Identifying The Amount Of Fertilization Required For Rice Crops Using Image Processing System

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Abstract—**This Project deals with digital image processing techniques and AI for detection, processing and identification of plant diseases. Disease symptoms will be visible on leaves. 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. Our project focuses on providing information regarding the amount of pesticide/insecticide to be used for an unhealthy crop. The user clicks a picture of the crop and uploads it to the server via the android application. After uploading the image the user gets an unique ID displayed on his application screen. The user has to make note of that ID to be used later to retrieve the message. The uploaded image is then processed and features of that image are extracted. Based on those features the clustering of images is done and the best cluster giving the maximum information regarding the affected part is selected. The result consisting of the disease name is retrieved and uploaded into the message table in the server. Now the user will be able to retrieve the complete information in a presentable format by entering the unique ID he had received in the Application.**

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

I. 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 many 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 the proper way[2].

The purpose of this project is to obtain an image from the farmer of the diseased crop preferably the stem or the leaves through the Android Application installed on farmer"s phone. The image is then processed using image-processing technique and the disease type is detected. The diseases affected to the crop and the amount of fertilizer or the pesticide/insecticide to be used is updated to the Android Application that was previously used by the farmer to upload images[7].

An Image is a two dimensional signal. Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. Advent of new technologies such as Digital image processing and Image analysis technology has many applications in the biological field. About 78% of the farmers are small and marginal in the country and they are poor in resources. Therefore, they are not in a position to use optimum quantity of inputs in their crops which are essential for increasing the productivity. Most farmers may not know the amount of fertilizer required for crops and thus it may lead to unbalanced use of fertilizer and they may also not know which pesticide/insecticide to be used for the diseased crop. Hence the yield gets affected[7].

A user friendly application installed on Android phones may to some extent help farmers solve the problem of a farmer to detect a disease. The farmer clicks the image of the crop and sends it. The image is processed using the Image Processing techniques and the disease is detected. The details of the disease and the area affected along with the amount of pesticide/insecticide are sent to the farmer and the farmer can see the details in his application. This 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. This 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[7]..

Image enhancement methods basically fall into two domains, spatial and frequency domain. Spatial domain: as the name suggests in this approach different methods are used, which will affect the manipulation of pixel values of an image Frequency domain: in this method first a Fourier transform of the image is computed and then different operations are performed on them and finally results are obtained by getting the inverse Fourier transform of the image.[3]

Image Processing is cast core research area within engineering and computer science regulation too. Image processing basically contains the following three steps:
a) Importing the image with ocular scanner or by digital photography.
b) Analyzing and handling the image which includes data condensation and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
c) Output is the last stage in which result can be changed image or report that is based on image analysis [6]

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 a 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. Automatic 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[2].

II.RELATED WORK

Table.1 Literature Survey

Sr.no	Name of Paper	Publication	Research Gap
1	Crop Plant Disease Detection Using Image Processing	7 May, 2019, International Journal of Innovative Technology and Exploring Engineering (IJITEE)	This paper discusses various plant diseases and how to improve precision agriculture (PA) using Image processing. The aspects considered are the higher yielding and result in good quality of crop production.. Then the identification of exact disease in rice such as Blast, Bacterial Leaf Blight, Brown spot, Sheath Blight and False smut are to be achieved through the image processing. In this study the analysis was done by segmentation techniques such as Otsu's and K-means clustering and feature extraction and classification is advocated for the usage through image processing technique.[2]
2	Plant Health Monitoring Using Image Processing	March 2018, International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)	These proposed works are more focused on Detection of disease on the Plant leaf using Android. Firstly capture image from digital camera (mobile camera) The captured image will be considered for further feature extraction. 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 is more user-friendly by enhancing language translation too. With image processing, SVM and k means is also used, k-means is an algorithm and SVM is the classifier.[7]
3	A Study of Image Processing in Agriculture	July 18, 2017, Int. J. Advanced Networking and Applications	In this paper we have developed a method by giving the input of the various diseases affected leaves to reduce the usage of weedicides, thus saving the environment. The threshold value is detected to be less than minimum edge frequency of weeds present in the same field. The block numbers from the filtering step cannot be given automatically to the motor, it has to be done manually. This will take some time.[6]
4	Leaf Disease Detection and Selection of Fertilizers using Artificial Neural Network	June -2017, International Research Journal of Engineering and Technology (IRJET)	This includes image acquisition, image preprocessing, segmentation using k-means clustering, extracting features, ANN based training, classification, finally identification of leaf diseases and fertilizers. Artificial Neural Network (ANN) is of great use for automatically detecting leaf disease and fertilizer for that disease. The proposed system uses K means clustering technique for segmentation of image to segment diseased area and background area of the input leaf image in order to calculate the percentage infection of the disease in the leaf. These systems can be helpful in identifying correct pesticide easily remove the disease in a short period and can get the good results and profit from the plants[5]
5	AGRICULTUR AL PLANT DISEASES DETECTION USING DIFFERENT TECHNIQUES	April 2017,ICRTES M	This paper presents the different advanced techniques to detect and classify plant leaf. The technologies used in monitoring health and diseases in plants under field conditions.These technologies include spectroscopic and imaging based, and volatile profiling-based plant disease detection methods like water-stress and nutrient-stress detection. However statistical analysis to evaluate the ability of technique to discriminate or classify plant condition was not achieved.[4]
6	Plant Disease Classification Using Image Segmentation and SVM Techniques	(2017), International Journal of Computationa l Intelligence Research	For preventing the losses in the yield and quantity of the agricultural product, Classification is performed. Disease classification on plant is very critical for supportable agriculture. It is very difficult to monitor or treat the plant diseases manually. It requires huge amount of work, and also need the excessive processing time. Plant disease classification involves the steps like Load image, pre-processing, segmentation, feature extraction, svmClassifer.[3]
7	"IDENTIFYIN G THE AMOUNT OF FERTILIZATI ON REQUIRED FOR RICE CROPS USING IMAGE PROCESSING SYSTEM TO INCREASE THE YIELD	(2016),Visves varayaTechno logical University, Belgaum	The proposed objective was implemented on three different types of crops namely Rice, Sugarcane and Cotton.The experimental results indicate the proposed approach can recognize the diseases with a little computational effort. By this method, the plant diseases can be identified at the initial stage itself and the pest control tools can be used to solve pest problems while minimizing risks to people and the environment. In order to improve disease identification rate at various stages, the training samples can be increased with the optimal features given as input condition for disease identification and fertilization management of the crops. As a part of Future Enhancement the complete process described in this project can be automated so that the result can be delivered in a very short time.[1]

III.PROPOSED SYSTEM

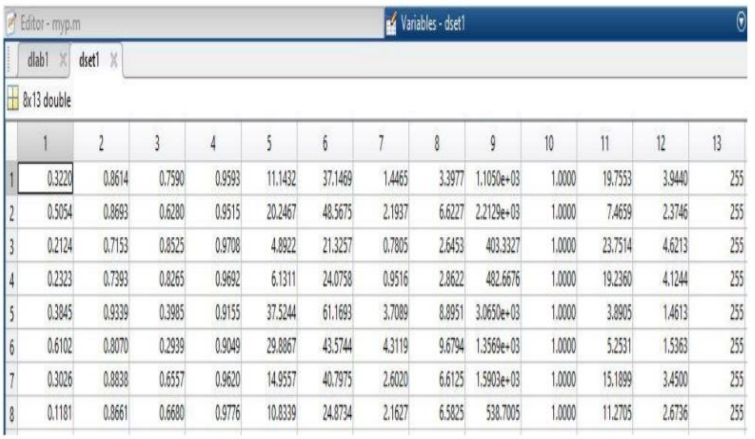
These proposed works are more focused on Detection of disease on the Plant leaf using Android. Firstly, capture images from digital cameras (mobile cameras). Most probably the camera with some limitations and criteria will be considered. The captured image will be considered for further feature extraction, 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 descriptions that can prove important for additional processes. With image processing, SVM and k-means is also used, k-means is an algorithm and SVM is the classifier. Then next various techniques are to be used to get and result in hand.

In the proposed system at first the images are acquired from the farmer. The images are received from the farmer via the Android Application developed exclusively for the service of the farmer. The images are uploaded by the farmer by choosing the appropriate image of the leaf or the stem preferably from the Choose File option. On uploading an image the farmer receives an ID which has to be used later by him to check the pesticides for the affected disease. The image uploaded by the farmer is processed by the MATLAB. Then image-processing techniques are applied to the acquired images to extract useful features that are necessary for further analysis. After that, several analytical techniques are used to classify the images according to the specific problem at hand. The disease type is detected and displayed by the MATLAB. The affected area is also displayed to identify the severity of the disease. The pesticides for the detected disease and the amounts to be given to the plant are entered into the database. The farmer in order to see the details has to click another button in the app which is View Message. On entering the ID which was previously displayed to the farmer the farmer can view the details that were uploaded. Identifying the amount of fertilization required for Rice Crops using Image Processing system to increase the yield Automatic detection of plant diseases is an important research topic as it may prove benefits in monitoring large fields of crops, and thus automatically detect the diseases from the symptoms that appear on the plant leaves. This enables machine vision that is to provide image based automatic inspection, process control and robot guidance. Comparatively, visual identification is labor intensive, less accurate and can be done only in small areas.

A)SVM and K-means

Support Vector Machine

A support vector machine comes under a supervised learning model in machine learning. SVM's are mainly used for classification and regression analysis. SVM has to be associated with learning algorithms to produce an output. SVM has given better performance for classifications and regressions as compared 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 a 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 divided by a gap which is as wide as possible[2].



	1	2	3	4	5	6	7	8	9	10	11	12	13
1	0.3220	0.8614	0.7590	0.9593	11.1432	37.1469	1.4465	3.3977	1.1050e+03	1.0000	19.7553	3.9440	255
2	0.5054	0.8693	0.6280	0.9515	20.2467	48.5675	2.1937	6.6227	2.2129e+03	1.0000	7.4659	2.3746	255
3	0.2124	0.7153	0.8525	0.9708	4.8922	21.3257	0.7805	2.6453	403.3327	1.0000	23.7514	4.6213	255
4	0.2323	0.7393	0.8265	0.9692	6.1311	24.0758	0.9516	2.8622	482.6676	1.0000	19.2360	4.1244	255
5	0.3845	0.9339	0.3985	0.9155	37.5244	61.1693	3.7089	8.8951	3.0650e+03	1.0000	3.8905	1.4613	255
6	0.6102	0.8070	0.2939	0.9049	29.8867	43.5744	4.3119	9.6794	1.3569e+03	1.0000	5.2531	1.5363	255
7	0.3026	0.8838	0.6557	0.9620	14.9557	40.7975	2.6020	6.6125	1.5903e+03	1.0000	15.1899	3.4500	255
8	0.1181	0.8661	0.6680	0.9776	10.8339	24.8734	2.1627	6.5825	538.7005	1.0000	11.2705	2.6736	255

Fig.1 SVM Dataset

K-means

[2]The k-means algorithm tries to split the data set which contains the information of a particular data set into a fixed number of clusters (k). Primarily k numbers of cancroids are chosen. A centric is a data point which is situated at the center of a cluster. The cancroids are picked at random from the present input data set such that all cancroids are

Unique and vary from each other. These cancroids are used to train the SVM. Then it produces a 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 cancroids.
2) Each object is assigned to the group that has the closest centric.
3) After assigning all the objects, recalculate positions of the K cancroids.
4) Repeat steps 2 and 3 till the cancroids are at one place and don't move longer.

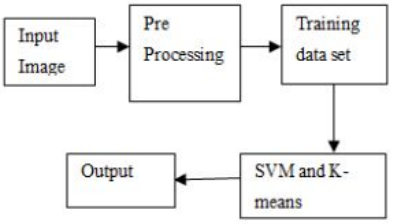


Fig.2 Image Pre-processing using SVM and Kmeans

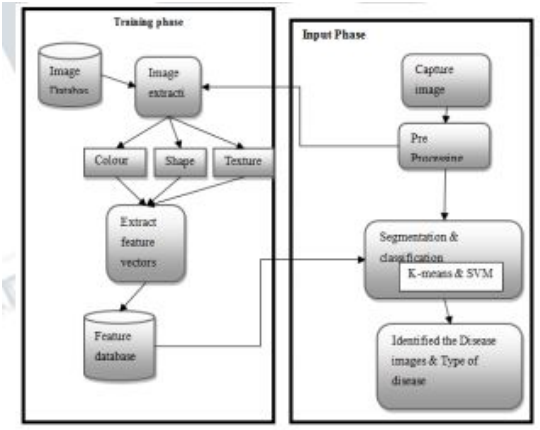


Fig.3Architechture Diagram

B)Advantages

- It will have less use of manpower.
- There will be an increase in productivity of plants.
- This system has low cost and provides easy detection of leaf diseases
- Segmentation of an image is fast for images where the boundaries are well defined.

IV.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 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.
• We have also tested the concept for healthy diseases to analyze the accuracy of concepts.
• There are also the chances of multiple diseases on a single leaf.
• The analyzed accuracy level for further comparison with SVM classifier.

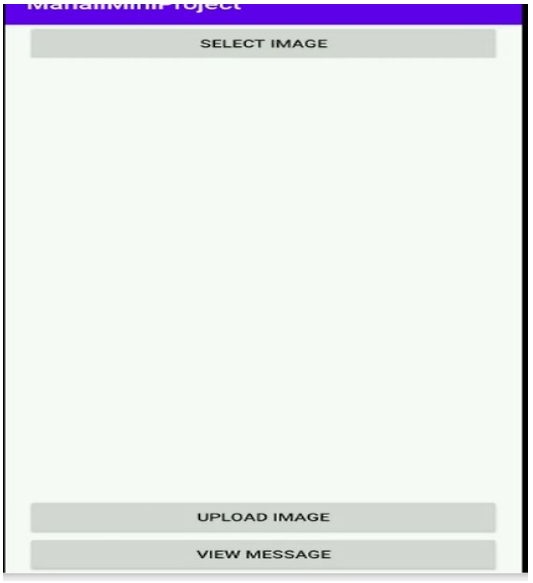


Fig.4 GUI of the System

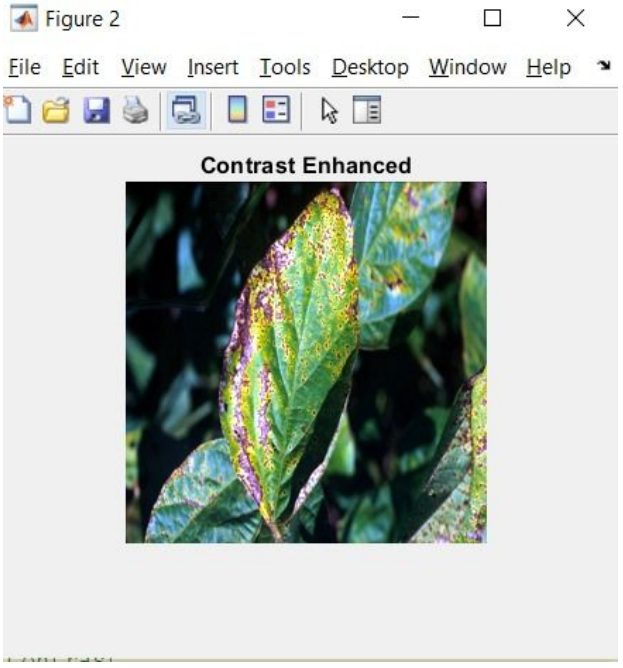


Fig.5 Image Segmentation

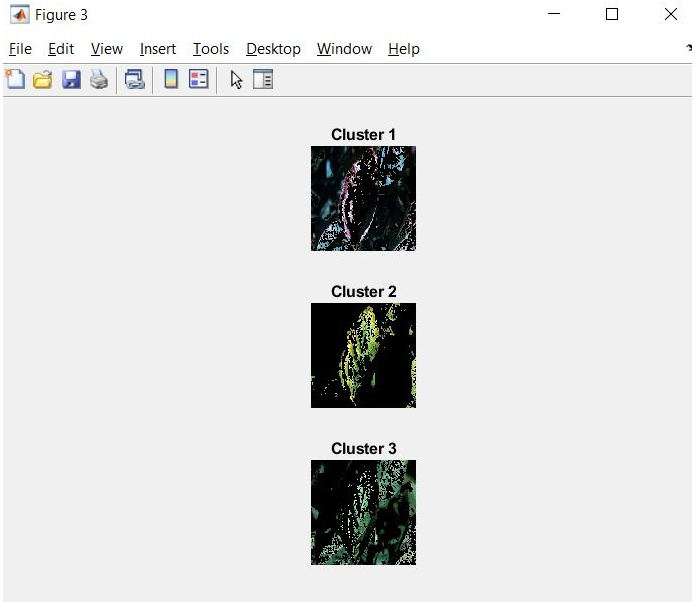


Fig.6 : Various segmentation stages using k-means clustering of finding brown spot infection in plant

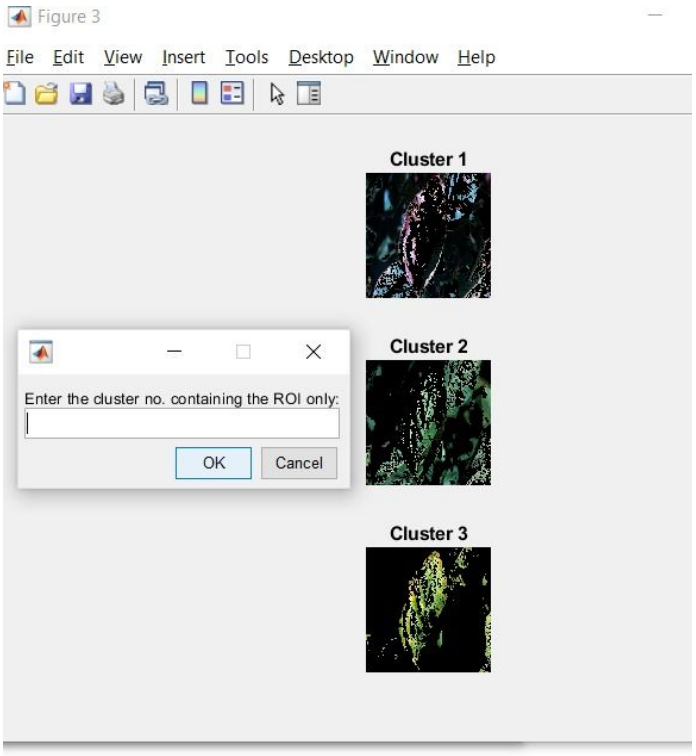


Fig.7: Various segmentation stages using k-means clustering of finding brown spot infection in plant

The result of various clustering segmentation shown in Fig 6, which presents different clusters using k-means algorithm in image segmentation. The proposed method shows full automatic and good efficiency.

Fig.8 showing the area affected by the disease and disease name

V. CONCLUSION

In this Project we have proposed a feature extraction based concept of detecting disease of sugarcane leaf. After doing a review on various techniques and algorithms we had come to the conclusion that, SVM algorithm gives the better result as compared 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 the Multilingual concept. This application is helpful for farmers and laboratory where they can easily protect their Plants and there will be an increase in growth of production.

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