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## Detection of Leaf Disease by SVM Algorithm and Irrigation Control by Arduino

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**ABSTRACT:** Identification of the symptoms of disease by naked eye is difficult for farmer. The disease can be identified by using image classification. There are three common disease in all types of plant such as rice blast, anthroconosis, leaf curl. The crop protection is done by using computerized image processing techniques includes image preprocessing, image segmentation, image classification, that can detect the diseased leaf. The image preprocessing technique and the image segmentation techniques such as kmean clustering and the image classification is done by the SVM algorithm, then the pesticides also provided to the plant. The arduino controller which is connected to the matlab tool by using a UART connection is used to controller the irrigation and the pesticides given to the field. The Dc motor is used to control the range of pesticides given to the field. The pesticides used to rectify is based on natural fertilizers such as using the fish pond water as a pesticides which was used as a pesticides in olden days. The details about disease can be sent to the farmer via android application. The farmer can get the information from cloud or via android application by just notifying the details about the disease.

**KEYWORDS:** kmean clustering, support vector machine, Arduino, UART.

### I. INTRODUCTION

High quality crop production is the big challenge for farmers, especially in India. In villages, cultivation is the main occupation of farmers. Their maintenance is entirely depends on the crop production. The crop production rates are directly proportional to the each day plant growing progress so that plant disease detection is very important. Therefore, detection of plant in early stage is very essential to prevent it from spreading to the entire field. In olden days farmers can able to detect the disease by their experience and observations. Regular observations and good experience leads to the accurate disease detection with remedies. This is practically not possible for the large fields. Lack of experience in agriculture field causes wicked quality crop. Various diseases occur in different parts of the plant can be identified by observing the change in symptoms, spots, colour etc. The major requirement in agriculture field to improve crop production is less time consuming and automatic diagnosis technique. Recently, android applications are designed using image processing approaches to find the different solutions of problems rise in agriculture such as disease detection in stem, leaf, flower and fruit. Agriculture is the most important sector Indian economy. Indian agriculture sector accounts for 18 percent of India's gross domestic product (GCD) and provides employment to 50 % of the countries workforce. In 19<sup>TH</sup> century there are large number of cultivation lands for farming. So large agriculture products can be produce. But in 21<sup>ST</sup> century there is lack of resources, land and only few people are liked to do the forming. And many diseases present in the leaf of the plant, so there is the reduction of product. In ancient days the cultivators are able to identify the plant disease by their naked eyes, and they use only the natural fertilizers and the pesticides, by this they can have a quality and healthy food products. But today the cultivation of the food product are reduced and the present generation are not able to cultivate quality products the main reason is that they don't know the type of disease that affect the plant and the fertilizers are fully made up of chemical product and they don't know the range of the pesticides. They cannot predict that what disease is affecting the plant. So we are doing this project to help the present generation to identify the disease and to say the range of the pesticides. By this we can have a good and the quality food product.



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## II. LITERATURE REVIEW

Gurleenkaursandhu ,Rajbirkaur [1] have developed the potential method of plant leaves disease detection techniques that facilitate the advancement in agriculture .It includes various phases such as Image Acquisition, Image segmentation ,Feature extraction and Image classification .Here the image acquisition is done by the camera ,mobile phones etc and also the image is taken from the web .Image segmentation is done by GLCM algorithm The GLCM method is a statistical method for the feature extraction .Image classification is done by KNN k Nearest Neighbor algorithm .There are two classifiers such SVM and Navie Bayes for disease detection and the results of these two classifiers are compared with execution time and accuracy.

Prabira Kumar Sethy,NaliniKantaBarpanda,AmiyakumarRath[2] have developed disease selection and identification on rice leaf diseases.The leaf disease detection is done by kmeans clustering ,Multi class SVM and PSO.Gray level co-occurrence(GLCM) matrix is used for feature extraction .The input of the image is captured by using the digital camera .The disease detection is done by SVM classifier for improving the accuracy by optimizing the data using PSO(Particle Swarm Optimization) algorithm.By using PSO feature extraction dataset SVM is used for differentiation and categorization of the rice leaf disease with normal precision of 97.91%.

L.R Priya,G.Ignisha,Rajathi,R.Vedhapriyavadhana[3] have developed the automatic disease detection system.They have introduced crop disease detection and the monitoring system.The disease detection is done by capturing ,segmenting,extracting the classifying features and final classification .It shows the percent of the affected area of the leaf.It sends message to the user about every action taken such as disease detection and about soil dryness.Other subsystems includes monitoring of the temperature ,humidity and soil moisture content.Based on input of soil moisture content the motor switch on and watering the plant.

Nambita M-Butale[4] has implement the method of image processing to detect the plant disease because agriculture plays a main role in Indian economy. This process is helped to improve the quality, quantity of a plant .It also reduce the cost, time and effort of the human beings. This automatic disease detection method is used for detecting the disease at a initial stage and also it gives a accurate result. The steps for detecting the disease is image acquisition, image enhancement , image segmentation, feature extraction and image classification.

Sharaddha Pandey ,Shailendra Kumar Singh [5] has agriculture is the backbone for the developing countries and india is one of the fast developing countries Due to the development of the industrialization and globalization the cultivable lands facing the hurdles. For instillation about the awareness and the necessity of the cultivable lands in younger generation minds. The technology plays a major role in all the field but till we are a using old

Saradhambal.G,Dhiviya.R,Latha.S,Rajesh.R [6] has used the image processing techniques. The main thing of this project is to reduce the usage of chemical pesticides in a agricultural field and to increase the production rate. Here the Kmean clustering algorithm is used to detect the leaf which is affected.The ultimate aim of the project is voice navigation system.so,that a person without a software knowledge can be able to use it efficiently.The steps for the image processing used in this project is image preprocessing ,image segmentation, feature extraction ,image classification.

SumitNema,BharatMishra,MamtaLamber[7] have developed a application for the detection of a leaf disease in a early stage and improve the quality, quantity of the plant. Because the main objective for the developing countries is agriculture and the quality of the crop is depends on the daily growth of the plants. This paper represents a review on different technologies for leaf disease detection by using image processing and classified them based on the analysis tool and the application.



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## III. PROPOSED SYSTEM

Identification of type of disease by naked eye is difficult for the farmers. The disease detection is done by using image processing technique that can detect the diseased leaf using image preprocessing, image segmentation image classification. The image classification technique such as k-mean cluster, SVM, GLCM algorithm. Then the pesticides also provided by using arduino controller



FIG 3.2 DISEASED IMAGE

The image processing techniques involves means algorithm. The steps in image processing techniques are

Image preprocessing

Image segmentation

Image classification

### IMAGE ACQUISITION:

Image acquisition is done by using digital camera , mobile phones and the image is also taken from the web .with the desired size and the resolution. The formation of database for the image is fully dependent on the application developer.

### IMAGE PREPROCESSING:

Image preprocessing is to increase the quality of image necessary for further processing and analysis. It includes color conversion, image enhancement and image smoothing. The quality of input image is achieved by removing undesired distortion from the image .Image enhancement is used to improve the image contrast. Image clipping is done to get diseased region. Median filter is used for the removing noise. Median filter is a nonlinear digital filtering techniques.

### IMAGE SEGMENTATION:

Image segmentation is the classification of an image into different groups. There are different methods and one of the most popular methods is K-Means clustering algorithm. Clustering is a method to divide a set of data into a specific number of groups. It's one of the popular method is k-means clustering. In k-means clustering, it partitions a collection of data into a k number group of data11, 12. It classifies a given set of data into k number of disjoint cluster. K-means



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algorithm consists of two separate phases. In the first phase it calculates the k centroid and in the second phase it takes each point to the cluster which has nearest centroid from the respective data point. There are different methods to define the distance of the nearest centroid and one of the most used methods is Euclidean distance. Once the grouping is done it recalculate the new centroid of each cluster and based on that centroid, a new Euclidean distance is calculated between each center and each data point and assigns the points in the cluster which have minimum Euclidean distance. Each cluster in the partition is defined by its member objects and by its centroid. The centroid for each cluster is the point to which the sum of distances from all the objects in that cluster is minimized. So K-means is an iterative algorithm in which it minimizes the sum of distances from each object to its cluster centroid, over all clusters.

## **IMAGE CLASSIFICATION:**

The classification according to the disease and the Mapping of images into one of a number of predefined categories is by the image classification. Classification includes image sensors, image pre-processing, object detection ,object segmentation, feature extraction and object classification.

## **ARDUINO:**

Arduino is used to develop the interactive things ,that accept input from the variety of switches or sensors and controlling of lights ,motors and other physical output .In our project the Arduino is used to control the DC motor and the LCD display which is used to display the disease name and then it is connected to Ethernet cable which is used to store the details about the leaf disease in cloud.The cloud storage is mainly used to minimize the work because once we stored the details about the leaf disease in cloud we can retrieve the details from cloud itself without any matlab for same type of disease.

## **UART:**

A Universal Asynchronous Receiver/Transmitter is a type of computer hardware that used to translates the data between serial and parallel forms .A UART is usually an integrated circuit used for serial communication over a computer or peripheral device serial port .In our project the UART connection is used to connect the MATLAB tool with a Arduino .

## **DC MOTORS AND L293D MOTOR DRIVER :**

L293D driver is a motor driver which allows DC motor to drive in any direction .L293D is an IC and it has 16 pins which is used control a set of two DC motors Simultaneously in any direction .It means that you control two Dc motor with a single L293D IC .The L293D can drive small as well as small motors .A DC motor is used to drive a mechanical load .Here the DC motors is going with the Arduino controller by using a L293D IC driver .The DC motor is used to provide pesticides to the field .The Dc motor turns on and off according to the Arduino input .Related to the disease of the plant the DC motor turns on and provide pesticides to the field:



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## V. RESULT



FIG 4.1 ORIGINAL IMAGE

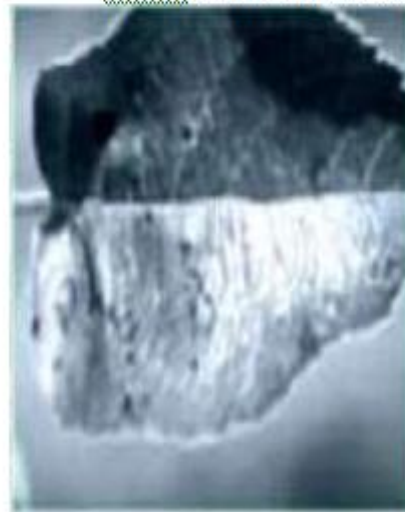


FIG 4.2 GRAYSCALE IMAGE



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FIG 4.3 SEGMENTED IMAGE

The result displayed as a 2x2 column (i)original image (ii)noise added image (iii)filtered image (iv)segmented image and the disease displayed in both matlab and the LCD display which is connected with arduino .then by using motor the pesticides and the natural fertilizers is given to the field.

## V. CONCLUSION

In coming days, it is very important to save the plant from the disease . Therefore the quantity of the plant product can be increased, the quality also preserved. By using the MATLAB we are detecting the disease of the plant and also with the help of Arduino the suitable pesticides can be also provided to the field.

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