Identification and Rectification of Hemorrhage Plants Using Multispectral Camera

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***Abstract*- Plant diseases are responsible for the major losses in the agricultural industry across the world. Monitoring the plant's health and detecting the pathogen early are important to reduce the disease. The main objective of this paper is to detect plant disease early with the help of drones and immediately pesticide is being sprayed in that particular area. The drone which we use will have multispectral cameras .It can capture the invisible light such as near infrared rays produced by plants of electromagnetic spectrum. The reflected light what we have received classifies the plants into healthy vegetation and stressed vegetation. Multispectral camera uses Multispectral imaging technique to find out vegetation index.**

***Index Terms*- Multispectral imaging, Normalized vegetation index, Healthy vegetation, Near infrared rays , Stressed vegetation.**

INTRODUCTION

Indian economy is highly dependent on agricultural production.In India 70% of population depends upon farming and it plays an vital role. Plant diseases have been the major problem nowadays .So it is important to detect the diseases at its early stages. If not it can cause serious health problems and affects the economy and productivity. Plant disease monitoring in a visual manner is time consuming and tedious process. It is less accurate and we cannot monitor large area with only our naked eye. Only it is applicable for limited areas .Difficulty levels are more when there is no adequate technical support. So thus to reduce manpower and plant disease, the drones are used which could detect the diseases early and pesticide is sprayed automatically. So by the use of automatic detection it will give accuracy more by the less efforts and less time.

LITERATURE SURVEY

Agriculture monitoring system using Zigbee and raspberry pi found to be efficient. Wireless sensor network is used to monitor the agricultural fields of various factors such as soil moisture, temperature and humidity along with other factors which is of significance. The user can monitor the agricultural environment from a remote location, thus providing a greenhouse condition for the plants. Zigbee nodes were used to send data wirelessly to a central server which collects the data, stores it and displayed through the client mobile.

An automated irrigation system mainly designed for optimizing the usage of water on agriculture because of climatic conditions. To reduce the unwanted usage of water. Wireless sensor to maintain the quality of water in three parameters such as ph, conductivity, temperature.

The GSM based monitoring continuously sends information about the changes happening inside the greenhouse. It is a microcontroller based circuit in which it monitors and records the values of temperature, humidity , soil moisture and sunlight of the natural environment to achieve the maximum plant growth and yield. An integrated Liquid Crystal Display(LCD) is used for real time display of data collected from the various sensors . The sensors used are soil moisture sensor, light sensor, humidity sensor and temperature sensor

PROPOSED METHOD

The proposed system uses DJI phantom pro camera which is with a bigger batterygives 28 minutes of flight time and higher top speed of 44mph. The drones was specially designed for agricultural purpose and covers 160 acres on a single charge. DJI phantom 4 camera has global positioning satellite(GPS), First person view(FPV), Stabilized gimbals. The drone works with help of PIX 4D

software which converts multi spectral and RGB images into accurate NDVI map which helps us to know about the reflectance . It helps to capture plant's reflectance at specific bands, and storing the value at pixel level. It access the information about vegetation health and thus helps in calculating vegetation indices.

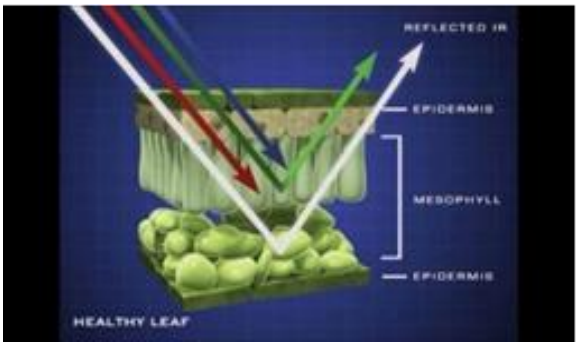

Fig.1 Healthy leaf reflection of sun's radiation

The system uses near-infrared (NIR) imagery to DJI phantom 4 pro camera for measuring with maximum accuracy and automatic spraying of pesticide in an affected areas. The drone has multispectrometer which uses multispectral imaging. This enables the system to detect the disease at its early stages.

This imaging technology uses green, red, red-edge and near infrared bands. This is done to capture both visible ad invisible crops of vegetation.

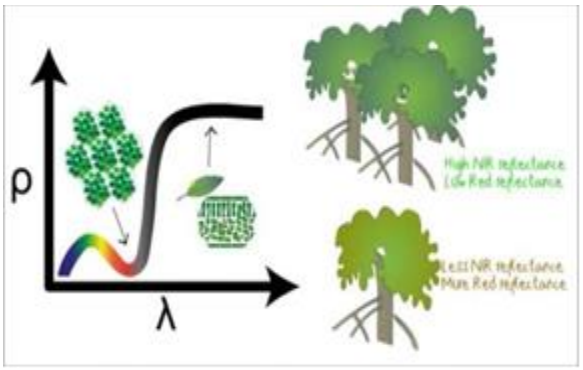

Fig.2 Amount of reflectance

It is an effective tool for analyzing plant health. The human eye is sensitive only to wavelength between 400 and 700 nm. A multispectral image sensor captures image at specified frequencies across the electromagnetic spectrum. Every object's surface reflects some of the light what it receives. Thus the plants do reflect or absorb sun's radiations. Plants can reflect both visible and non visible lights of electromagnetic spectrum. The spectrometer which is present inside are responsible for measuring reflectance.

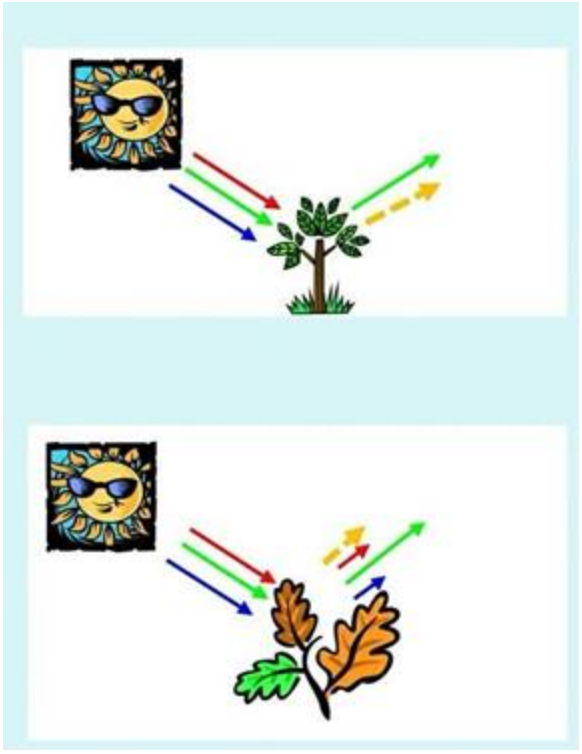

Fig.3 Normal leaf reflectance vs diseased leaf

Camera image can be classified into monochrome which is grayscale , white and black. Then RGB which uses only red, green and blue bands. The multispectral camera uses additionally yellow band. The multispectral images are integrated with special software which output the information to our desired purpose.

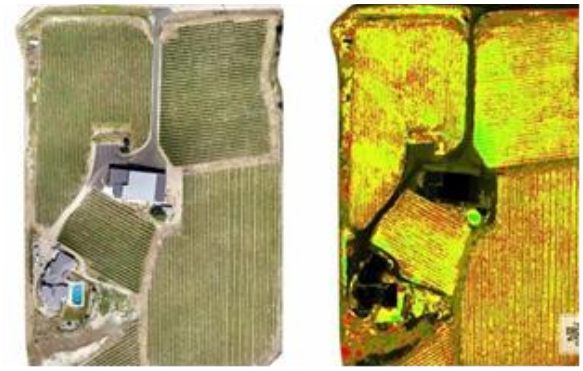

Fig.4 Normal image vs multispectral image

Additionally the system is integrated with LIDAR technology which determines the soil type, 3D modeling, land mapping, prevention of soil erosion, crop analysis, crop damage, soil analysis. LiDAR technology helps to determine how far the crops have been damaged and upto what extent. So this helps farmers to come up with preventive measures to prevent damage and increase yields.

It maps the exact design of the land and also terrain and shape of the land. So that we can decide what to farm and how to farm.

It provides 3D models of a farm land ad helps in identifying natural resources around that area. To identify water catchment area ad the flow of erosion

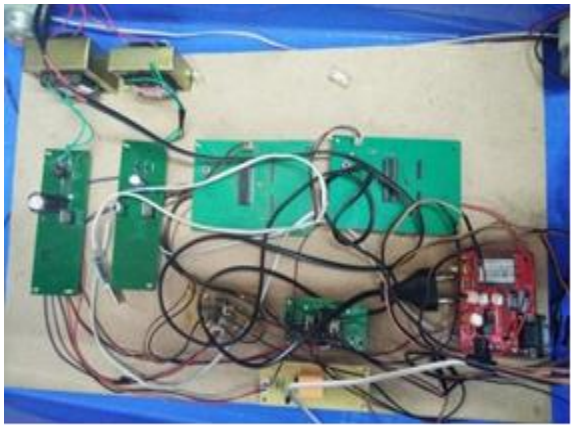

Fig.5 Demonstration setup

NDVI CALCULATION

NDVI is nothing but normalized difference vegetation index. It is an equation that takes into account the amount of near infrared reflected by plants. Plants can absorb solar radiation which they are using as process of energy in photosynthesis. Normal cameras only record visible light. Due to the presence of chemical properties. Plants can reflect sun's radiations.

Multispectral camera additionally takes yellow and thus gives four bands. It allows to take reflected near infrared rays. Vegetationreflectance properties are used to deriveVegetation indices(VIs). Plants maximum can emit near infrared rays. Using the amount it has reflected we can predict the vegetation. The sun's energy is absorbed , reflected or re-emitted by vegetation depending upon the amount of chlorophyll in the plant.

The near infrared reflected by plants is considered to be healthy vegetation whereas if it reflects the visible light it is considered to be stressed vegetation. The area what we have monitored shows the image as multispectral image. The green part is said to be healthy and red or yellow part is said to be stressed vegetation.

NDVI=NIR-RED/NIR+RED

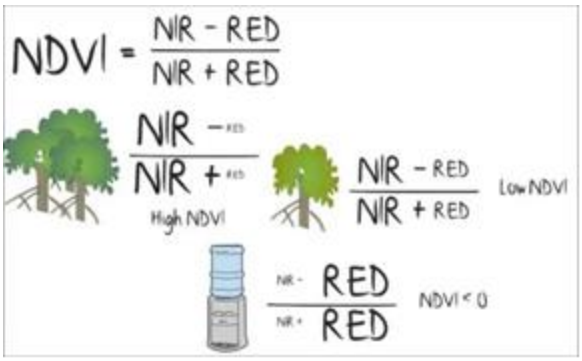

Fig.6 NDVI calculation

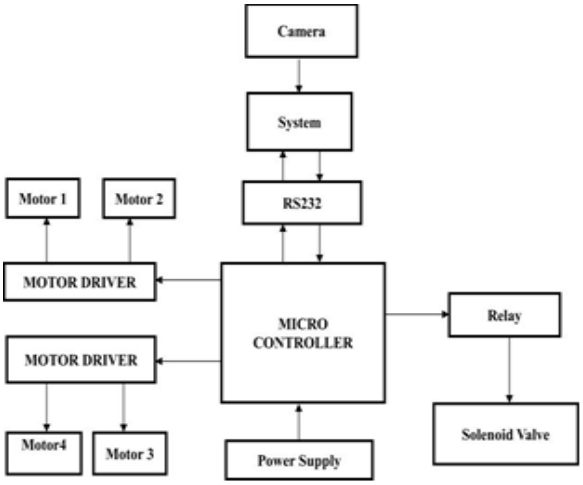

Fig.7 Block Diagram

RESULT ANALYSIS

The main aim of our project is to identify the diseased plants and automatic spraying of pesticide. Hence a hardware module is created that finds out the stressed vegetation and valves of camera are opened to spray the pesticide.

Based on the amount of reflectance the disease extent can be classified. And also the real time implementation is given.

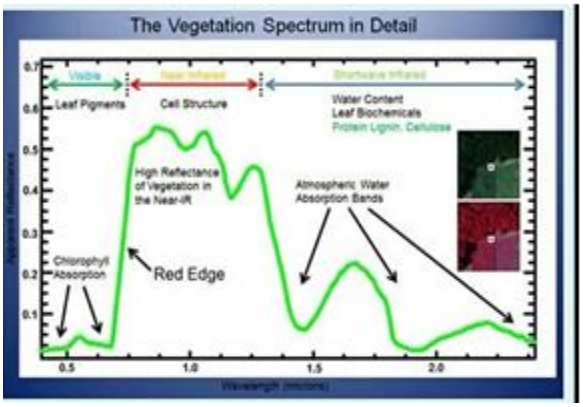

Fig.8 Graphical representation

Green vegetation occurs when higher NIR reflection and lower visible reflection. Stressed vegetation occurs when there is a lower NIR reflection and higher visible reflection. If stressed vegetation found pesticide will be sprayed.

CONCLUSION

Thus we identified stressed areas of a field, measuring overall crop health and see exactly how crops are performing in real time and recommend or take action while still in the field without an internet connection. It serves as a reliable and efficient system for monitoring agricultural lands. Implementation of these type of system will definitely improve the yield of crops and overall production. Thus we developed an automation system for disease detection which is an efficient and time saving. To identify pests, insects and weeds for early detection of diseases and hence reduced the man power. Achieved the overall significant parameters of plants which can definitely increase the yield.

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