent from the user mobile phone and now this message is decoded and command is sent to the microcontroller. Microcontroller gives commands to the device connected i.e. the water pump motor or medicine motor will switch ON/OFF.
Following drawbacks are noticed in this system are as:
(1). Some Farmers are generally ignorant farmers found difficulty in typing keywords for sending control SMS. Like a on water,
(2). Working cost increases due to bidirectional flow of SMS between system and user mobile (Min. 4 SMS/day/ mobile).
(3). SMS are dependent on network traffic. So sometimes, messages use to take unswervingly long time defeating the basic purpose of system

b.    *Missed Call*

The working cost of communication between user and farm control system cell phones was further reduced by using concept of miscall where in no charges are obtained by using only ring signal for information transfer[1]. A voice call is treated as miscall when either calling side disconnects after receiving ring tones or called side does not respond to call

c.    *Android App*

Today's every person uses a Android phone for day to day life we can use this smart phone to control the activity which is performing in the farm using the android app, the user only click on the app button and action will be perform in the farm.

B.   Component

a.    *Microcontroller:* Microcontroller is used to control the operation of various machines and devices according to the program or given instructions in the memory or ROM of the Microcontroller. The working of Microcontroller is controlled by program that is called Firmware and is written in ROM. Some latest ROMs can be Re-Programmed, but mostly it does not require

b.    *Motor:* A Motor is a used to spread the water as well as the medicine in the farm, and single motor we use for both work. This is control by the microcontroller i.e. by the Android application which is use by remote user, the user can switch ON/OFF the motor any time from any where it will operate.

c.    *Camera:* A camera is fitted in the farm at corners because the bacteria's  are always entered from the corner and spade in call area, there for we fit the camera in corner and each camera capture the some image (Ex. 5/day) and Send it to the user application where the disease of the leaf is detected and proper result is shows to farmer for getting the maximum production in minimum work done. This Image Is digital image because in this image we perform the image processing.

C. Detection of Disease

We introduce an image-processing-based solution for the automated leaf diseases detection. We test our result on three diseases which effect on the plants; they are: Black rot, Downy mildew, powdery mildew. The overall concept for any vision related algorithm of image classification is almost the same. First, the digital images are acquired from the environment using a digital camera. Then image-processing techniques are applied to the acquired images to extract useful features that are necessary for further analysis. After that, several analytical discriminating techniques are used to classify the images according to the specific problem.
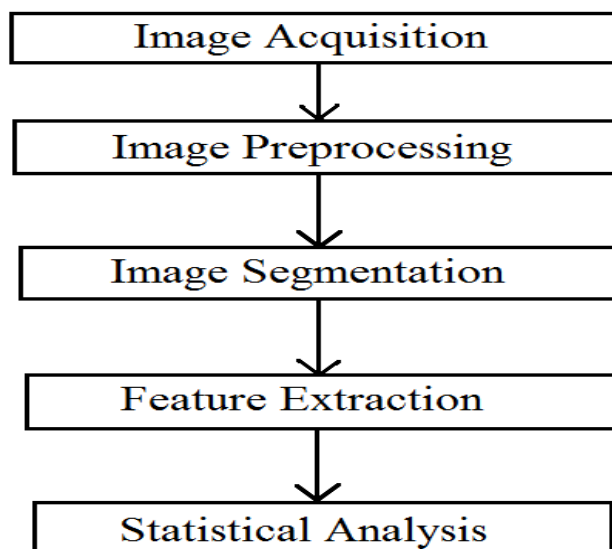


Figure 4 : The basic procedure of the proposed approach

The step-by-step procedure of the proposed system

1. RGB image acquisition
2. Convert the input image from RGB to HSV format
3. Masking the green-pixels
4. elimination of masked green pixels
5. Segment the components
6. Obtain the useful segments
7. Computing the features using color-co-occurrence methodology
8. Evaluating of texture statistics
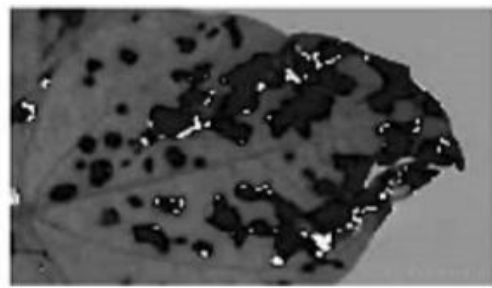


Fig 5.a. bacterial brown sop
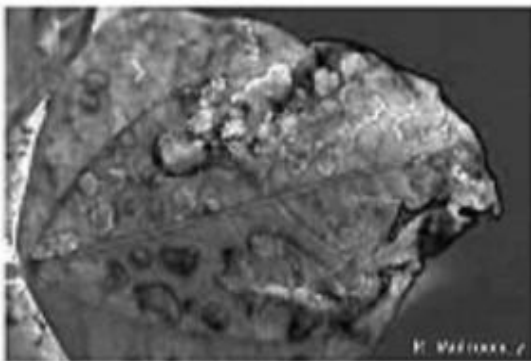


fig 5.b. Hue component



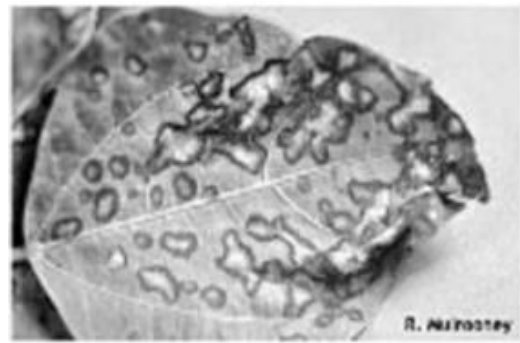Fig. 5.c.saturation component



fig. 5.d. Intensity component

Color Transformation structure: Firstly, the RGB images of leaves are acquired by the embedded system to mobile device. Then RGB images are converted into Hue Saturation *brightness* (HSB) color space representation. RGB is an ideal for color generation. I see the *HSB colour space* used all over the place. Model is an ideal tool for color perception. Colours that appear to be relatively nearer or closer to the observer. Saturation refers to the relative purity or the amount of white light added to hue and Value means amplitude of light. After the transformation process, A third component of the mode, the epode is sometimes delivered after the strophe. Saturation and Value are dropped since it does not give extra information [3].

## V. MATHEMATICAL MODEL

Let communication between mobile device and MC denoted by s1, where
  s1= {I, Θ,  Fme, Ff , Ø , C}
I=set of input, where
    Ci, type call input

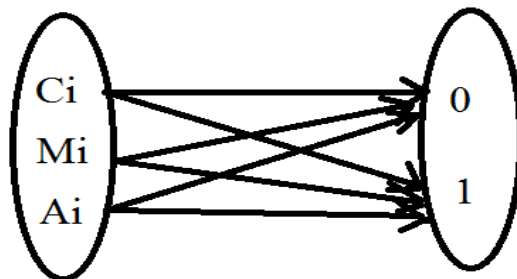Mi, type message input
Ai, type application input

|  Domain |  Range |
|---|---|

Let us say, type Ci input as case1,type Mi
Input as case2 and type Ai input as case3

Case I: I= {Ci/Ci ε {0,1} ψ i=0,1,2....N}
Case II: I= {Mi/Mi ε {I} ψ i=0,1,2,....N}



Case III: I= {Ai/Ai ε {0,1} ψ i=0,1,2,....N}

I={Ci, Mi, Ai}
let Θ be set of output
Θ = {Si/Si ε {0,1} A i=00,1,2,....N}
Let Fme the function implemented at micro control Module
Fme= f(x)

f(x)={{Ci,0},{Ci,1},{Mi,0},{Mi,1},{Ai,0},{Ai,1}}
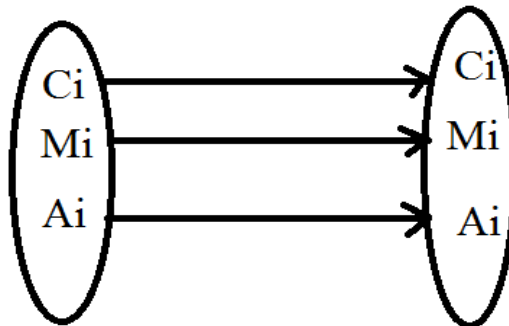Let f be in build module
f=f(r)={{Ci,Cj},{Mi,Mj},{Ai,Aj}}

Figure 6: One to One Relationship

Let Ø be set of constraints
Ø={I/I ℂ{Ci, Mi, Ai}i=1.........N}
Let l be completeness part
Case 1= if l ℂ I & = l ε Ø , the result will be NP Hard



Case 2=∧, €,,&, I , Ø, will take in polynomial time
.

## VI. PROJECT SCOPE

It is useful for farmer, greenhouse owner to perform their task. This is fully automated system which works with less man power and user can perform the following things:

- ✓ Remote user can on/off water pump using internet/call/message.
- ✓ Remote user can on/off medicine pump using internet/call/message
- ✓ Automatically get information about the medicine.
- ✓ Application gives the current disease status of plant.
- ✓ Gives the information of medicine for particular disease.
- ✓ Observe and look after the farm from anywhere.
- ✓ Automatic schedule the daily farming activities.
- ✓ Daily Reminders to farmer about their schedule activity.
- ✓ Automatic on/off water pump if user fails to give command.
- ✓ Automatic on/off Medicine pump if user fails to give command.

## VII.     ACKNOWLEDGMENT

## VIII.     CONCLUSION

An application of detect the plant disease and also control, schedule and monitors the all agricultural recourses gives help to farmer to utilized the work as well as time. From this application farmer can reduce their effort, and also increase the production of farm. As from our method we find the plant disease from the percentage of infected holes on the leaf from that we calculate disease. After calculating the disease this application helps the farmer to choose an appropriate medicine for the particular disease.

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