Abstract: The agricultural plants need to monitor for control and management of plant disease yield plant harvesting. In this system we use mobile phones for real-time monitoring of plant disease for proper diagnosis and treatment. A central server is placed at the pathological laboratory for sharing of the data collected by the mobile phones. The part of the processing carried out in the mobile device includes leaf image segmentation and spotting of disease patch using improved k-means clustering. The collected information is processed at the central server and appropriate action is taken according to the test cases.

Keywords: mobile vision; m-Agriculture; plant disease diagnosis; unsupervised segmentation; power conservation.

I. INTRODUCTION

The primary purpose of Energy Efficient Mobile Vision System for Plant Leaf Disease Identification is to provide a clear and descriptive “statement of user requirements” that can be used as a reference in further development of the software system. This document is broken into a number of sections used to logically separate the software requirements into easily referenced parts.

This report aims to describe the Functionality, External Interfaces, Attributes and Design Constraints (IEEE Std.830-1993) imposed on Implementation of the software system described throughout the rest of document. Throughout the description of the software system, the language and terminology used should unambiguous and consistent throughout the document. Now a days, world is like a global village due to computerization and internet facility. Here we are interested to introduce a new concept for advanced, well-educated and interested farmers who are adopting latest technologies in farming. We are providing the facilities like guidance regarding different plants, market updates of different commodities, different diseases and the treatments on different plants like fruits, and grains., Experts opinions on different diseases on crops and animals, maintaining dealers information of different cities.

II. LITERATURE SURVEY

A literature survey is studying several scholarly papers on the said topic, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature review is focused on a research questions, trying to identify, appraise, select any synthesize all high quality research evidence and arguments relevant to that question

[1] H. Al-Hiary, S. BaniAhmad, M. Reyalat, M. Braik, Z. ALRahmeneh in Energy Efficient Mobile Vision System for Plant Leaf Disease Identification. The paper discusses that it provides faster and more accurate solution. The experimental results demonstrate that the proposed technique is a robust technique for the detection of plant leaves diseases. The developed algorithms efficiency can successfully detect and classify the examined diseases with a precision between 83% and 94%, and can achieve 20% speed.

[2] Anand. H, Kulkarni, Ashwin Patil R. K. in Applying image processing technique to detect plant diseases. The paper discusses that developed good classification system for plant diseases. The Gabor filter is used for segmentation and Artificial neural network is used for classification of diseases. Artificial neural network based classifier is adopted which uses the combination of color and texture feature to recognize and classify different plant diseases. Experimental result showed that classification performance by ANN taking feature set is better with accuracy 91%.

[3] S. Arivazhagan, R. Newlin, Shebiah S., Ananthi, S. Vishnu Varthini in Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features. The paper discusses that automatic detection of plant diseases is an essential research topic as it may prove benefits in monitoring large fields of crops, and thus
automatically detect the symptoms of diseases as soon as they appear on plant leaves.

[4] Arti N. Rathod, Bhavesh, Tanawal Vatsal Shah in Image Processing Techniques for Detection of Leaf Disease. The paper discusses that it indicates the neural network classifier that is based on statistical classification support accurate and automatic detection of leaf diseases with a precision of around 93%. K-means clustering provides an efficient result in segmentation RGB image.

Existing system
In recent days, there has been an attempt to assist the farmer by telephony service but, this service is not 24X7 hours service. Sometimes, the farmers are not able to connect with experts due to communication failures. Another important problem is that in a critical situation, if the farmers are not able to explain or if the disease is a new one, then farmers would not be able to identify the diseases of the crops. Captured images from crop surfaces can provide a better solution where the remote agriscientist can see instantly the image for disease diagnosis. Similarly, captured skin, face, or other images through the developed application may be sent to expert doctors to extend telehealth advice to remote areas.

2. Telephonic Suggestion

III. PROPOSED SYSTEM
To develop a remote diagnosis system for monitoring, control and management of agricultural production through use of advanced technology, especially image processing and computer vision, information and communication technology, and mobile technology. Mobile-based agriculture (m-Agriculture) refers to the delivery of agriculture-related services via mobile communications technology. In order to inform decisions on agricultural measures to optimize plant growth, it provides for individual decision-support systems and services which are based on localized contextual information, i.e. delivering location-specific information based on climatic patterns, soil and water conditions. It also involves gathering relevant data through mobile technologies like automated weather stations or systems equipped with sensors for location-based collection. Thus, m-Agriculture involves two-way advisory systems that provide individual feedback and advice such as remote diagnosis of diseases by experts. These systems typically include the use of smartphones and intermediaries for the communication with farmers and require remote sensing instruments and GIS.

Proposed Methodology
A. Leaf image segmentation
In image, video and vision applications image segmentation is a fundamental step to separate homogeneous regions. For image analysis and image understanding, proper segmentation is a necessary condition. Features such as color histogram, texture or edge-based methods are used for finding homogeneous regions in an image. Image segmentation methods are classified as supervised or unsupervised. In our work, we propose to use K-means clustering approach for color leaf image segmentation. An image is composed of foreground and background. In our work, we assume that the leaf image is available with simple and uniform background.

B. Selection of diseased patch
The image of the diseased leaf captured by the mobile device in the field needs to be transmitted to some central server present in the pathology laboratory. In White et al. captured and transmitted the complete image to a tablet PC located nearby. However, this requires a proper connection and a high-speed Internet connectivity.

Mobile Application Development
The mobile application consists of 5 basic functionalities. They are
1) Training
2) Image Capture
3) Image Selection
4) Image Acquisition
5) Pre-processing

I. Training
In this module, necessary input is fed to the system in the form of images of the leaf. The
system applies necessary steps to extract values for vital parameters from the image. This image along with these parameters with their values and other essential information is stored in the database. These functions are performed by the admin from his login screen.

2. Image capture
At the very first page of the application, the application bar shows the icon for capturing image using the application. On navigation of the menu, the user gets to take image on shutter click event using the phone.

![Image capture using mobile](image)

Figure 2: Capturing leaf disease image using mobile

3. Image selection
In case of previously taken pictures of paddy, the application navigation menu also contains the option of selecting an image from the existing photo library of the phone.

4. Image Acquisition
This module is a part of the app installed on the android mobile. This module is initiated whenever the user intends to discover details about any leaf. Using this module, the user can submit the image of the leaf for its identification by the system. This module captures the image and sends it to the central server for processing.

5. Pre-processing
Using this module, the image captured from the user’s mobile is subjected to necessary pre-processing. In this method, the image is converted into a standard binary format from other format like colour or gray scale. This pre-processed binary image is then subjected to identification wherein the vital parameters of the leaf are extracted for its comparison.

6. Identification
In this process, the vital parameters of the leaf are extracted for its comparison with the ones stored in the database. The algorithm is applied on the pre-processed image for its comparison. The image which has maximum of its characteristics matched with the ones stored in the database is displayed to the user for viewing further details about the leaf.

IV. ALGORITHM

A. Feature Extraction
In this process, the area of coin is taken as the reference. Adjust the distance between the camera and the leaf.

**Algorithm:**

1. start
2. acquire the leaf image
3. convert colour image to gray scale
4. convert gray scale to binary
5. count number of pixels in the leaf vicinity
6. multiply pixel count with one pixel value
7. compare with database image
8. stop

B. Edge Detection
Every leaf is having its own edge features. Some leaf boundaries are saw tooth, some are smooth and some are wavy so on. Also midrib alignment and vein pattern of leaves are different. Hence this algorithm is used to extract this information. Here Canny edge detection algorithm is used.

**Algorithm:**

1. start
2. acquire the leaf image
3. convert colour image to gray scale
4. apply Canny edge detection algorithm
5. calculate histogram
6. compare with edge histogram of the database image
7. stop

C. Colour Histogram
Every leaf is having its own colour with varying intensity. Some are green; some are yellow, red so on. Even though we consider green coloured leaf its intensity will be different. Hence this part of algorithm extracts this information from an input leaf.

**Algorithm:**

1. start
2. acquire the leaf image
3. apply Canny edge detection algorithm
4. calculate histogram
5. calculate the difference with the database image
6. stop.
V. EXPERIMENTAL RESULTS

The complete system is designed using OpenCV and Android operating system. The minimum hardware requirement for mobile devices is 1 GHz processor and 256 MB RAM. Here, though multi-core processors are available, the experiments are carried out on single core processor to actually measure the computational cost and time factor associated with it. A total of 297 diseased leaf samples are captured using different mobile devices at different resolutions. The segmentation results of few leaf samples are shown in Fig.5. Clearly, it is seen that the segmented leaf image requires less transmission cost to transfer over a wireless medium. The transmission link used in our experiments is a high speed wireless connection of 54Mbps.

V. CONCLUSION

After reviewing above mentioned techniques and methods we can conclude that there are number of ways by which we can detect disease of plants. Each has some pros as well as limitations. On one hand visual analysis is least expensive and simple method, it is not as efficient and reliable as others. Image processing is a technique most spoken of very high accuracy and least time are major advantages offered, but it backs away when implementing practically. Alongside the supply of cultivation tools, the farmers also need access to accurate information that they can use for efficient crop management and there is no better way than providing them a service that they can use through their mobile phones. Our undertaken project is thus going to be useful for farmers by providing an useful plant leaf identification system and will eventually identify their diseases.
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VII. REFERENCES


