Image Processing System for Fertilization Management of Crops

Romana Tazeen, Shilpa H N, Usha P

Dept. of CSE, Cambridge Institute of Technology, Bangalore.
rtazeen23@gmail.com,shilpadee78@gmail.com,usha.p75@gmail.com

Mrs. Jayanthi M G, Dr. Shashikumar D R

Dept. of CSE, Cambridge Institute of Technology, Bangalore.

ABSTRACT:

The paper focuses on providing the information regarding the pesticide and the amount of pesticide to be used for an unhealthy crop. The user who is the farmer clicks a picture of the crop and uploads it to the server via the android application. After uploading the image, the farmer gets a unique ID displayed on his application screen. The uploaded image is then processed using image processing techniques, the features are extracted based on clustering and SVM Classification is applied, accordingly the disease is detected. The disease and the corresponding pesticide and other information about it are updated into server. The farmer using this unique ID can retrieve the complete information about the Disease name, affected area, pesticide name and its optimal amount to be used.

Keywords - Image Processing, Feature Extraction, Clustering, SVM classification.

I. INTRODUCTION

An Image is a two dimensional signal. Image processing is a method to perform some operations on an image 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 of farmers may not know the amount of fertilizer or the pesticides required for crops and thus it may lead to unbalanced use of fertilizer. Hence the yield gets affected.

A user friendly application installed on Android phone may to some extent help farmer 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.

II. METHODOLOGY

The methodology in order to achieve this process of sending the information to farmer after receiving image from him has the following steps:

a) Upload Image
b) Image Preprocessing
c) Segmentation (k-means clustering)
d) Feature Extraction
e) SVM Classification
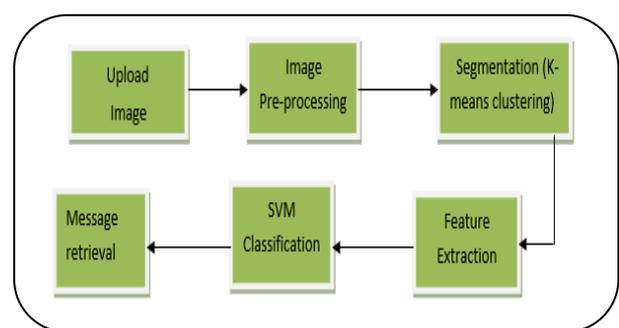f) Message Retrieval

Fig 1: Block Diagram for Fertilization Management

a) Upload Image

When the farmer selects the Choose File option, gallery folder opens so that the farmer can select image from the folder. On selection of right image and the image being displayed the farmer can click on Upload image option. The image gets uploaded to the server and gets stored in the database.

For uploading the image a php script is uploaded into the server. The php script inserts the image into the table by using INSERT query. It displays "Successfully Uploaded Image" and the ID is displayed.

b) Image Pre-processing

The image acquired is pre-processed. The pre-processing starts by resizing the image into 256 *X* 256 format and converting the RGB image to L*a*b* color space. The L*a*b* color space consists of Luminosity layer L*, chromacity layer a* and b*. All of the color information is stored in the layers a* and b*. It requires to make color form so that the RGB colored image is converted to L*a*b* space.

c) Segmentation

There are several algorithms used for segmentation but one of the best methods used for detection of disease is k- means clustering.

Classify the colors a*b* color space using k-means clustering. Since the image has 3 colors we create three clusters. Measure the distance Euclidean Distance Metric. Label every pixel in that image using results from K means.

Then a blank cell array is created to store the results of clustering. Followed by create RGB label using pixel_labels. Selection of appropriate cluster is another important aspect. The cluster which displays the maximum disease affected part is to be selected.

d) Feature Extraction

The features of the selected cluster are extracted. The selected image is converted to grayscale since the image is in RGB format. The required statistics are derived from Gray level cooccurance Matrices(GLCM). The following 13 features that are extracted and evaluated and are stored in an array:

Contrast, Corelation, Energy, Homogeneity, Mean, Standard Deviation, Entropy, RMS. Variance, Smoothness, Kurtosis, Skewness.

e) SVM Classification

Support Vector Machines are based on the concept of decision planes that define decision boundaries.

Using the support vector machines first requires the SVM to be trained. The SVM for disease detection was trained with images for diseased Rice crop plants. Here the images for Rice Blast disease and Brown Spot disease are downloaded and the features were extracted for the images.

The entire data was stored in dataset which has features of images known as Training Images. Two disease plant features are entered in to the dataset. Similar can be extended to multiple diseases using the Multi SVM.

f) Message Retrieval

The ID that was generated for the farmer which is unique to every farmer has to be entered by him for getting the required message. After analysing the image in the MATLAB the details of the disease and the amount of fertilizer are updated into the table as per the ID of the image.

The message is fetched from the server and its displayed in the text area of the activity layout. Details such as ID, Crop Name, Disease name, Pesticide, Amount of pesticide, Affected Region are displayed.
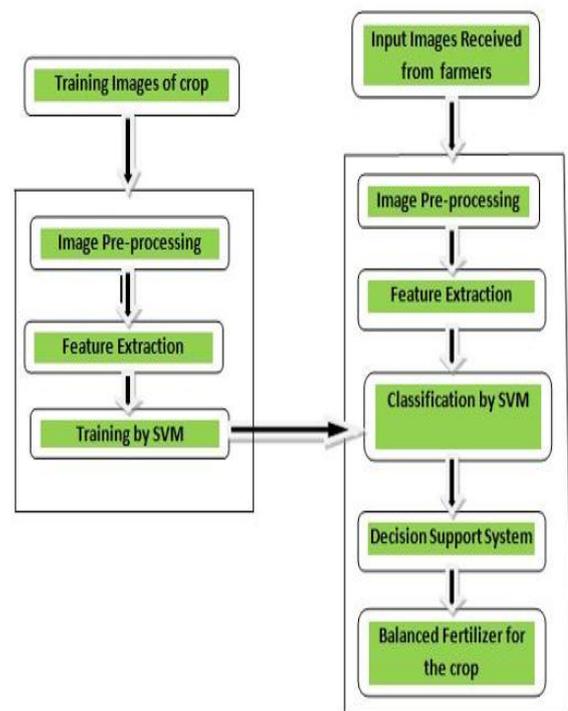

Fig 2: Block Diagram for Image Processing

III. RESULTS and DISCUSSION

We have built an interactive android application which helps in communication between the farmer and the server. The application will help the farmer to get the necessary information regarding the pesticide that has to be used for the infected crop. This application built has 3 main

buttons which are Choose File, Upload Image and View Message.

The Choose file button allows the farmer to choose a image from the gallery which includes the infected crop image that was captured by the farmer. Then the farmer can click on Upload image button. This action results in uploading the image to the server and a unique ID is displayed to the farmer for his future reference in order to retrieve the result message.
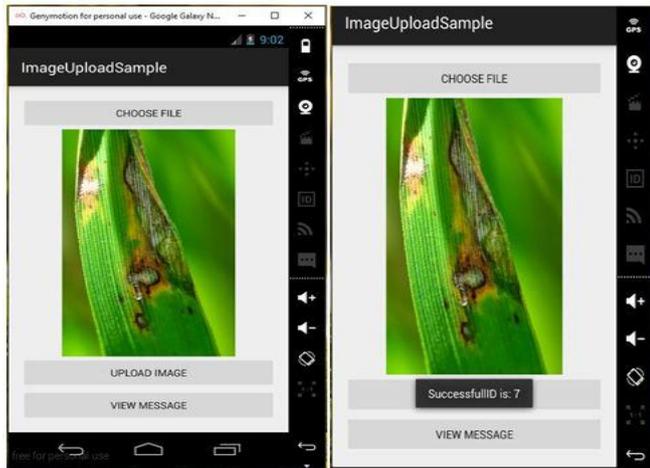

Fig 3: Application Layout while uploading image

Once the image is uploaded to the server, we download that image from the server and give that image as input to the image processing system. The image gets processed and clustering of that image is done to get the accurate infected area of the crop or leaf (as per the uploaded image). Then the cluster giving the maximum information of the affected area is selected and based on the SVM classification the result is retrieved, which gives us the information that includes the disease name and area affected.
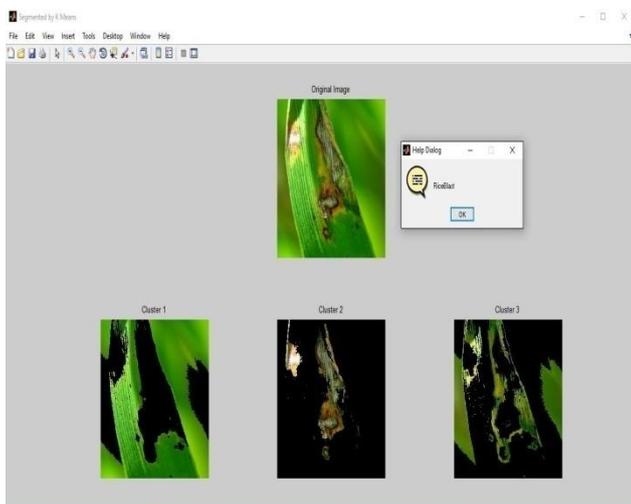

Fig 4: Clustering of the input image

After retrieving the necessary information regarding the affected crop, the information regarding pesticide that has to be used to treat that crop and the optimal amount of that pesticide to be used is gathered. This information is uploaded back to the server in a presentable format. Now the farmer can retrieve these details by entering the ID in the View Message option of the Android application.
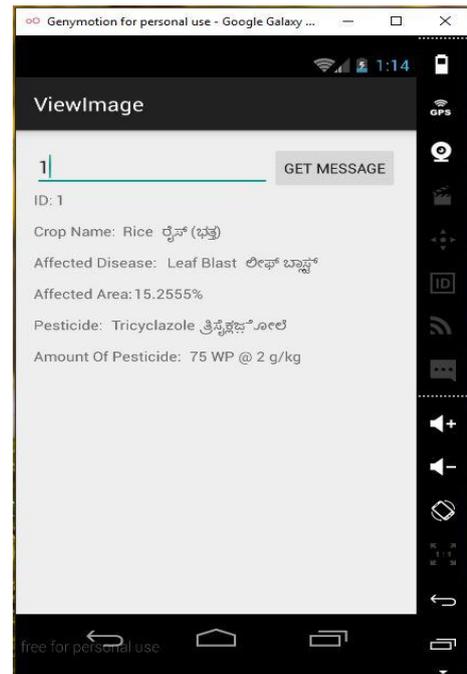

Fig 5: Output Layout displaying the Result

IV. CONCLUSION

An application detecting plant diseases (Rice, Cotton and Sugarcane) and providing necessary suggestions has been implemented. The results indicate the proposed approach works with less computational effort. As a part of Future Enhancement the complete process can be automated so that the result can be delivered in a very short time and the training samples can be increased to improve efficiency of disease identification.

ACKNOWLEDGMENT

REFERENCES

[1] S. Arivazhagan, R. Newlin Shebiah*, S. Ananthi, S. Vishnu Varthini March 2013. Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features. Agric Eng Int: CIGR Journal Vol. 15, No.1 211

[2] Al-Bashish, D., M. Braik, and S. Bani-Ahmad. 2011. Detection and classification of leaf diseases using K-means-based segmentation and neural networks based classification. Information Technology Journal, 10(2): 267-275

[3] Al-Hiary, H., S. Bani-Ahmad, M. Reyalat, M. Braik, and Z. AlRahamneh. 2011. Fast and accurate detection and classification of plant diseases. International Journal of Computer Applications, 17(1): 31-38

[4] Argenti, F., L. Alparone, and G. Benelli. 1990. Fast algorithms for texture analysis using co-occurrence matrices. IEEE proceedings, 137, (6): 443-448

[5] Arivazhagan, S., R. N. Shebiah, S. S. Nidhyanandhan, and L. Ganesan. 2010. Classification of citrus and non-citrus fruits using texture features. Computing Communication and Networking Technologies, ICCCNT-2010

[6] Bauer, S. D., F. Korc, W. Forstner. 2011. The potential of automatic methods of classification to identify leaf diseases from multispectral images. Precision Agriculture, 12: 361-377

[7] Chamasemani, F. F., and Y. P. Singh. Malaysia, Bio-Inspired Computing: Theories and Applications (BIC-TA), 2011 Sixth International Conference. Faculty of Information Technology, MultiMedia University. Cyberjaya, Malaysia

[8] Chih-Wei, H., and C. Lin. 2002. A comparison of methods for multiclass support vector machines. IEEE Transactions on Neural Networks, 13(2): 415-425

[9] Helly, M. E., A. Rafea, and Salwa-El-Gammal. 2003. An integrated image processing system for leaf disease detection and diagnosis. in Proc. IICAI, pp.1182-1195

[10] Jean, W. 2009. Extension plant pathologist, georgia plant disease loss estimates, www.caes.uga.edu/publications