

PLANT DISEASE DETECTION AND PESTICIDE SPRAYING USING DIP AND IoT

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ABSTRACT: Identification of disease is extremely difficult in agriculture field. If identification is inaccurate then there is an enormous loss on the production of crop and economical value of market. This project is used for detection of various plant diseases and when the disease is identified an SMS alert is sent to farmer and a pesticide spraying is done automatically using NodeMCU. This approach can be useful in the field of agriculture for accurate detection of diseases and to take the respective measures. The proposed Approach Consists of leaf image database collection, pre-processing of those images and segmentation followed by k-means clustering, feature extraction and classification using SVM algorithm. After detection of disease, the information is passed to NodeMCU and finally the message is sent to farmer by means of a cloud (Ubidots).

IndexTerms -k-means clustering, SVM algorithm, NodeMCU, Ubidots.

1. INTRODUCTION

India is quick developing country and agriculture is the back bone for the countries development in the early stages. Because of industrialization and globalization ideas the field is facing hurdles. On top of that the awareness and also the necessity of the cultivation ought to be instilled within the minds of the younger generation. Now a day's technology plays very important role in all the fields however until these days we are using some previous methodologies in agriculture. Identifying disease incorrectly results in immense loss of yield, time, cash and quality of product. Identifying the condition of plant plays a very important role for successful cultivation. In the past days, identification is done manually by the skilled people but due to the numerous environmental changes the prediction is changing into tough. At the current era, the farmers are using numerous pesticides for crop at regular intervals. Presence of pests and disease has an effect on the speed of crop cultivation. It reduces crop yield in a significant quantity and as a result there will be a rise in economic condition, food insecurity and mortality.

The present system depends on visual observation that could be a time consuming method. This drawback may be utterly resolved if we have a tendency to use automatic management of using pesticides during which the pesticides are going to be used based on the growth of the crop. With the advancement in image processing technology, it is possible to make an automatic mechanism for the detection of pests. The Internet of Things is the connected network of physical objects and devices, vehicles, buildings etc., embedded with electronics, software, sensors, and network connectivity-that allows these objects to gather and exchange data. Building a great deal application needs the proper choice and combination of sensors, networks and communication modules. Therefore we will use image processing techniques for identification of disease. Typically we will observe the symptoms of disease on leaf, stems, flowers etc. Therefore we use leafs for identification of diseased plants.

2. LITERATURE SURVEY

A new automatic methodology for disease symptom segmentation in digital images of plant leaves. The recognition of disease name for the leaf image is performed in this work. Study and analysis of different plant disease detection using image processing work is carried on. The k means clustering algorithm is employed for segmentation. The k-means idea is added to the proposed system which can divide the leaf into totally different clusters. The survey of disease identification on different leafs is done. Comparison of various detection technique of plant disease detection is mentioned. SVM and k-means clustering has employed in this method. An identification of variety of leaf diseases using varied data processing techniques is the potential research area. The diseases of various plant species has mentioned. Some of the disease names were classified in this system. The idea SVM for classification is employed in this system.

3. PROPOSED METHODOLOGY

The proposed method starts with collection of leaf images and Pre-processing of those images followed by segmentation of images using k-means clustering method, feature extraction and finally the classification of disease using SVM algorithm and therefore the disease is detected.

The detected disease is then passed to NodeMCU. It activates the motor for spraying of pesticide and also sends an SMS to the farmer by means of Ubidots.

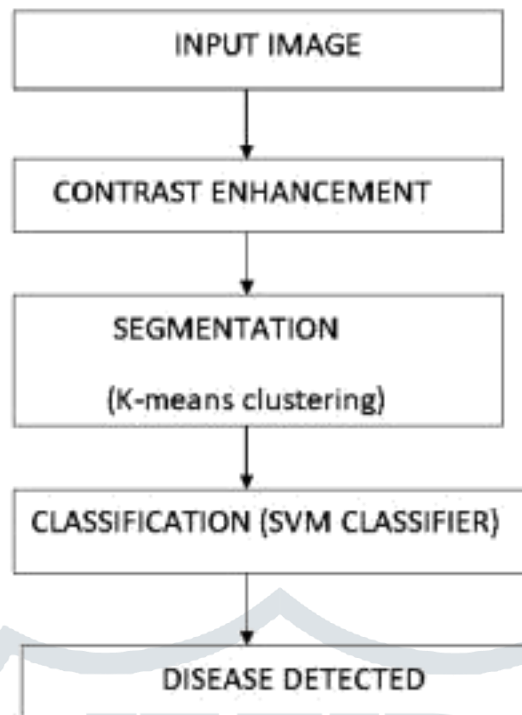


Fig 1: software block diagram

Image acquisition: First we consider a plant which is affected by the disease and capture the image of the diseased leaf and then we load this image as an input to the system.

Contrast enhancement: The second step after loading the image is contrast enhancement. It makes the image features to be clearer by increasing the contrast.



Fig 2: contrast enhancement

Segmentation: Image segmentation is the process of partitioning or dividing the image into segments or clusters to analyze easily. Here we use K-means clustering algorithm for segmentation.

3.1 K-means clustering algorithm

- This algorithm is used to divide the image based on the feature of the leaf in to k number of groups.
- First we need to select the value of k which represents the no. of clusters into which the image is to be divided.
- Each and every pixel is assigned to its nearest centroid k.
- The centroid position is changed by means of data values assigned to the group. The centroid shifts to the centre of its assigned points.



Fig 3: clustered images

We have to enter the cluster number which contains the exact diseased part.

3.2 SVM Algorithm

“Support Vector Machine” (SVM) is a supervised machine learning algorithm which can be used for both classification or regression challenges. However, it is mostly used in classification problems. It is also commonly used for image recognition challenges, performing particularly well in aspect-based recognition and color-based classification.

Classification: Here the classification is done using SVM algorithm. SVM is nothing but support vector machine.

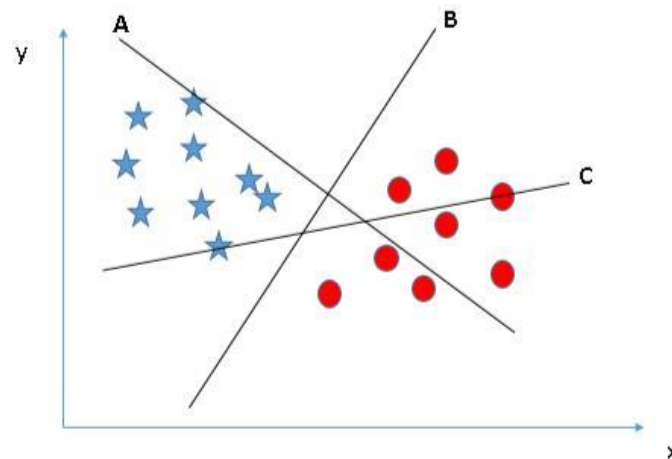


Fig 4: SVM classification model

In the above figure a simple classification problem is given in 2D input space. The two different colors indicate the images of star-shaped and round objects. We can draw a line separating the two classes and many such possibilities exist. It is clear that the line B is better classified than line C because there is less error. The line C may be the optimal line of separation. A line becomes a plane if we have three attributes variables instead of two, and becomes a hyperplane if there are more than three attributes. The line B represents what is known as the optimal hyper plane (OH). Another name of OH is maximal margin hyperplane. Finally the disease is detected and the disease name is displayed.

4. HARDWARE IMPLEMENTATION

The disease data is sent to NodeMCU by means of serial communication using USB cable. Then the DC motor is switched on for sprinkling of pesticides. The NodeMCU is initialized to send the data at 9600 baudrate. The detected disease name is then uploaded to the cloud (Ubidots). Then this cloud sends the disease name to the farmer through SMS.

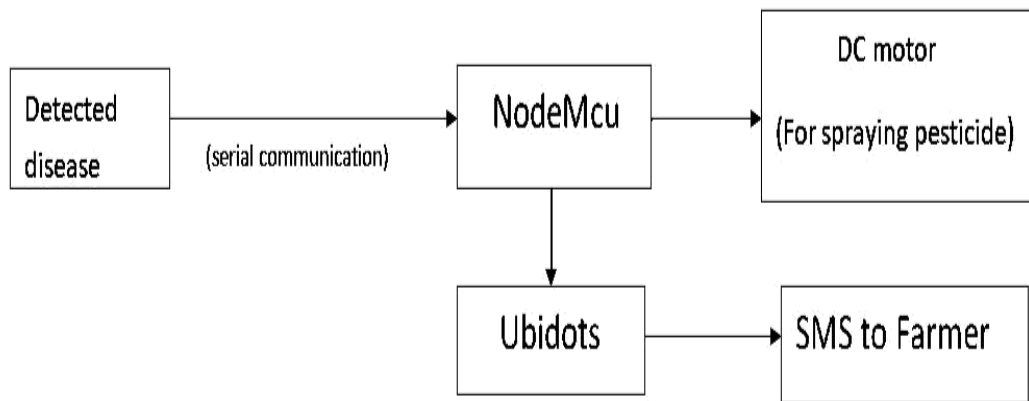


Fig 5: hardware block diagram

The Node MCU is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines. It includes firmware which runs on the ESP8266 WI-FI SOC from Espressif systems, and hardware which is based on the ESP-12 module. Advanced API for hardware IO, which can dramatically reduce the redundant work for configuring and manipulating hardware. The DC motor is used for spraying of pesticides. Here we use 6V DC Motor for spraying of pesticides when the disease is detected. USB is defined as an acronym that stands for Universal Serial Bus which is a type of computer port which can be used to connect equipment to a computer i.e., NodeMCU to the computer. Here we use single channel 5v relay. Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. It provides automatic on-off of motor.

5. RESULTS AND DISCUSSIONS

Load the diseased image, enhance the contrast of the image and segment the image by k-means of clustering and the obtained results are shown in the fig 6 and fig 7.

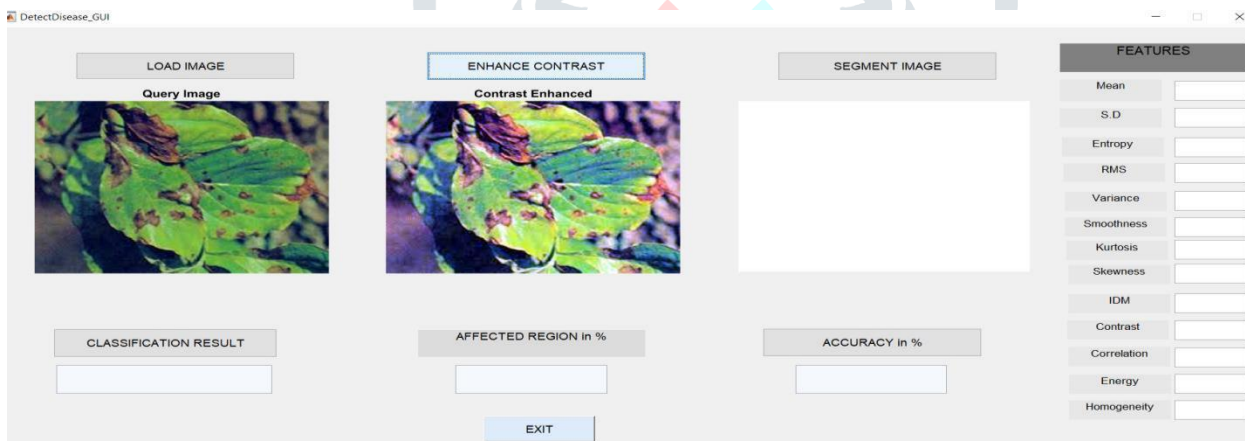


Fig 6: Image enhancement

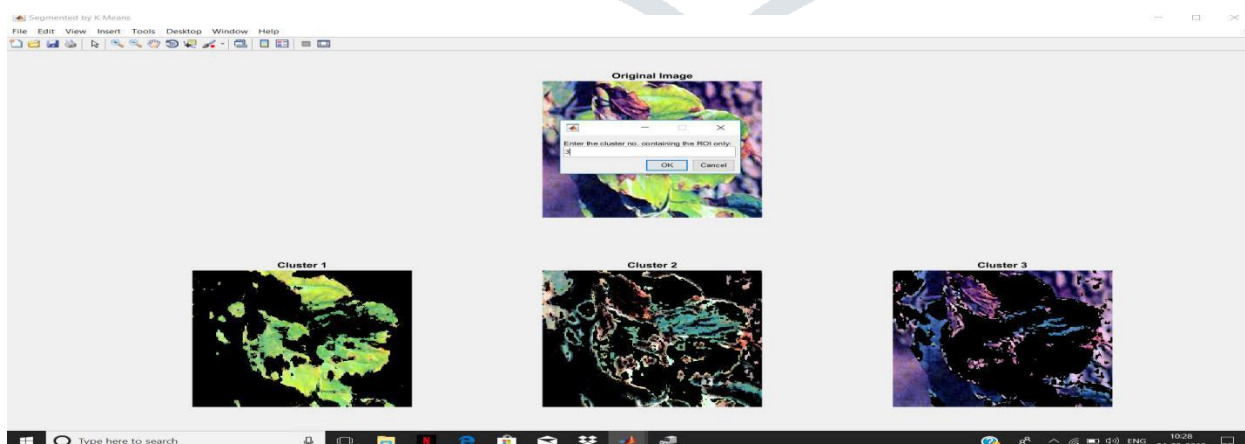
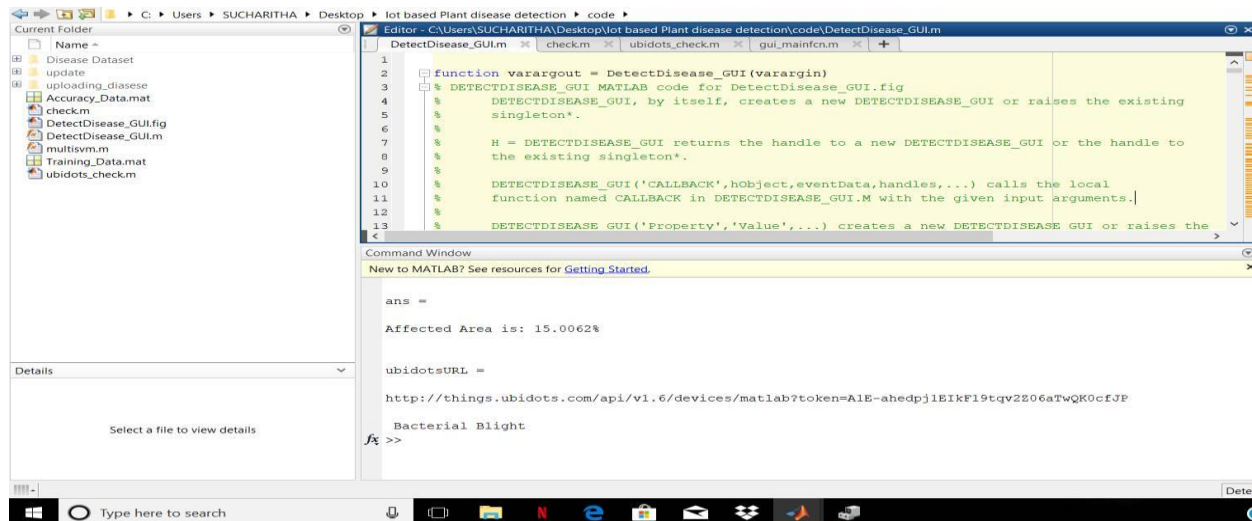


Fig 7: Segmented by K-means

Based on the segmentation and SVM classification the affected percentage of area and the type of disease is obtained as shown in the *fig 8*. For the input image applied in this example the affected area is 15.0062% and type of disease is Bacterial Blight.



```

1 function varargout = DetectDisease_GUI(varargin)
2
3 % DETECTDISEASE_GUI MATLAB code for DetectDisease_GUI.fig
4 %
5 % DETECTDISEASE_GUI, by itself, creates a new DETECTDISEASE_GUI or raises the existing
6 % singleton*.
7 %
8 % H = DETECTDISEASE_GUI returns the handle to a new DETECTDISEASE_GUI or the handle to
9 % the existing singleton*.
10 %
11 % DETECTDISEASE_GUI('CALLBACK',hObject,eventData,handles,...) calls the local
12 % function named CALLBACK in DETECTDISEASE_GUI.M with the given input arguments.
13 %
14 % DETECTDISEASE_GUI('Property','Value',...) creates a new DETECTDISEASE_GUI or raises the

```

```

New to MATLAB? See resources for Getting Started.

ans =

Affected Area is: 15.0062%

ubidotsURL =

http://things.ubidots.com/api/v1.6/devices/matlab?token=A1E-ahedpj1EIkF19tqv2206aTwqK0cfJP

Bacterial Blight
fx >>

```

CONCLUSION

The work prevails over an automatic pesticides management mechanism that reduces human intervention within the crop cultivation. It prevents the adverse effects of over usage of pesticides that results in reduction in crop cultivation. This model is successfully applied to attain great results with most varieties of crops. The goal of this project is implementation of controlled irrigation techniques using some principles. In the future, alternative image processing techniques may be used to modify the detection and extraction more efficient and accurate. It can be seen that the internet of Things and Image processing is combined and implanted within the field of agriculture to get satisfactory results. By using this approach, the disease identification is done for all kinds of leaves and also we can know the affected area of leaf in percentage. And also an sms alert is sent to a farmer and automatic spraying of respective pesticide spraying is done.

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