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Automated system for analysis of soil and plant disease detection for grapes

Bhagyashri Pachpute, Prof. Dr. S. V. Shinde, Suviksha Poojari, Deepti Sahare, Mayuri Patil
Pimpri Chinchwad College of Engineering, Pune, India

Bhagyashri04592gmail.com,swatii.shinde@gmail.com
suvikshapoojari@gmail.com,deepti24sahare@gmail.com,
patilmauri3007@gmail.com

Abstract

India is an agricultural country where farmer faces a lot of problems. Farmer suffers major losses every year due to crop infestation with pests and this in turn affects his lifestyle. Soil Nutrient uptake is also an important aspect in the calculation of soil quality, as it indicates how much it can sustain plant life. Soil nutrient uptake is determined by the quantity of water ph of macro and micro nutrients, etc. The oldest method of inspection the soil parameters was time intensive in which the farmers used to verify and calculate the results manually. In order to resolve the above issue, it is important to establish a system that monitors the farm continuously and detects the disease as quickly as possible. And also this system allows the user to detect soil parameters which will predict crop suitable for that soil. In this paper we gave brief idea by continuously monitoring crops using Image Processing to solve this problem. This system is used to detect diseases and spray disease pesticides in adequate quantities when appropriate, and also detect soil fertility.

Keywords— *Image processing, Pesticide, Raspberry Pi, Disease Prediction, SIFT, Soil Detection.*

1. Introduction

Agriculture is India's number one source of revenue. Agriculture alone accounts for around 22 per cent of our country's production. India is a agricultural country and agriculture relies on about 70 per cent of the population. Farmers have a huge range of suitable crops to select and find the appropriate pesticides for plants. Plant disease contributes to a significant reduction in both agricultural product quality and quantity. A solution to this issue is to spray pesticides on crops only when necessary and remove the disease-affected crops. It required continuous farmer-by-farmer monitoring, but this was not possible at all times by farmer due to different reasons such as lack of proper expert guidance. The whole problem is solved by the use of device that automatically detects any disease and protects crops from unnecessary pesticides and insects. In this system, ordinary camera (webcam, mobile camera) is inserted, to reduce the overall solution cost. Identification of plant disease by continuous visual inspection is a very challenging task and at the same time less effective and can only be achieved in limited areas.

Where as if the technique of image processing is used for disease detection then it will take less time and be more accurate. Some general illnesses in plants are red and

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yellowish spots, while others are fungal, viral, and bacterial. Image processing is the method used to assess the region of disease affected and to assess the color variation of the area affected. This system developed an impulsive model of disease management, depending on the impulse differential expression. The most effective way to control pests and minimize the diseases on crops is to create a proper plan.

Literature survey

As the world is moving towards new technologies and implementations, trend-up in agriculture is a needed target as well as many work in agriculture.

Many works include the use of a WSN which gathers data

from various sources. The collected data provide information of different environmental factors. There are number of other factors that decrease the productivity to a greater extent. In farming, therefore, automation will apply to evaluate these problems. So, to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all these factors. Hence this paper deals on the production of smart farming using IOT in this paper firstly the soil type and soil quality is tested using sensors.

Here the quality of soil is decided considering different soil tests like humidity test, moisture test and temperature test. The findings of this analysis suggest which type of crop is suitable for that soil.

Figure 1: Soil detection using Sensors

B] Smart System Monitoring on Soil [5]

Our nation's agriculture is significantly reduced due to a lack of interest in agricultural land and water. It also leads to very little production due to inexperience of soil dryness, no timely use of pesticides and appropriate crops for that soil. Hence advanced agriculture works a very important role for promoting agriculture.

In this paper it collects the pH data from the sensor and sends it to cloud. The cloud stores and processes the data which is then provided to the registered farm owners.

The resultant data is in understandable format. Also if the pH rate is low then the application suggests appropriate pesticides for cultivation.

The aim of this device is to detect the level of soil resources and the monitor the level of water and temperature with SMS alerts.

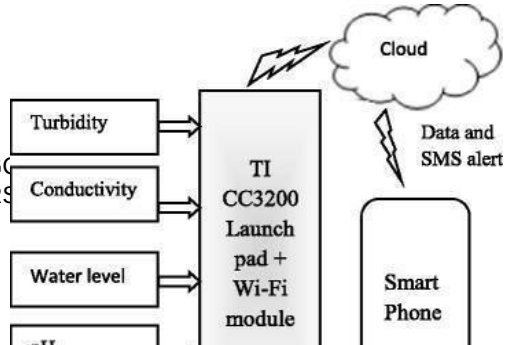

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Figure 2: Working model of Smart system

The important aim of this system is to create an embedded system for the pre-processing of images captured by camera for the continuous recognition of grape leaf disease. In this, the final classification test is performed on three sicknesses through a prepared neural network.
In this, firstly diseased leaves are passed as input to this system for testing. The remedy for this disease is shown to the user.

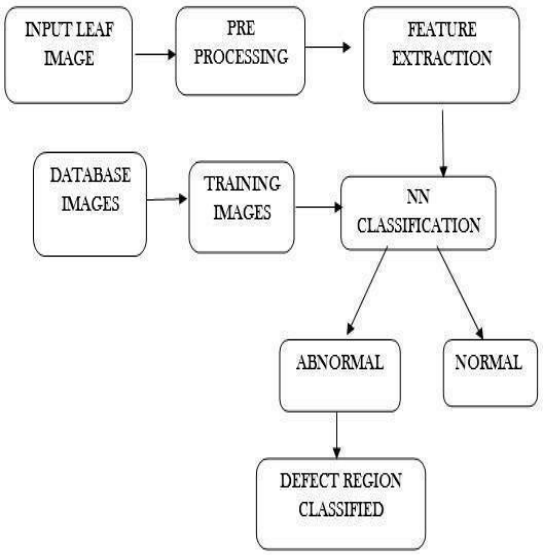

Figure 3.Working model

Figure 4.Types of Diseases (Powdery, Downey Mildew, Black Rot)

C]**A Unique Technique for Grape Leaf Disease Detection [6]**

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Plant leaf diseases broadly influence the generation of the nation to contribute for different techniques for detection and prevention of these diseases. Hence plant disease detection with the help of modern technique provides accurate results. Nearly, visual distinguishing proof is less exact and tedious. This system is helpful and gives accurate results in less effort by discovering particularly for grapes leaf diseases.

D] **Detection of Disease in Cotton Leaf using artificial neural Network [9]**

Crop health and progress in the seasonal changes are the major factors considered to determine the forthcoming yield. The number of environmental factors associated with the crop cycle is multiple. There are number of diseases by which crops get affected and leads to the failure so there's a need for a farmer to take preventive measures. The main aim here is to focus on the targeted quality of the cotton. This system is divided in to two parts:

2. Methodology for Implementation of Proposed System

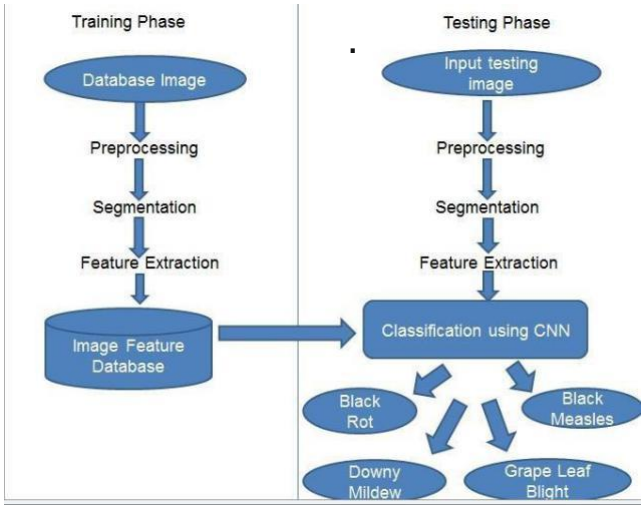

Figure 6: Working of Leaf Disease detection

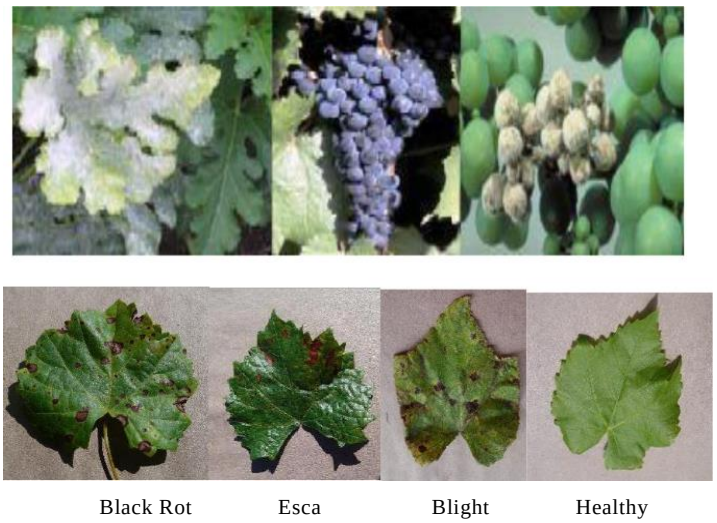

Figure 7: Plant leaf disease for grapes.

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Our proposed study, as shown in the above figure, would compare the sensor data from sensors with pre- determined sensors such as soil moisture sensors. The deployed sensors data are fed to the raspberry pi and generate alert related pesticides. Finally, an approach based on image processing techniques is proposed for the detection of crop diseases. The main purpose of the Suggested solution is to find the disease of the plant with little computational effort. The proposed approach is comprised of four phases. Accuracy is improved by the use of distinct methods of image processing such as image analysis, pre-processing, and extraction and classification characteristics. Speed and precision are the two main features of plant disease identification to be achieved by image processing methods.

We have taken our dataset from the below link:
https://www.kaggle.com/chandan372/plant-village

3. Product Functionality

Detecting various parameters for Soil of Grapes-

System Architecture:

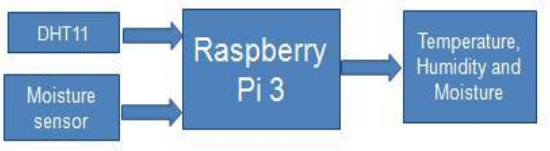

Figure 8: Working of detecting soil parameters

Soil Moisture Sensor:

Figure 9: Soil moisture sensor

The temperature and humidity sensor can be used to monitor the soil moisture content by examining the volumetric
water content. Measuring the moisture mechanisms required to remove dirt and weigh the samples of these mechanisms is measuring the dielectric constant electrical resistance or interaction with the neutrons. External aspects such as soil temperature type and electrical conductivity need to be configured based on the property and humidity calculated in the soil. There are various methods that can be used to calculate indirectly the water content of the soil, including the reflectometry of the frequency domain, which measures the rate of operation of an oscillating loop with some volume of water around it. Time domain transmission is used to measure the velocity of the volume component neuron humidity gage to measure the amount of neutrons in the soil moisture and Resistivity is used to

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calculate the electricity stream between two electrodes that can be help to assess the humidity content

Temperature Sensor

Figure 10: Temperature sensor

The LM 35 sensor is used because the output voltage of it is linear with the Celsius scaling of the temperature. It has a huge range of operations. The maximum output is 5V. There are three terminals used by controller to control the GSM to perform desired function. It also has reverse voltage protection and the LED notifications. It is operated in 900/1800 MHz. The output will increase 10mV for every one degree rise in temperature. The range is from -55 degrees to +150 degrees.

Humidity Sensor

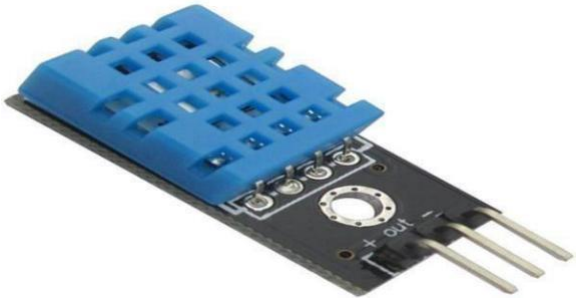

Figure 11: Humidity sensor

A humidity sensor measures, senses and reports both moisture and air temperature. The ratio of humidity in air to the highest level of humidity at a given air temperature is called relative humidity. When looking for safety, relative humidity is now an important element. The function of humidity sensors is to detect changes that alter electrical currents or air temperature. Humidity sensors can be classified as capacitive, resistive and thermal. All three sensor types monitor minute atmospheric changes to calculate air humidity.

4. Proposed System Design for the System

i)Digital image assessment.

ii)Implement artificial neutral network back propagation in machine learning.

The flow of proposed system is given below in figure:-

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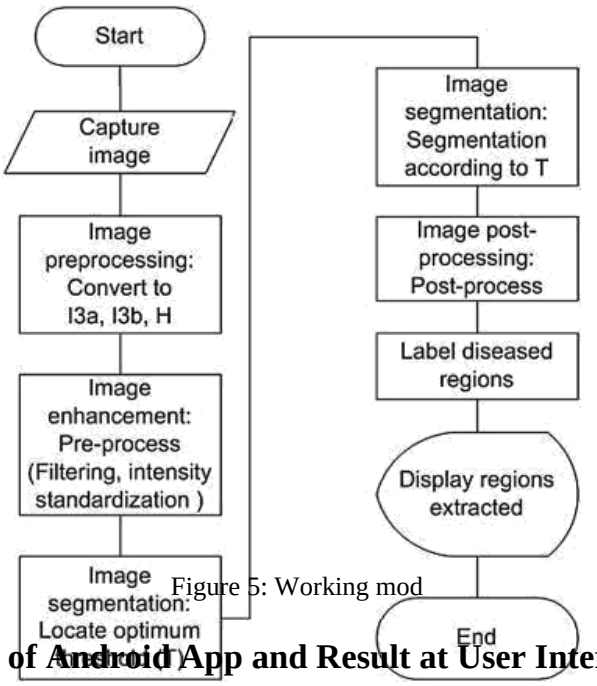

Figure 5: Working mod

5. Final Status of Android App and Result at User Interface

Existing System results [14]: Results of Image classification

Dataset	Total test sample	Correctly classified	%Accuracy
Black Rot	10	9	90%
Esca (Black Measles)	10	8	80%
Leaf Blight	10	7	70%
Healthy	10	9	90%
Combined	40	33	82.5%

Table 1. Results after testing

Experimentation Results: Results of our system

Class	no. o f images	Accuracy
Healthy	84	96.2%
Black Rot	236	86.26%
Esca	276	89.15%
Leaf Blight	215	92.32%

Table 2. Results after testing

6. Conclusion

Thus, we have proposed smart automated irrigation system for disease detection and sprinkle pesticides. It also detects soil and suggests the type of crop suitable for that

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soil. The system design includes soil moisture sensors in the field of agriculture to compare sensor data with minimum values set of different types of sensors soil and specific crops. The deployed sensors data are fed to the Raspberry pi. The data received by the data center is stored to perform data monitoring using image processing technique such as SIFT algorithm to detect the possible disease and provide pesticides for that condition. Finally, the analysis results and observed physical parameters are transmitted and displayed on user interface. The web application's user interface allows remote users to control the irrigation system by switching the raspberry robot on and off based on the commands.

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