Agriculture Land Monitoring Using Plant Disease Detection

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***Abstract*- The changes in climate and rainfall have been varied over the past period of time. It has by all means have caused a large increase in adopting of smart agriculture methods as this has caused increase in the quantity and quality of the yield along with helping in reducing the harmful greenhouse gas emissions. Smart agriculture is an amalgamation of automation and flow of large amount of data employed using IOT (Internet of Things). IOT is quite quickly developing and is thus a conventional method in different areas of interest. The proposed model uses sensor technology and wireless networks integration of IOT that is used and studied based on the current scenario of the agricultural industry of our country. A review is done and then a combined approach with wireless sensors, Image processing system and IOT is being proposed.**

***Keywords*-Agriculture; Image processing; IOT; Disease Detection;**

I. INTRODUCTION

India is primarily an agricultural country and has a large proportion of cultivable land, but the yield and the revenue generated does not justify the potential the potential of the agricultural sector. More than 60% of the land is used for agriculture hence it becomes very important to monitor and plant and use the resources in effective way such that productivity of the plant increases and automation in agriculture sector in improvised to improve the efficiency. Olakunle Elijah, Tharek Abdul Rahman, Igbafe Orikumhi, Chee Yen Leow and MHD Nour Hindia [1] gave an outline on the combination of IoT and Data Analytics in the field of agriculture wherein the advantages of using this technology as well as the area of opportunities that need to be taken care to make it cost – effective for small and medium scale farmers. Sukhvir Kaur, Shreelekha Pandey and Shivani Goel [2] developed a plant disease identification system wherein they created three models with different ratios of training are used for image testing. It uses three Support Vector Machine Classifiers and is flexible with other classifiers as well. The system combines 203 – dimensional vectors and texture features to provide accurate results. Neha S. Naik,

Virendra. V.Shete and Shruti.R.Danve [3] proposed an agriculture Robot which was particularly designed for sowing seeds only. It was a four wheeled vehicle which is controlled by LPC 2148 microcontroller and its operation was based on the precision agriculture which facilitated systematized seed sowing at favourable depth and at proper inter crop distance. K Durga Sowjanya, R Sindhu, M Parijatham, K Srikanth and P Bhargav [4] designed a multi-function autonomous agricultural - robotic vehicle which can be managed via Bluetooth for ploughing, seeding and irrigation systems. The robots were aimed at reducing human efforts while ensuring proper irrigation and efficacious employment of resources. Gulam Amer, S.M.M. Mudassir and M.A Malik [5] designed an autonomous robot for agriculture that can perform various agricultural activities like seeding, weeding, spraying of fertilizers, insecticides. The Bot was operated using Arduino Mega consisting of Atmega 2560 micro-controller. Saurabh Umarkar and Anil Karwankar [6] developed a system which greatly reduced the operating cost alongside reducing the time for digging operation and seed sowing operation by using solar energy to drive the agricultural bot. The energy for running the bot was derived from a solar panel whose captured solar energy was converted into electrical energy which was used to charge the battery and thereby charge the DC motor. Ultrasonic Sensor and Digital Compass Sensor were used with the help of Wi-Fi interface operated on Android Application to maneuver robot in the field and their rows, specific for each crop type.

II. PROPOSED MODEL

The propsed model is a combined approach with IOT, wireless sensors and image processing. It aims to collect real time data from sensors like temperature and soil moisture and uses LCD to display the readings via IoT. It also contains a motor which activates when the soil moisture level goes down below a specific rate.

The health of 4 leaves is checked using SVM techniques and is displayed accordingly. For image processing, Median Filter Method is used to detect and remove any noises in each and every pixel thus making the filtration process effective. The image is processed via the raspberry pi by the user or by a raspberry pi camera. The processing part is carried out using MATLAB. Various factors like contrast, correlation energy, homogeneity, mean, standard deviation and entropy are calculated and for each infection, a certain value is calculated using the algorithm.

The image is classified into clusters called Region Of Interest (ROI) as shown in the figure. The above mentioned properties are taken into consideration and calculated. Depending on the type of values displayed, the disease is categorized into 4 types and the user can take appropriate actions to make the plant healthy. The image is loaded and segmented into three different ROI. Depending on the Region of interest chosen, various

parameters obtained as the fed data set is compared to the data set collected from the image under test of various plants and the classification of disease is done based on the data and information is fed to the user.

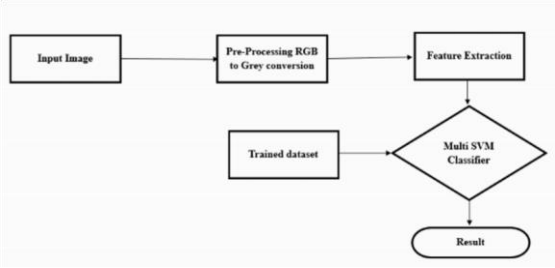

Figure 1. Image Processing Flow Chart

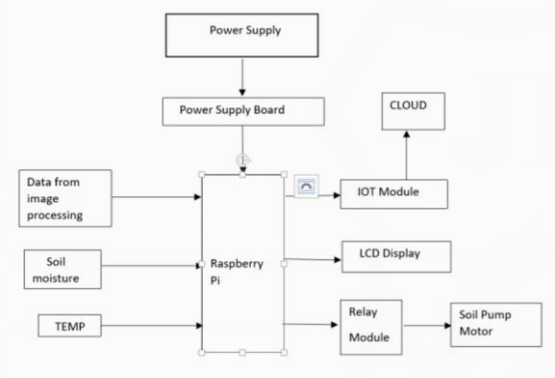

Figure 2. Block Diagram

III. COMPONENTS

The components used for the completion of project is mentioned below.

***A.** Raspberry Pi*

The Raspberry Pi is a cheap, small sized computer which projects into another display monitor or TV, and uses a USB keyboard and mouse. It is a competent device that allows people for computing, and to program in different languages such as Scratch, R and Python. It can perform every task we'd expect a personal computer to do, from browsing web to playing high-definition audio and video, making word documents and spreadsheets, and playing video games.

B. Soil Moisture Sensor

The Soil Moisture Sensor LM358 IC is used for measuring the relative humidity and volumetric water content present in the soil. These sensors along with other sensors can be used to perform various experiments regarding the productivity in agriculture sector. The bandwidth gain product is high and they can operate at high voltages. The sensor are plugged inside the soil and different parameters are calculated after getting the reading.

C. Temperature Sensor

Temperature sensor- LM35 are accurate circuit temperature modules integrated with voltage taken from the output port that has linear proportionality with temperature measured in centigrade. To make the circuit function properly, the circuit is being sealed to protect it from oxidation and other processes. Thermistor is also used for measuring temperature but instead of it LM35 is used as with the help of it temperature can be measured more precisely. Other than this LM35 has low self heating property and also it does not cause rise in temperature in still air.

D.IOT Module

It is an electronic device in which there are objects, things and machines are embedded which helps it in making connection to wireless networks and helps in sending and receiving of data. It is also referred as a "radio chip", the IoT has a data circuit and a technology which is exactly the same as found in mobile phones.

IV. RESULTS

Table 1
DATABASE

Parameters	Alternaria Alternata	Bacterial Blight	Anthracnose	Healthy leaf
Contrast	0.0778	1.48	0.9822	0.75
Correlation	0.9782	0.788	0.8321	0.89
Mean	14.8469	32.63	40.877	35.34
S.D	47.817	66.32	63.45	64.53
Homogenity	0.97	0.921	0.8821	0.92
Energy	0.76	0.58	0.388	0.44

The user obtains the information regarding the health of plant anywhere and anytime as the data collected is transferred over the internet using IOT module.
Raspberry Pi displays the other monitored factors such as temperature, humidity, soil moisture etc.
In this way a proper Automation in agricultural sector can bloom the economy of the industry

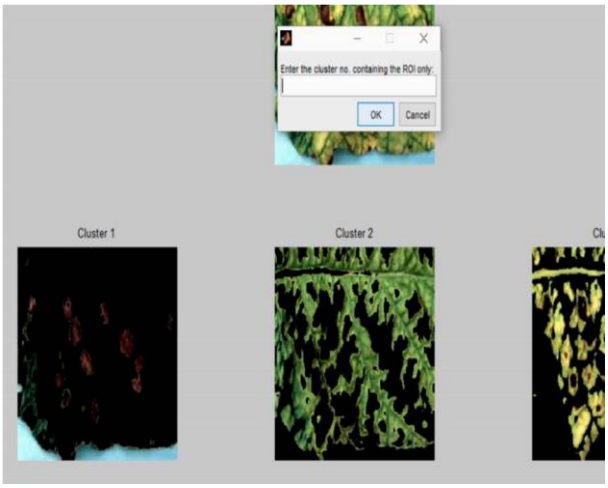

Fig 3. Clustered images and Select ROI

CLASSIFICATION RESULT	AFFECTED REGION in %	ACCURACY in %
Anthracnose	15.0015	98.3871

Fig4. (a)Sample output of Various Parameters

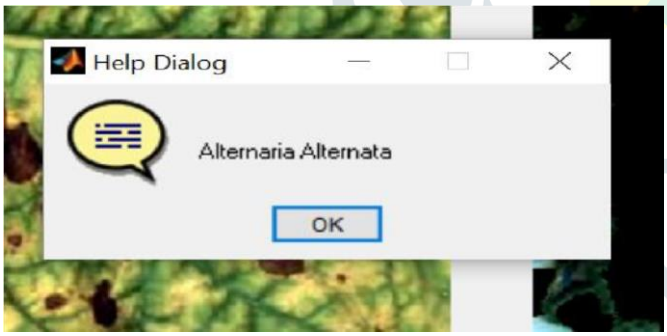

Fig 5. Disease Identification

FEATURES	
Mean	40.7498
S.D	63.0904
Entropy	3.7979
RMS	9.31352
Variance	3294.21
Smoothness	1
Kurtosis	4.29468
Skewness	1.48261
IDM	255
Contrast	0.96201
Correlation	0.840315
Energy	0.390164
Homogeneity	0.881959

Fig4.(b) Sample output of Various Parameters

The images classified under disease are treated accordingly using pesticides. There can be many reasons for the diseases but the major reason generally is due to poor growth of the plant. Infectious plant diseases are caused by microorganisms that infect a plant and deprive it of its nutrients. As a result, farmers end up using ways and means to curb it by investing in pesticides and insecticides which in turn, leads to high cost production, environmental degradation and deterioration in crop quality. These analysis helps to provide adequate water and nutrients needed for the plant when a user is notified.

IV. APPLICATIONS

(i)The system reduces water consumption drastically for agriculture purposes. It also monitors the soil moisture and temperature levels remotely using Internet of Things alongside monitoring the health of the leaves using Image Processing. (ii) Web Cam can be attached to the model for real time processing.(iii) Can be used on a drone so it can easily check diseases in plants like sugarcane.

V. CONCLUSION

The image processing of plants is done and their diseases are detected with the help of MATLAB software using SVM and K Clustering algorithm. After the disease detection, there is consideration of factors such as soil moisture and temperature and with the help of agriculture land monitoring system, their readings are taken into account. For a particular plant, a threshold value is set for the soil moisture and temperature and accordingly water is pumped out to the soil with the help of the relay module. If the model is to be built on a large scale then chlorophyll sensor, hyperspectral imaging sensor can also be added to the proposed model.

VI. REFERENCES

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