Plant Disease Identification using C-Means and SVM Classifier

K Rajasekhar, V. Harinath, S.Nandha kishor

Abstract: ***Agriculture is the backbone of India. In India 58% of people india are depends on agriculture. Vegetable are the most popular common crops in India. Many diseases are affected during the growing. To detect the vegetables plant leaf disease is more important because of fewer propensities.***

The vegetation production gets affected if correct care isn't taken. Image process is one in all upbringing technology that helps to resolve such problems with varied algorithms and techniques. Most of the diseases of vegetable plants detected at primary stages as they have an effect on leaves 1st. detective work the diseases at the initial stage on leaves can sure as shooting avoid close loss. During this project, we tend to area unit characteristic the sickness victimization image segmentation and also the SVM rule. to spot the pathological half in leaf, image segmentation is employed. And for classification of correct sickness, Multi-class SVM rule is employed.

In the last stage of the disease, detection is recommended by the User for treatment. Automatic disease detection has many benefits to monitor and control the large fields to detect the disease automatically. By using the pesticide minimize the economic loss and identify the disease.

This project is implemented by using Digital image processing and it can recognize the problems in crops from images, based on colors and shape to detect the disease automatically. We can rectify the problem fast and accurate manner. The image processing (Digital) technique is used to magnify the image. Here in this project, we are introducing the IoT based smart farming using the Raspberry PI and sensors with the image process. Here we will capture the images of tomato leaves with cam which is connected with raspberry pi that captured images will be sent to email id and that images are done using image processing in MAT lab software.

Keywords: Image processing, Python language, Plant disease identification.

I. INTRODUCTION

Automated detection of leaf sicknesses is the most essential research topic as it can show an advantage in monitoring large fields of crops, and for this reason, routinely detect the illnesses from the signs and symptoms that gift on the plant leaves.

This allows gadget imaginative and prescient this is to provide photo-based right here photo processing plays a critical function. The device offers the facility to capture a photograph, method it and get the result via picture processing in the actual world, farmers visually perform an inspection of vegetation which includes culmination, vegetables and the like affected by the unique disease for recognition and category.

Existing system:

In the existing system, we are checking the parameters of the plan manually. It needs the hands and to spot the expansion level of their crop. Farmer check fields them. The farmers themselves check the parameters in their crop field. They use solely the detector, not the extremely developed level of notification it's going to consume longer and a large variety of hands. Continuous observance of crops and maintenance is incredibly troublesome. This could cause a decrease in crop yield because of poor hands and observance.

Drawbacks:

- Required more manpower
- Time taken for identification is more.
  Finding manually is difficult

Proposed system:

In this system automatically disease will identifies using image processing. C-means and SVM algorithms can give the good accuracy results. In this system we can reduce the manpower and time. And also we can get a good accuracy results. Here we will capture the picture of the plants and we will send that pictures to the e-mail and from that e-mail we will get that pictures to the mat lab software and there we will get to know the disease which is affected to plan.

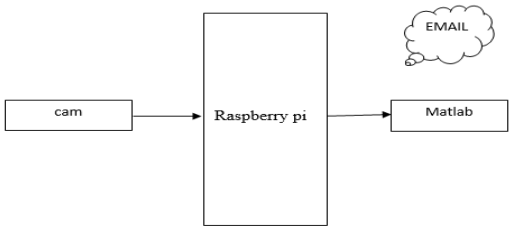

Fig1: Proposed System block diagram

Working:

The working process of the project is simple. In this project we detect the plant leaf disease and monitoring and controlling the parameters. We detect leaf disease using digital image processing. The captured images are sending to email by using raspberry PI.

And those images are getting

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processed by the digital image processing in Matlab and disease of the plant is identified.

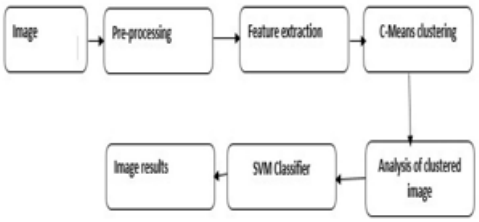

Fig1: Working block diagram

II. MATERIALS&METHODS

Fuzzy c-means (FCM) may be a methodology of clump that permits one piece of knowledge to belong to 2 or a lot of clusters. This methodology is frequently employed in pattern recognition. it's supported following of the subsequent objective function.

Where m is any complex quantity bigger than 1, u_{ij} is that the degree of membership of x_i within the cluster j, x_i is that the ith of d-dimensional measured information, c_j is that the

$$J_m = \sum_{i=1}^{N}\sum_{j=1}^{C} u_{ij}^{m} \left\| x_i - c_j \right\|^2 \quad , \quad 1 \le m < \infty$$

d-dimension center of the cluster, and ||*|| is any norm expressing the similarity between any measured information and therefore the center.

Fuzzy partitioning is disbursed through associate degree unvarying improvement of the target perform shown on top of, with the update of membership u_{ij} and therefore the cluster centers c_j by:

$$u_{ij} = \frac{1}{\sum_{k=1}^{C}\left(\frac{\left\| x_i - c_j \right\|}{\left\| x_i - c_k \right\|}\right)^{\frac{2}{m-1}}} \quad , \quad c_j = \frac{\sum_{i=1}^{N} u_{ij}^{m} \cdot x_i}{\sum_{i=1}^{N} u_{ij}^{m}}$$

This iteration will stop when, where ε is a termination criterion between 0 and 1, $\max_{ij}\left\{\left| u_{ij}^{(k+1)} - u_{ij}^{(k)} \right|\right\} < \varepsilon$

Whereas k are the iteration steps. This procedure can be converges to local minimum or saddle point of J_m.

The algorithm is composed of the following steps:

1. *Initialize* $U=[u_{ij}]$ *matrix,* $U^{(0)}$
2. *At k-step: calculate the centers vectors* $C^{(k)}=[c_j]$ *with* $U^{(k)}$

$$c_j = \frac{\sum_{i=1}^{N} u_{ij}^{m} \cdot x_i}{\sum_{i=1}^{N} u_{ij}^{m}}$$

3. *Update* $U^{(k)}$, $U^{(k+1)}$

$$u_{ij} = \frac{1}{\sum_{k=1}^{C}\left(\frac{\left\| x_i - c_j \right\|}{\left\| x_i - c_k \right\|}\right)^{\frac{2}{m-1}}}$$

4. *If* $|| U^{(k+1)} - U^{(k)} || < \varepsilon$ *then STOP; otherwise return to step 2.*

SVM Classifier:

Support Vector Machine is also one in all a supervised machine learning formula and this might be used for every classification or regression challenges. However, it's chiefly utilized in classification problems. Throughout this formula, we tend to tend to plot each data item as a degree in n-dimensional house (where n is vary of choices you have) with the value of each feature being the value of a selected coordinate. Then, we tend to tend to perform classification by finding the hyper-plane that differentiate the two classes okay (look at the below snapshot). In Python, scikit-learn might be a large used library for implementing machine learning algorithms, SVM is to boot getable at intervals the scikit-learn library and follow identical structure (Import library, object creation, fitting model and prediction).

- It works very well with clear margin of separation
- It is effective in high dimensional areas.
- It is effective in cases where vary of dimensions is larger than the number of samples.
- It uses a group of employment points at intervals the decision operate (called support vectors), so it's together memory economical.

ADVANTAGES

- Farming purpose
- Easily identifies the plant disease.
- Less human interference
- Reducing the time for identification of disease

APPLICATIONS

- Automatic plant disease identification.
- Farming purpose
- Nursery plants

III. RESULTS

Plant leaf is captured with camera and by the help of raspberry pi image is sent to mail. Outlook is configured with the mat lab program and image is download from

outlook and it will do image processing using c- means and SVM Classifier. And we find out the leaf disease by SVM classifier. So we can take the action for the disease.

Different types of disease found for different types of diseases that showed in below table-1.

Fig5 :Contrast enhanced input image

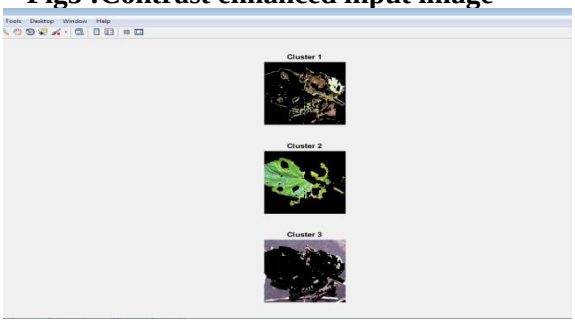

Fig6 :c-means clustering of input image clustert 1 is is medium and cluster 2 is low and cluster 3 is high segmented images.

Table-1

Leaf	Diseases
Tomato	Septoria leaf spot, Bacterial stem, Early blight, Mosaic
Beans	Bacterial brown spot, Halo Blight, Common Blight
Mango	Powdery mildew, Phoma blight, Red rust, Sooty mould

We have tested and identified different diseases from different plant leaf. And got a good accuracy and in the table 2 as per results we can check almost it identifies exact results. When we give bacterial stem leaf 10 times and disease identified 9 times correctly and one time for mosanic it shows. When we give different types of disease leafs in the out put section we got the same results. Overally the accuracy of the system is 97.5 %.

Table- 2

	Bacterial stem	Mosaic	Halo Blight	Sooty mould
Bacterial stem	9	1	0	0
Mosaic	0	10	0	0
Halo Blight	0	0	10	0
Sooty mould	0	0	0	10

IV. CONCLUSION

The proposed system, we implemented danced agriculture techniques and detection of the tomato plant disease using MAT lab with the integration of embedded systems. In this, we introduced Automation and monitoring the field long distance through the Cloud server. This system is economical and easy productive. There are more advantages like water save and less man power. This concept of modernization of agriculture is simple, affordable and operable.

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