A Survey on Leaf Disease Detection by Using K-means Algorithm

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Abstract: **The ultimate need of this world is the best farming which ensures the development of each country as the survival of human being is completely dependent on farming and its best production. The problem observed in various region of farming is the early crop diseases Occurring and making the crop production at low level. To avoid this, many researchers have been done and different techniques are used to detect early crop diseases and to apply the preventive measures for it. The expert systems have been proposed for this purpose. It is often based on facts described by the user. The recognition of a disease can often be based on symptoms like lesions or spots in various parts of a plant. The color, area and the number of spots present in the leaf can determine the disease that has affected a plant. This paper presents an algorithm which is used for automatic detection of plant leaf diseases.**

I. INTRODUCTION

The agricultural land mass is more than just being a feeding sourcing in today's world. Indian economy is highly dependent of agricultural productivity [3]. Therefore, in field of agriculture, detection of disease in plants plays an important role. To detect a plant disease in very initial stage, use of automatic disease detection technique is beneficial [1] and [5]. The agricultural production cost can be significantly increased if plant diseases are detected and cured in their early stages [4]. The plants have to be observed all the time to detect the first symptoms of a disease before it is spread to the whole crop [8]. Professional agriculture engineers may not be available to continuously monitor a crop if for example the crop resides in a distant region .The existing methodology for plant disease detection is simply naked eye observation which is done by experts through which identification and detection of plant diseases is done [6]. For doing so, a large team of experts as well as continuous monitoring of plant is required, which costs very high when we do with large farms. At the same time, in some countries, farmers do not have proper facilities or even idea that they can contact to experts [9]. Due to which consulting experts even cost high as well as time consuming too. In such conditions, the suggested technique proves to be beneficial in monitoring large fields of crops. Automatic detection of the plant diseases by just seeing the symptoms on the plant leaves makes it easier as well as cheaper[7]. Plant disease identification by visual way is more laborious task and at the same time, less accurate and can be done only in limited areas. Whereas if automatic detection technique is used it will take less efforts, less time and become more accurate. In plants, some general diseases seen are brown and yellow spots, early and late scorch, and others are fungal, viral and bacterial diseases. The progression of the symptoms in time can vary significantly depending on the biotic agents and they can be classified as primary or secondary. More than one pathogens can infect concurrently a plant. The symptoms that appear in this case may differ from the symptoms caused by the individual pathogens. The symptoms of a pathogen can be often expressed as fungal or bacterial leaf spots. Vein banding, mosaic and ring spot can also appear [2]. The leaves can be distorted or a powdery mildew can appear. Spore structures may also be present. The plants can be also be injured by air pollution or by soil/air chemicals.

II. LITERATURE REVIEW AND RELATED WORK

A study has been done for feature extraction of plant disease. This provides technological push up by describing various algorithms and calculation methods to calculate various components required for image-based leaf disease detection .Basically, for any research work, literatures help the researchers to motivate for the innovation of a new concept for the successful result. Many research works have been published regarding the advancements of image processing for feature extraction and classification. Some researchers have suggested that a fast and accurate new technique is developed based on computer image processing.

2.1. Existing System:

Generally, farmers detect plant diseases by visual observation which is based on their experience or knowledge [10] .Some government departments also help farmers to do /this work. But when we think about an electronic expert system for leaf based plant diseases detection, in current scenario this kind of system is not available for day to day use [12]. An android application may boost this concept and make available these researches for end users who actually need this kind of technology in their day to day life. In Existing System to get the solution for a particular crop disease, one needs to communicate the agricultural department. Otherwise one needs to search the web randomly [11]. This does not provide

the exact solution and all the persons cannot communicate with the agricultural department. More over the process is highly time consuming.

2.2. Analysis of Problem:

In modern agricultural system, enormous computational methods and techniques have been developed to help farmers to monitor the proper growth of their crops. In ancient agricultural system, the naked eye observation by the farmers or experts is the main approach adopted for detection and identification of crop diseases under microscopic conditions in laboratory. However, this approach requires continuous monitoring of experts which might be quite expensive in large farms. Further, in some developing countries, farmers have to go long distances to contact the experts, this makes consulting experts too expensive and time consuming. The basic problems with crop are to make a fast and accurate recognition and classification of the diseases by observing the infected leaf images. There are two main characteristics of leaf-disease detection machine-learning methods that must be achieved, they are: speed and accuracy. The disease diagnosis of different crops has traditionally been done manually. Several efforts have been done to automate the process of disease identification and provide solution for corresponding disease.

III. PROPOSED SYSTEM

The proposed system runs on PHP as Server-side application and provides an Android Mobile application in client side. Here the administrator in server side uploads the crop disease information and images to the server. The client needs to login the system and needs to upload the image to the server and the search process is done in server and the correct match is found and the solution to the crop disease is sent to the client-side mobile application as response. Image segmentation is the classification of an image into different groups. Many researchers have been made in the area of image segmentation using clustering. There are different methods and one of the most popular methods is k-means clustering algorithm. K - means clustering algorithm is an unsupervised algorithm and it is used to segment the interest area from the background. Subtractive clustering method is one of the data clustering method where it generates the centroid based on the potential value of the data points. So subtractive cluster is extensively being used to generate the initial centers. The centers are used in k-means algorithm for the image segmentation. Then the segmented image is filtered to remove any unwanted region from the image. The most common algorithm uses an iterative refinement technique. Due to its ubiquity it is often called the k-means algorithm; it is also referred to as Lloyd's algorithm, particularly in the computer science community .Given an initial set of k means m1 (1)… mk (1) (see below), the algorithm proceeds by alternating between two steps:

Assignment step: Assign each observation to the cluster whose mean has the least squared Euclidean distance, this is intuitively the "nearest" mean. (Mathematically, this means partitioning the observations according to the Voronoi diagram generated by the means).

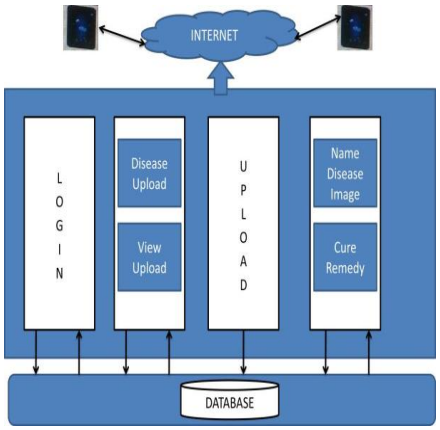
$$s(t) = \{xp: ||xp - m(t)|| \leq ||xp - m(t)|| \forall j, 1 \leq j \leq k\} \quad (1)$$

Where each x_p is assigned to exactly one $S^{(t)}$, even if it could be assigned to two or more of them.

Update step: Calculate the new means to be the centroids of the observations in the new clusters.

$$m(t+1) = \frac{1}{|s(t)|}\sum_{xj\epsilon s\,(t)}^{\infty} xj \text{ --------(2)}$$

By using this algorithm we can effectively identify the disease present in the crop. It is one of the fast and accurate techniques used to identify the disease and provide solution for the corresponding disease. The accuracy rate is found to be increased in this technique when compared to all other techniques of image comparison.



K-Means:

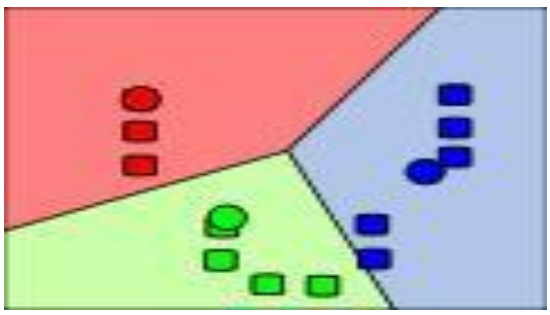
Using k-Means Segmentation and Clustering algorithm the comparison of the uploaded leaf image with the server side data is performed and the matched result is send to the client side Android application. It reduces the time in getting the solution. In computer vision, **segmentation** refers to the process of partitioning a digital image into multiple regions (sets of pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. The result of image segmentation is a set of regions that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture.

The K-means algorithm is an iterative technique that is used to partition an image into *K*clusters. The *K*-means algorithm assigns each point to the cluster whose center (also called centroid) is nearest. The center is the average of all the points in the cluster — that is, its coordinates are the arithmetic mean for each dimension separately over all the points in the cluster...

Example: The data set has three dimensions and the cluster has two points: $X = (x1, x2, x3)$ and $Y = (y1, y2, y3)$. Then the centroid Z becomes $Z = (z1, z2, z3)$, where $z1 = (x1 + y1)/2$ and $z2 = (x2 + y2)/2$ and $z3 = (x3 + y3)/2$. Admin creates new crop category. Later disease can be added to the category. Second, the disease can be uploaded in the server. It contains category of plant, crop name, disease name, description and solution with the disease leaf image. Update the details and provide security to the records. Lists the set of disease leaf records to the admin and delete option to remove unwanted records. Client first registers his information to the server. Once registered the information is stored in the server. Then after giving correct credentials the user logins the system. Uploads the disease image. Receives and displays the result got from the server. Android Client application communicates with the PHP Server side application using Apache HTTP Client Library. Communicates via Request object and response is handled by Response object and is processed by android handler.

IV. CONCLUSION

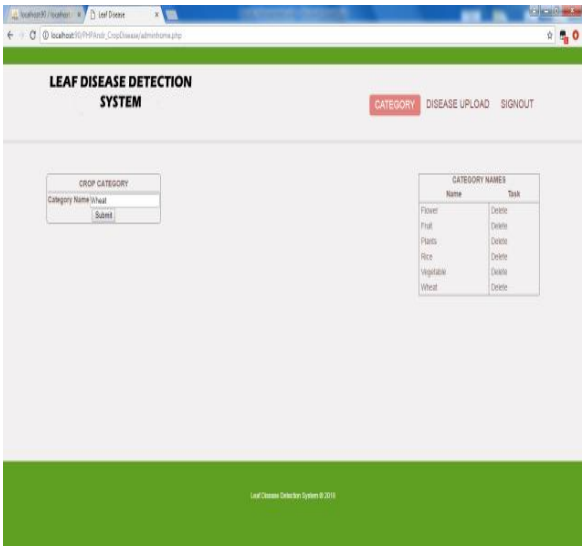
Hence a user friendly and time saving application is developed using PHP and the Android. Since android is the only device used by all the population this application reaches very quickly than any other applications. A user-friendly

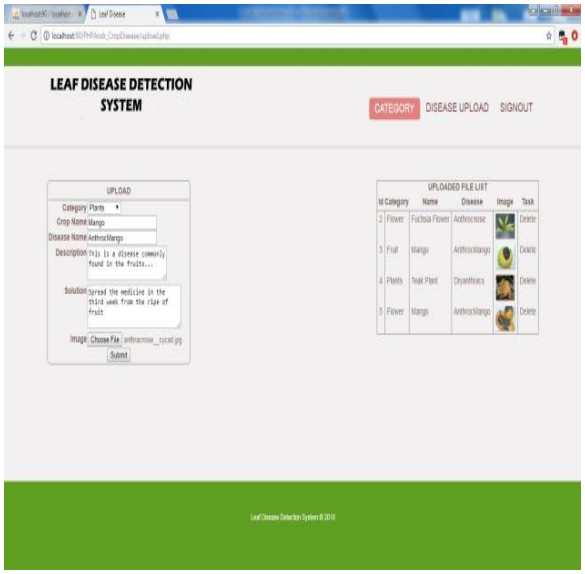


System runs in both Server side and Client-side mobile application which provides solution for Leaf disease detection is developed. Its functionality is defined in both comparison of Image and client server technology. In Future we can implement Sensors and Artificial Intelligence so that to measure the severity of disease accurately and recover rate of the plant is also be calculated.

V. RESULT

Admin creates new crop category. Later disease can be added to the category. Second, the disease can be uploaded in the server. It contains category of plant, crop name, disease name, description and solution with the disease leaf image. Update the details and provide security to the records. Lists the set of disease leaf records to the admin and delete option to remove unwanted records.





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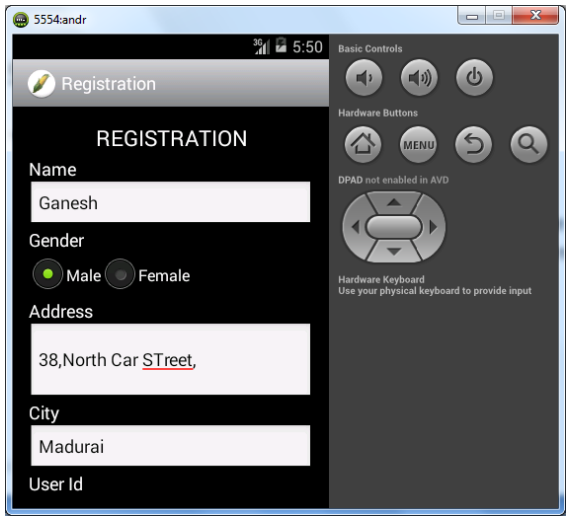

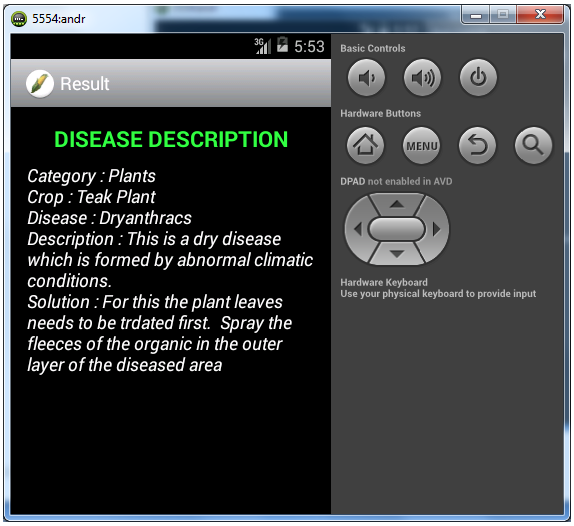

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