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Plant Health Monitoring Using Image Processing

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Abstract – **Agriculture has become much more than simply a means to feed ever growing populations. It is very important where in more than 70% population depends on agriculture in India. That means it feeds great number of people. The plant diseases affect the humans directly or indirectly by health and also economically. Identification of the plant diseases is a very vital process to avoid the losses in both quality and quantity of leafs in agricultural production system. This Project deals with digital image processing techniques for detection, processing and identification of plant diseases. Diseases can affect at any part of plant especially in leaf. This Project includes only those methods to identify disease in leaves. Disease symptoms will be visible on leaves. It is very tough job to monitor the plant diseases manually. Manual plant disease monitoring system needs more processing time and expertise in the plant disease. So a fast, automatic and accurate approach to identify the plant diseases is needed. Hence, image processing techniques are used for the detection, processing and identification of plant diseases because these techniques are fast, automatic and accurate. Traditional method of checking diseases in plants is through visualization but this method is not so relevant in detecting the diseases associated with plants. So we can provide a better alternative, fast and accurate detection by using image processing techniques which can be more reliable than some other old methods.**

Keywords— plant, disease, SVM, image processing, clustering, segmentation

1. INTRODUCTION

Plants become an important source of energy and only a primary source to the problem of global warming. The damage caused by emerging, re-emerging and endemic pathogens, is important in plant systems and leads to potential loss economically. In addition, Leaf diseases contribute directly and indirectly to the spread of human infectious diseases and environmental damage. As these diseases are spreading worldwide causing damage to the normal functioning of the plant and also damaging the financial condition by significantly reducing the quantity of Leafs grown. The Leaf production losses its quality due to much type diseases and sometimes they occur but are even not visible with naked eyes. Farmers estimate the diseases by their experience but this is not proper way.

Generally, the plant is affected by diseases, pests, unfavourable conditions and nutrition deficiency. The symptoms and the losses caused by these diseases and pests are different and their life cycles are also different hence the adopted control measure are also completely different. Plant diseases are mainly originated by parasitic and non-parasitic causes.

The main approach adopted in practice for detection and identification of plant diseases is naked eye observation of experts. The decision making capability of an expert also depends on his/her physical condition, such as fatigue and eyesight, work pressure, working conditions such as improper lighting, climate etc. That's why this is not a proper way and also time consuming. It might be expensive as continuous monitoring of experts in large farms. So, we need a fast way and remote sensing form to protect the Leaf from disease. The leaf area monitoring is an important tool in studying physiological features related to the plant growth, photosynthetic & transpiration process. Also being useful constraint in evaluate, injure caused by leaf disease and pastes, to find out water and environmental stress, need of fertilization, for effective management and treatment .The classification and recognition of Leaf diseases are of the major technical and economic importance in the agricultural Industry. The main diseases of plants are viral, fungus and bacterial disease. The viral disease is due to viral changes in environment, fungus disease is due to the presence of fungus in the leaf and bacterial disease is due to presence of germs in leaf or plants.

Automatic detection of plant diseases is an essential research topic as it may prove benefits in monitoring large fields of Leafs and thus automatically detect the symptoms of diseases as soon as they appear on plant leaves. Therefore looking for fast, automatic, less expensive and accurate method to detect disease by calculating leaf area through pixel number statistics.

The system consists of a mobile application, which will enable the farmers to take images of plants using their mobile phones and send it to a central server where the central system in the server will analyze the pictures based on visual symptoms using image processing algorithms in order to measure the disease type. An expert group will be available to check the status of the image analysis data and provide suggestions based on the report and their knowledge, which will be sent to the farmer as a notification in the application. Automatic

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detection of plant diseases is an important research topic these days as it may prove benefits as automatically detect the diseases from the symptoms that appear on the plant leaves

RELATED WORK

]Let's have a brief overview of the various Projects, which I have referred for implementation of my project. The usage of image processing technology for plant disease degree grading eliminates the subjectivity of traditional classification methods and human-induced errors. Thus the estimation credibility is improved and accurate data are provided for disease studies. The method is also convenient, which simply needs computers, digital cameras with the Combination of necessary software programs to realize for the disease batch grading. The correct recognition and classification of the plant disease is very essential for the successful cultivation of the Plant and this can be done by using image processing. The basic steps for disease detection using image processing include image acquisition, image pre processing, feature extraction, detection and classification of plant disease . Enhanced images have high quality and clarity than the original image. Colour image have primary colours red, green and blue. It is difficult to implement the application using RGB because of its range. Hence they convert RGB to grey images . recognition of plant disease through some automatic technique is beneficial as it reduces a large work of monitoring in big farms of Plants and at very early stage itself detects the symptoms of the disease. They have presented a survey on various classification techniques . Abdul hallis et al in their Project, have used MATLAB for feature extraction and image recognition. Here digital camera is used for image capturing.

Plant leaves diseases, its detection and diagnostic method is a scientific method. Digital image processing is a technique which is used and implemented in detection of diseases in pants. The image pre-processing is used to get clear, noiseless enhanced leaves images. These enhanced images are used to leaves diseases detection and its analysis. Various types of images are used in image pre-processing. Generally, plant leaves image colour and texture is an unique features, which are used to detect and analyze the diseases. This Project considers Greyscale and RGB images of infected plant leaf detection and their analysis gives the solution which is suited for the disease occurrence.

In this paper consists of two phases to identify the affected part of the disease. Initially Edge detection based Image segmentation is done, and finally image analysis and classification of diseases. This work the input images using the RGB pixel counting values features used and identify disease wise and next using homogenization techniques Sobel and Canny using edge detection to identify the affected parts of the leaf spot to recognize the diseases boundary is white lighting and then result is recognition of the diseases as output.

Rabia Masood developed Genetic algorithm based system whose Disease detection efficiency is about 73%. Cotton leaves were used for experimentation.. Limitation of existing work:

- The implementation still lacks in accuracy of result in some cases. More optimization is needed.
- Priori information is needed for segmentation.
- Database extension is needed in order to reach the more accuracy.
- Very few diseases have been covered. So, work needs to be extended to cover more diseases.
- The possible reasons that can lead to misclassifications can be as follows: disease symptoms varies from one plant to another, features optimization is needed, more training samples are needed in order to cover more cases and to predict the disease more accurately.

PROPOSED SYSTEM

These proposed works are more focus on Detection of disease on the Plant leaf using Android. Firstly capture image from digital camera (mobile camera). Most probably the camera with some limitations and criteria will be considered. The captured image will be considered for further feature extraction, using one of the above algorithms. There are many features of images that are to be extracted, but we in our proposed system are going to consider some of them. The below system architecture shows the actual work flow of the concept that we are working on. The main focus of this proposed work is to help the farmers, distress from loss due to imperfect information of a choice of diseases. The concept should be more user-friendly so, we are focusing on language translation too.

There are various image processing techniques applied to detect the disease. Image processing is used to get helpful description that can prove important for additional process. With image processing, SVM and k-means is also used, k-means is an algorithm and SVM is the

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classifier. Then next various techniques are to use to get and result in hand.

Advantages

•It will have less use of manpower.
•There will be increase in productivity of Plant.
•This system has low cost and provides easy detection of leaf diseases.

SVM and K-means

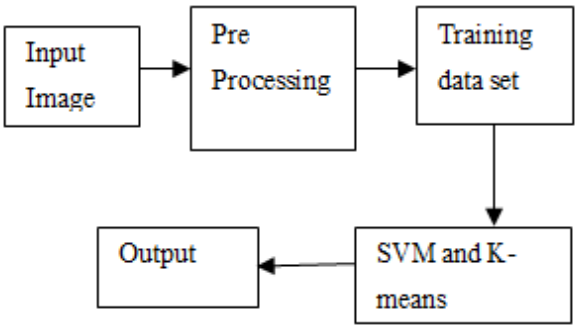
Support Vector Machine

A support vector machine comes under supervised learning model in the machine learning. SVM's are mainly used for classification and regression analysis. SVM has to be associated with learning algorithm to produce an output. SVM has given better performance for classifications and regressions as compare to other processes. There are sets of training which belong to two different categories. The SVM training algorithm creates a model that allots new examples into one category or into the other category, which makes it non-probabilistic binary linear classifier. The representation in SVM shows points in space and also they are mapped so the examples come across as they have been divide by a gap which is as wide as possible.

K-means

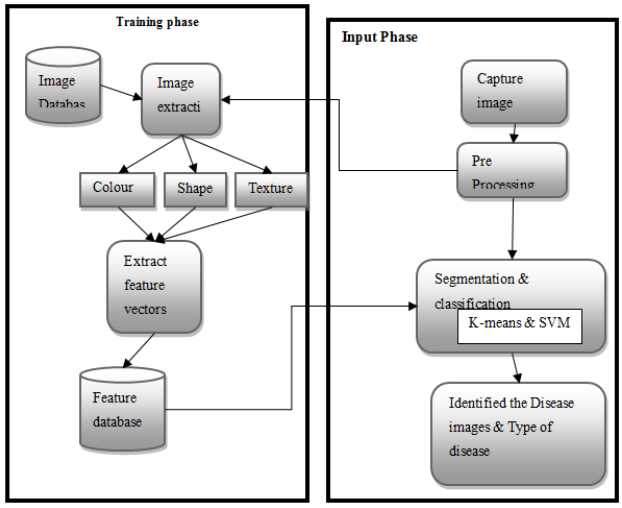
The k-means algorithm tries to split the data set which contains the information of particular data set into a fixed number of clusters (k). Primarily k numbers of centroids are chosen. A centroid is a data point which is situated at the center of a cluster. The centroids are picked at random from the present input data set such that all centroids are unique and vary from each other. These centroids are used train the SVM. Then it produces randomized set of the clusters. The algorithm is composed of the following steps:

1) The K points are placed into the space which is represented by the objects that have been clustered. They represent initial clusters of centroids.
2) Each object is assigned to the group that has closest centroid.
3) After assigning all the objects recalculate positions of the K centroids.
4) Repeat the step 2 and 3 till the centroids are at one place and don't move longer.



This leads to the separation of the objects into the groups. Thereafter each centroid is set to the arithmetic mean of the cluster which it is defined to. The set of final centroid will be used to produce the classification/clustering of the data which is given as the input.

ARCHITECTURE DIAGRAM



Result Analysis

• This Analysis elaborates the evaluated results with proper discussion.
• In android, a GUI (graphical user interface) base interface is generated for the experimentation.
• The stepwise process of image processing for plant leaf disease detection is explained in previous section.
• The proposed modified SVM classifier, experimentation is performed for images.
• Accuracy also varies from different images.
• As per the expert dataset, the detected diseases are Blast, Brown spot, False smut, leaf streak, Leaf Spot, Anthracnose and Bacterial Blight.

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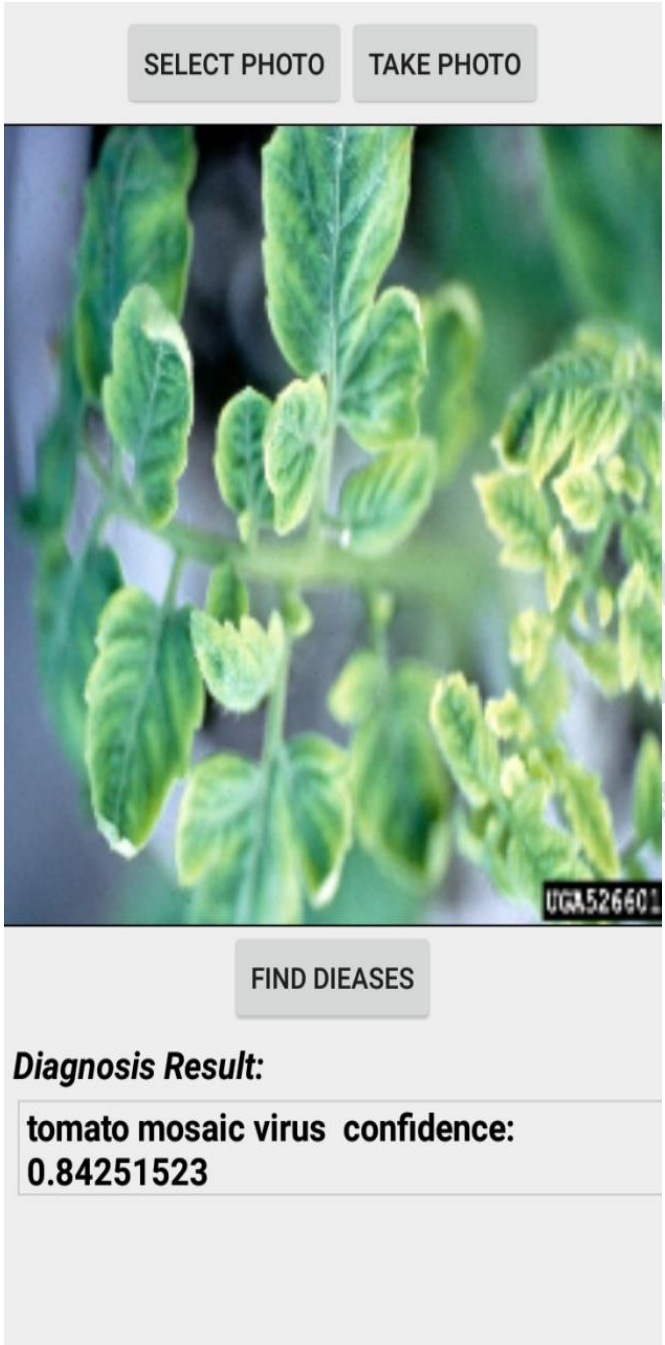
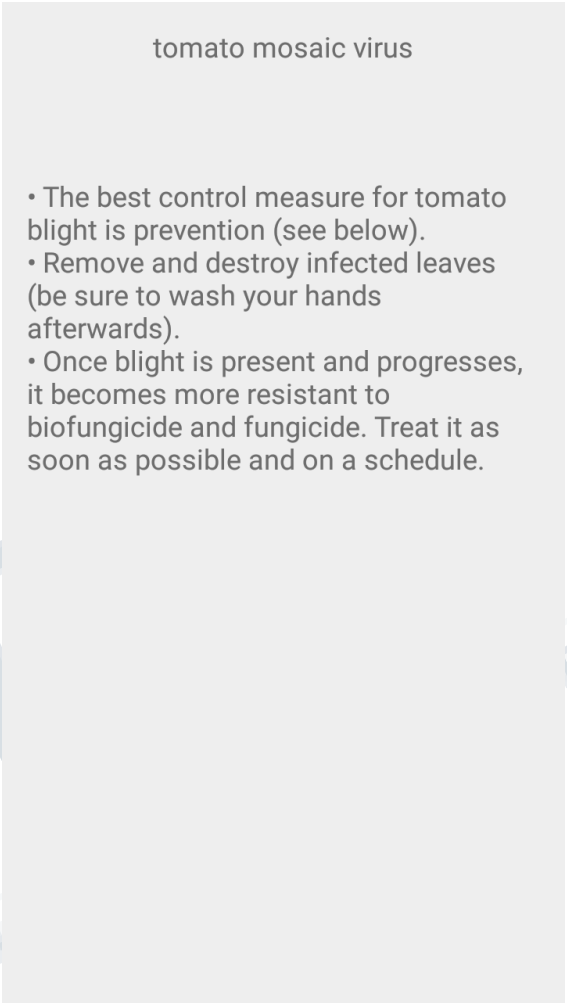
• We have also tested the concept for the healthy diseases to analyse the accuracy of concept.
• There are also the chances of multiple diseases on a single leaf.
• The analysed accuracy level for further compared with SVM Classifier.





CONCLUSION

In this Project we have proposed feature extraction based concept of detecting disease of sugarcane leaf. After doing review on various techniques and algorithms we had come to conclusion that, SVM algorithm gives the better result as compare to other algorithms. This approach can also be developed using normal techniques like JAVA, but using Android gives the efficient and effective result. As the main focus of this application is user-friendly, this application id designed in such a way that it supports Multi-Lingual concept. This application is helpful for farmer and laboratory where they are can easily protect their Plants and there will be increase in growth of production.

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