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Plant Disease Recognition and Fertilizer Suggestion Using Image Processing

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ABSTRACT: In our India 2/3 of the population dependent on agriculture, it is backbone of our economy. Agriculture has become a way life. Farmer is a real hero who takes the responsibility of agriculture but farmers are facing lots of problems during farming one of the major problem is identifying the disease infected to plant and also he can't get idea that which type of fertilizer to be used and also the amount, due to which productivity of crop get reduced. So that to solve this problem we are going to create a website which will recognized a plant disease, It will provide a proper information about fertilizer to be used and also provides an option for online purchasing the fertilizer. Our website will also provide information about the experts, farmer can directly contact with them and cans solve their problems, We are also providing a comments box farmers at which they can communicate with other farmers and also discussed the solution. We propose k-Medoids or k-Means clustering algorithm to find out the infected area, SVM classification algorithm for feature extraction, classification and for disease recognition. These systems will definitely helpful for farmers to overcome their efforts..

KEYWORDS: Image Processing, Plant disease identification, Fertilizer suggestion, Image acquisition, K-Means algorithm, k-Medoids algorithm, SVM classification.

I. INTRODUCTION

In our India 2/3 of the population dependent on agriculture, it is backbone of our economy. Agriculture has become a way of life. Farmer is a real hero who takes the responsibility of agriculture but farmers are facing lots of problems during farming one of the major problem is identifying the disease infected to plant and also he can't idea that which type of fertilizer to be used and also the amount, due to which productivity of crop get reduced. So that to solve this problem we are developing our website In that we use image processing techniques, k-means clustering algorithm and also classification algorithm to process the image. After that some important features get extracted ,SVM is use for classification we will get the disease affected and by using that disease name as key it will suggest a fertilizer to be used. Our website also provides option for online purchasing the fertilizer.

In our website we also add the information of the experts to whom farmers can easily contact related to their farming issues or the plant disease etc. They can communicate them easily .We provide comment box for farmers where they can put their views or ideas anything they want to share with other farmer friends. Thus, in that way our website will definitely helpful for farmers to reduce their efforts and increase the production.

These techniques will generate an accurate and appropriate result that helps to problems related to plant disease identification and fertilizer recommendation.

II. LITERATURE SURVEY

Detection and classification of the leaf disease using K-means-based segmentation and neural networks based classification, ISSUE 11.

In this paper they were basically worked on the leaf diseases and some limited disease they were taken in Consideration. Those diseases are early scorch, Cottony mold, ashen mold late scorch and tiny whiteness. They concept is automatic identification of disease and classifications among the different groups or modules according to the some extracting features by using a various types of techniques. To detect the proper disease they used image processing.

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Image processing process the image means some operations are performed on the images so that the image will be more proper and we will able to enhance some useful information from it. It will helps in agricultural sector to classified the leaf disease automatically. So proper data set will be available for the further processing. This data set will be used in various types of application related to agriculture sector.

Techniques used:

There are two main properties are used here those are detection and classification of plant diseases .For detecting and classifying disease they were used K-Means Theorem and also a Neural networks techniques .

Main objective:

1) Identification of the affected part of leaf.
2) Taking out the features set of the affected leaf images.
3) Classification of the disease using leaf images.

Leaf disease detection and grading using computer vision technology and fuzzy logic , ISSUE 2015.

This paper represents the detection of leaf disease by pre-processing the leaf images extracting the features using Artificial Neural Networks and then the classifications of diseases and segmentation by using k-means algorithm. And finally grading is done which is basically based on amount of particular disease affected or the amount of disease available in the leaf.

They include two phases.

1)1st phase includes:

Image Acquisition, Image pre-processing, Extraction of features of infected leaf and Artificial Neural Network

2)2nd phase includes:

Testing of all the phases includes in 1st phase then classification, segmentation, calculation of grading using fuzzy logic textbox.

Thus this system provides additional information i.e. amount of disease present in affected plant leaf. It will definitely help to the farmers to avoid the manual observation of leaves to identify which type of disease is affected and the grading also i.e. amount.

eAGROBOT-A Robot for Early Crop Disease Detection using image Processing, ISSUE 15.

This paper is focused on disease identification, monitoring of plant diseases, deficiency of nutrients, irrigation controlled and also controlling the use of fertilizer and pesticides. The concept is that they provide here remote sensing solution. eAGROBOT is aground based agricultural robot that is used to overcome farmers challenges related to the farmland and also it provides a solution based on that .That robot will be automatically surveyed farmland, it will also detects the disease as well as spray the pesticide And specifically and physically real time testing results obtained from cotton and groundnut plantations and future focus has been detailed and future focus has been detailed in this paper.

Techniques used:

K-Means clustering, Neural networks, Single hidden layer using back propagation technique, Eight textual features are used. This paper provides an enhanced fully autonomous form .They also mentioned that a device like tractors can also be used as autonomous device by integrating it with technology. So that by using robot farmers work will be reduced but cost will be required more.

Detection, categorization and suggestion to cure infected plants of Tomato and grapes by using openCV framework for Android Environment, ISSUE 17.

This paper is basically based on the Android based application. They were specifically work on Tomato and grapes. Firstly they consider whatever the lifecycles or the lifespan of that Particular plant i.e. Tomato and grapes to get more information about that plant. They had used various types of image processing techniques to get the processed and clear image of the infected plant those techniques are as follows.

Image Processing techniques:

1)Image resizing: In Image resize technique geometric transformations is basically used .By scaling the image a new image with a proper pixel will get. In this technique some functions are used like **void resize (source, destination, size( ), 0.5, 0.5, interpolation)**

where,

source : input image

destination: output image

2)*Interactive Foreground extraction using Grabcut Algorithm*: In this algorithm foreground of algorithm of images is separate out using this Grabcut Algorithm. Pixels of foreground and background are taken in consideration and they work on it.
3) *RGB or HVS conversion*: This algorithm is used to convert the one image colour space into another colour space.
4) *Adaptive thresholding*: This technique is used for segmentation.
5) *Template Matching*: This technique is used for template matching.

Leaf disease detection and fertilizer suggestion, ISSUE 2019

The major problem related to agriculture is farmers are manually observing the leaves or plants to identify the infected type of disease. That is not a convenient method because they can't get the idea i.e. that is which type of fertilizer used to defect that disease or overcome it. This problem has studied in this paper .They used different types of image processing techniques to get proper image or get accurate image. They used K-mediod clustering algorithm for clustering purpose and Random forest algorithm to get the accuracy in the detection of leaf disease. They used some following characters Mean, SD, RMS, Variance, Smoothness, Skewness, Contrast, Correlation, Energy these characters are used for measuring the accuracy and also finding the disease after that searched disease name can be used as key to known that which type of fertilizer to be used.

So it will helps farmers to get proper and accurate information related to the leaves diseases also the fertilizer and amount of fertilizer to be used .It will overcomes the farmers efforts and also saves the time.

III. PROPOSED SYSTEM

We all know that agriculture is most important sector for us. And Farmer is real life hero who really takes hard efforts for us. But in agricultural sector farmers are facing lots problems one of the major problem is plant disease due to unwanted changes in the climate ,improper nutrients, Bacteria, fungus and all such things the healthy plants get affected by a hazardous disease due to which the productivity of the crops get reduced. Farmers are continuously and manually observing the plant to identify which type of disease but sometimes he can't get the proper idea about it and so he just cut that part which is affected and he goes to the shop market then he will get idea about the disease and also about the fertilizer to reduce all his efforts our system provide a better solution on it.

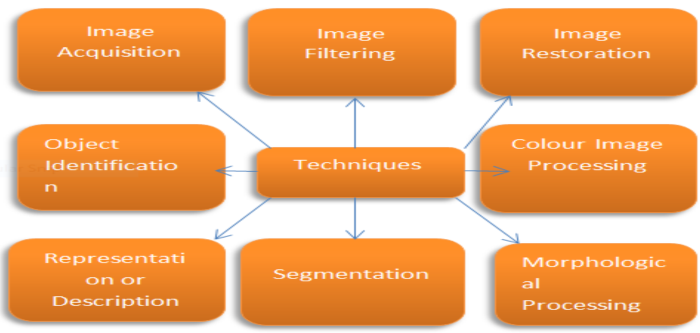

Fig.1 Techniques Used

Image Preprocessing:

Image Processing are techniques are used to get accurate image. When image get captures through camera from real field it may be contain dust, water spots and spores also. The purpose of image processing is to eliminate all these things and get the clear image.

1) Image Acquisition
   Image acquisition is nothing but converting virtual or an optical in to electrical signal. we can simply say that Image acquisition is capturing a image through digital device like digital camera and storing it. To identify the infected plant area we need to capture the image work on it for that image acquisition is required.

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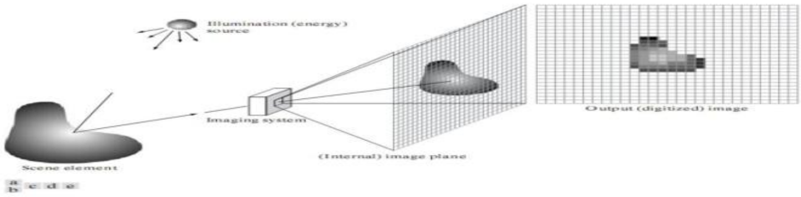

Fig.2 Image Acquisition

1) Image Filtering

Image filtering is process of enhancing the image or modifying the image. When we captured the plant image it may contain dust, spores, water droplets so to eliminate all these things image filtering is used to get the proper image and clear image.

2) Colour image processing

Colour image processing is used for identifying the symptoms of the plant disease by doing analysis of coloured image. The Colour image processing method includes algorithm that will convert RGB image into H, I3a and I3b colour transformation.

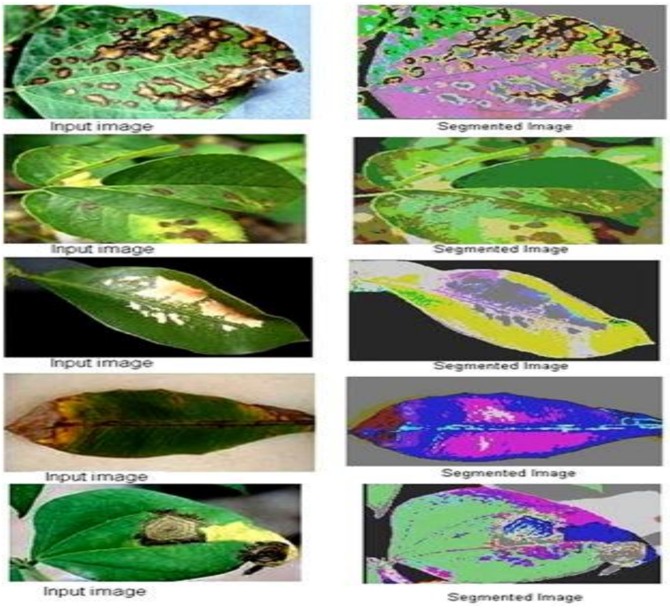

Fig.3 Colour image processing

3) Morphological Image Processing

Morphology is a set of Image processing operations that process images based on shapes. In a morphological operation, each pixel in the image is adjusted based on value of other pixel.

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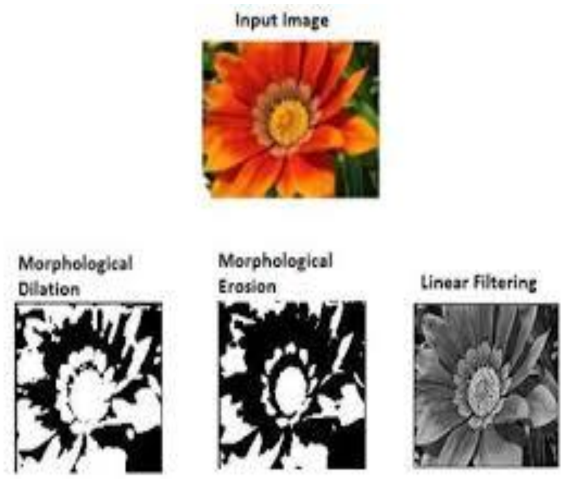

Fig.4 Morphological image processing

4) Image Clustering

K –Medoids Clustering Algorithm

Medoid is nothing but the point lie in the cluster ,whose dissimilarities are minimum in the cluster with all other points.Formula for calculating the dissimilarities between the medoid and the object point is $E = |Pi - Ci|$.

1. Initialize: select k random points out of the n data points as the medoids.
2. Associate each data point to the closest medoid by using any common distance metric methods.
3. While the cost decreases:

   For each medoid m, for each data o point which is not a medoid:

   1. Swap m and o, associate each data point to the closest medoid, recompute the cost.
   2. If the total cost is more than that in the previous step, undo the swap.

K-Means Clustering Algorithm:

Properties of K-Means Algorithm and K-Means Algorithm

1) Properties of K-Means Algorithm

   a) There is K number of clusters always.
   b) There is minimum one item in each of the given cluster.
   c) The clusters never overlap with each other.
   d) Each member of single cluster is nearer to its cluster than any other cluster.

2) The Process of K-Means Algorithm

   a) First divide the dataset into K number of clusters and assign the data points randomly to the clusters.
   b) Then for each data point, calculate the Euclidean distance, from the data point to every cluster.

The Euclidean distance is the straight-line distance between two pixels and is given as follows:

Euclidean Distance=$\sqrt{(x1 - x2)^2 + (y1 - y2)^2}$

Skewness is also calculated.

5) Image Classification

After segmentation classification is done.For classification SVM Algorithm is used .It separates the foreground and background pixels.

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Introduction of svm

SVM is support vector machines algorithm, which is used for the classification purpose. SVM is supervised, flexible algorithm of machine learning which is use for classification as well as regression. Now a day in many applications SVM is use its accuracy is near about 88%.
SVM model is basically used for classifying the data into different classes using hyperplane its main goal is find a maximum marginal hyperplane.

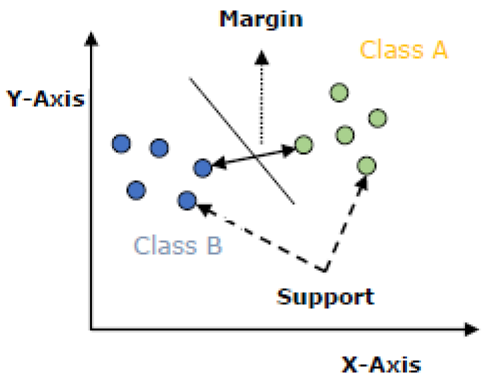

Fig.5 SVM Classification

Important attributes in SVM –

- **Support Vectors** − Data points that are closest to the hyper plane is called support vectors. Separating line will be defined with the help of these data points.
- **Hyper plane** − As we can see in the above diagram, it is a decision plane or space which is divided between a set of objects having different classes.
- **Margin** − It may be defined as the gap between two lines on the closet data points of different classes. It can be calculated as the perpendicular distance from the line to the support vectors. Large margin is considered as a good margin and small margin is considered as a bad margin.

Linear separable SVM
Linear SVM is type of SVM in which the dataset is classified by just drawing a single line**.**
Nonlinear separable SVM
It is type of SVM in which data cannot be classified by using a single line**.**

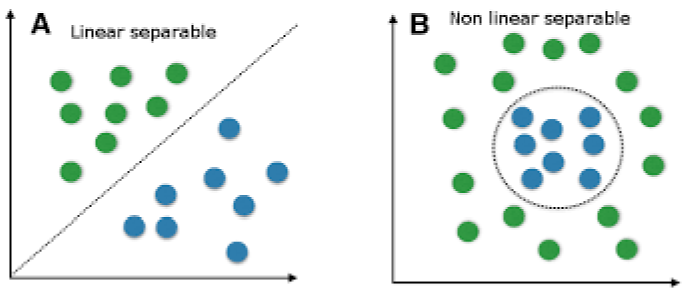

Fig.6 SVM classification

6) Disease identification and fertilizer suggestion
After classifying the given image we will get the affected disease, that disease name is used as key to get that which fertilizer is to be applied

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IV. SYSTEM ARCHITECTURE

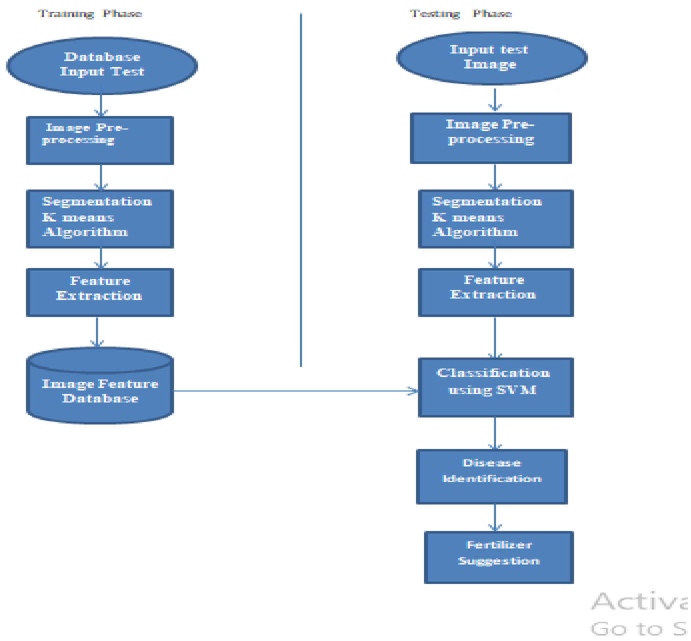
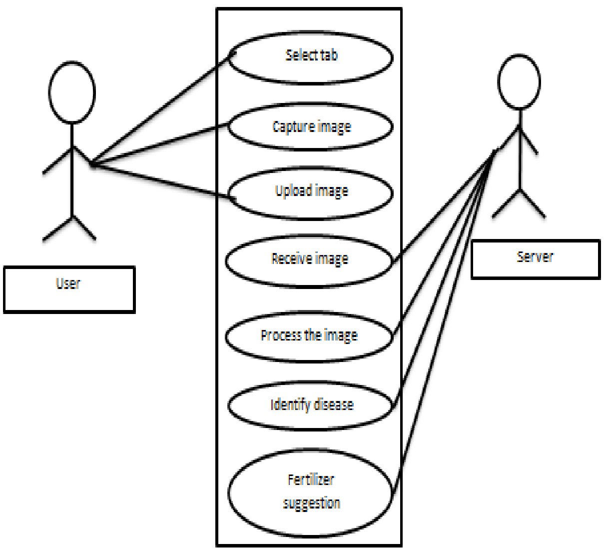


Fig.7 System Architecture

V. UML DIAGRAMS



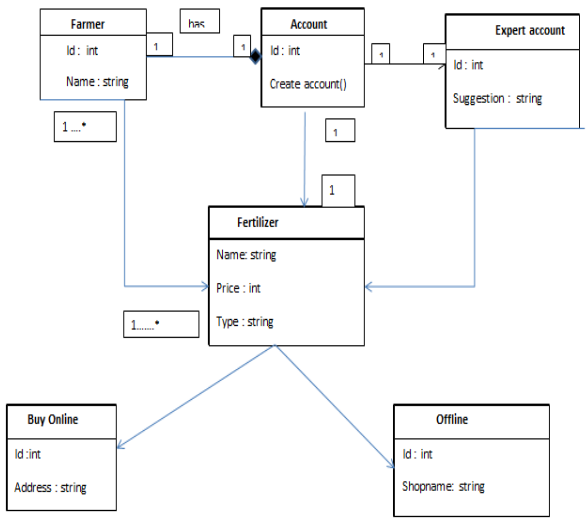


Fig.8 Use case Diagram

Fig.9 Class Diagram

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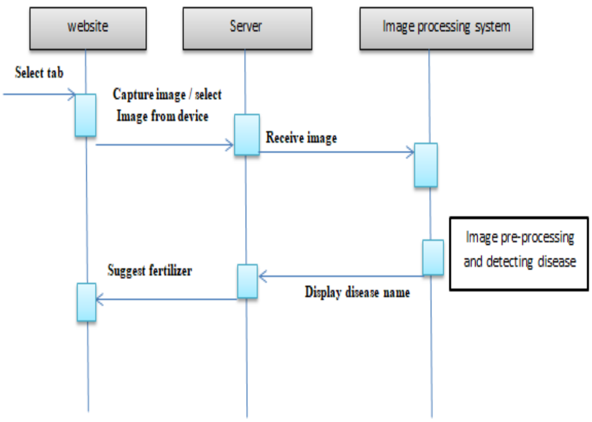

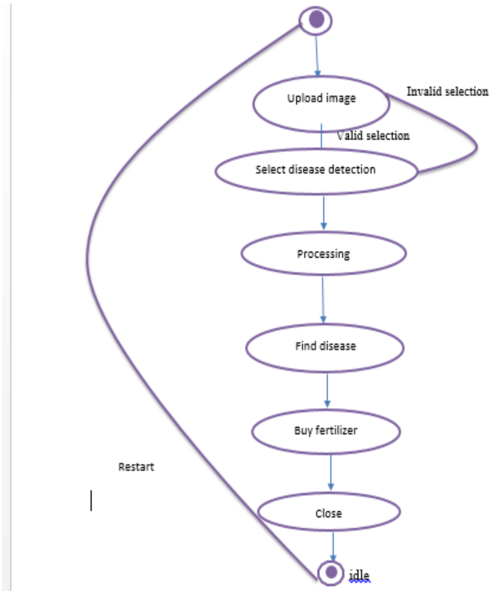

Fig.10 Sequence diagram

Fig.11 Statemachine diagram

E-R DIAGRAM

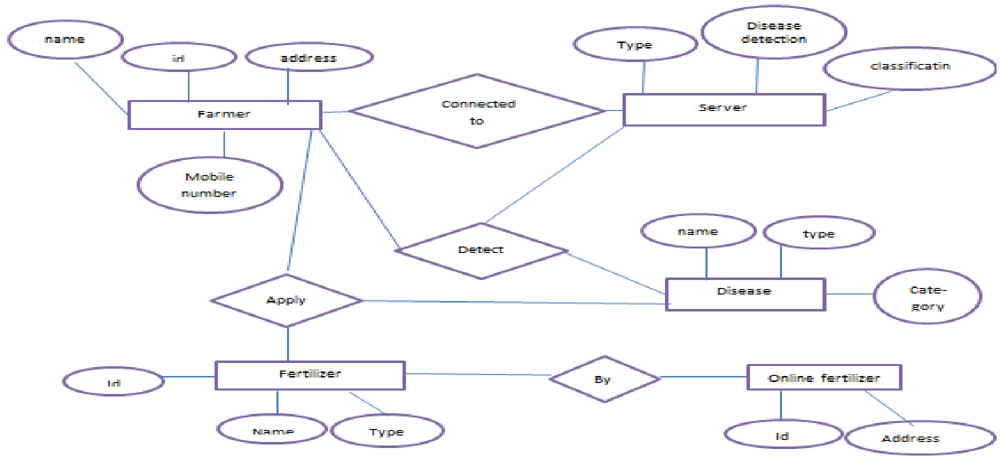

Fig.12 E-R Diagram

VI. EXECUTION STEPS

1. Capture image through camera.
2. Image Processing.
3. Image Clustering.
4. Image classification.
5. Feature Extraction.
6. Disease suggestion.
8. Fertilizer Recommendation.

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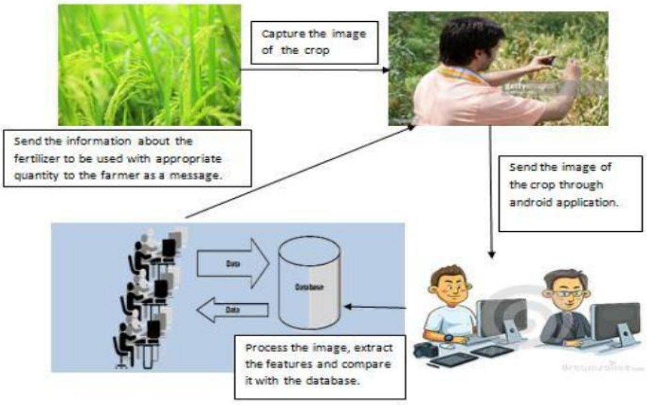

Fig.13 Execution steps

VII. CONCLUSION AND FUTURE SCOPE

Thus with various algorithms and dataset we will be developed a enhance system that will definitely full fill the farmers ambitions. System will give proper and accurate information related to the plant disease also the fertilizer. That will helps to farmer for avoiding a manual observation of the plant to know about the infected disease also system will reduces a time to get fertilizer because it provides an online purchasing option.

For future scope we can also add the soil moistures information, which season is appropriate for which plant, amount nutrients and all. Also we can work on market issues faced by the farmers.

REFERENCES

[1] Dheeb Al Bashish, Malik Braik and Sulieman Bani-Ahmad, "Detection and Classification of Leaf Diseases using K-means-based Segmentation and Neural-networks-based Classification," Year:2011 DOI: 10.3923/itj.2011.267.275.

[2] Sai Kirthi Pilli, Jessy George Smith, "eAGROBOT - A robot for early crop disease detection using image processing", year:2015 DOI: 10.1109/ECS.2014.7090754.

[3] Aakanksha Rastogi, Ritika Arora, Shanu Sharma, "Leaf disease detection and grading using computer vision technology & fuzzy logic."

[4] Anand K. Hase, Priyanka S. Aher, Sudeep K. Hase, "Detection, categorization and suggestion to cure infected plants of Tomato and grapes by using openCV framework for Android Environment," year:2017 DOI:10.1109/i2ct.2017.8226270Corpus ID: 6411066.

[5] R Indumathi, N Saagari, V Thejuswini, R Swarnareka., "Leaf disease detection and fertilizer suggestion, ISSUE 2019".

[6] Bauer, S. D.; Korc, F., Förstner, W. "Investigation into the classificationof diseases of sugar beet leaves using multispectral images". In: E.J. vanHenten, D. Goense and C. Lokhorst: Precision agriculture 2009.Wageningen Academic Publishers, p. 229-238.

[7] H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z.ALRahamneh. "Fast and Accurate Detection and Classification of Plant Diseases". In International Journal of Computer Applications (0975 –8887) Volume 17– No.1, March 2011.

[8] Rumpf, T., A.-K. Mahlein, U. Steiner, E.-C. Oerke, H.-W. Dehne, L.Plumer, "Early detection and classification of plant diseases with Support Vector Machines based on hyperspectral reflectance",Computers and Electronics in Agriculture, Volume 74, Issue 1, October 2010, Pages 91-99, ISSN 0168-1699.

[9] Precision agriculture '09. edited by: E.J. van Henten, D. Goense and C.Lokhorst, "BoniRob: an autonomous field robot platform for individual plant phenotyping" . By A. Ruckelshausen, P. Biber, M. Dorna, H.Gremmes, R. Klose, A. Linz, R. Rahe, R. Resch, M. Thiel, D. Trautz and U. Weiss Page 841-847, SBN: 978-90-8686-113-2.

[10] Camargo, A. and Smith, J. S., "An imageprocessing based algorithm to automatically identify plant disease visual symptoms, Biosystems Engineering", Volume 102, Issue 1, January 2009, Pages 9-21, ISSN 1537-5110.

[11] Rajneet Kaur, Manjeet Kaur, "A Brief Review on Plant Disease Detection using in Image Processing" International Journal of Computer Science and Mobile Computing, February 2017.

[12] Iqbaldeep Kaur, Gigty Aggarwal and Amit Verma, "Detection and classification of Disease Affected Region of Plant Leaves using Image Processing Technique", Indian.
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