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Realization and Analysis of a Complete Plant Using Image Processing

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ABSTRACT: Indian economy greatly depends on the agriculture therefore it is known as the backbone of India. The agriculture segment accounts for 18% of India's GDP and is providing employment to 50% of the country workforce. The main aim of this proposed work is to reduce the manual monitoring of soil testing, seed germination and plant irrigation and help farmers to increase the agricultural production. The testing of soil is carried out through various sensors and based on the data received the farmers can cultivate the crop that is suitable for soil. Detection of plant's diseases is carried out through image processing technique. It also includes pest detection and control by using Acoustic sensor and the use of Ultrasonic sound emitter keeps the pests away from destroying the crops. It alerts the farmers through a message. A direct communication link is set up between farmers and the consumers without the involvement of any middleman via mobile app.

KEYWORDS: pH sensor, NPK sensor, Temperature sensor, Humidity sensor ,moisture sensor ,Irrigation system, MATLAB

I. INTRODUCTION

Agriculture is the fundamental support and the backbone of Indian economy. In the previous decade, it has been observed that there is very least progress in the agricultural sector. The cost of Food are reaching great heights day by day because good and healthy crop production rate is being disdain.Since2010 it has smacked over 40 million population into poverty[1].Though many advancements took place in field of agriculture, the farmers are not able to get profitable yield due to the insufficient knowledge on the nutrients required and the parameter's like PH, temperature, humidity, moisture etc. The nutrients like Nitrogen, Phosphorus, and Potassium(NPK) play a vital role in plant growth. Low nutrition level may cause various plant disorders and low crop yield. The amount of recommended macro nutrient's like NPK (nitrogen, phosphorous, potassium) is purely dependent on the type of crop and also on plant growth status. The main theme behind this is to measure the real time values of PH, humidity, moisture, NPK etc.

The data is analyzed by data mining technique for as specific crop which can be obtained via mobile application. Infection on plants leads to the major reduction in quality and quantity off arming food stuffs. Checking the strength of the plant and diseases on the plant, shows an important role in fruitful production of crops. In previous days, observing and scrutiny of the plant diseases were done through physical method by the experts in the field which requires huge amount of work and also require extreme handling time. Image processing methods are used in detection of the plant disease. Most of the time symptoms observed are on the plants

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stem, leaves and fruit. It has become the toughest job for the farmers to prevent crops from pesticides related diseases. The pests could damage the crop, which leads in reduction of crop yield and the quality of the crop. Farmers use lot of techniques to kill the infectious pests, detection of pest disease is important before treating it. Without having knowledge of the pest in advance and using pesticides may lead to negative impact such as pests will be able to develop resistance towards the particular pesticide leading to change in results, which also kills useful pests and natural enemies of pests that can lead to increase in the pest population. We are also using the Ultrasonic sound emitters to prevent pests in the field and thus protects the crops from being damaged and also proves that the growth of the grains completely over, and also alerts the farmers through the message. Various procedures for seed quality assessment and arranging depend on the uncovering of different physical and physiological seed attributes.

II. RELATED WORK

Many studies were carried over on the field of agriculture to create a raise in the yield and the quality of the food grains using modern technologies. [1] The main intention of the authors was to collect realistic data of the agriculture farm that provides information on the weather pattern, crops etc by the combine approach of IOT and wireless communication. [2] In this paper we make use of different kind of sensors such as pH sensor, temperature sensor, and humidity sensor. Based on the real time values obtained they are analyzed and particular crop pattern is been suggested which suits the soil.[4] This paper major intention is to rest or e macronutrients present in the soil by measurement of nutrients present. The presence of nutrients is obtained by using sensor [5] Here make use of different sensors to measure the real time values of the nutrients like Nitrogen (N), Phosphorous(P), Potassium (K)and the data measured is sent to the cloud through Zig Bee protocol. [6] In this system the real time data is analyzed using different technique and the data is sent to the cloud which can be accessed through mobile application. [8] In this the author specifies of the automatic irrigation. Soil moisture is used to detect the moisture level present in the soil, based on the values obtained the field is irrigated using the valves. In further stages the plant diseases are detected through image processing using a tool developed through MATLAB, also pest is detected through WSN, which is controlled through Ultrasonic sound emitters and also alters the farmers through message. This system also proposes of automated irrigation based on soil moisture. Finally, the direct communication is set between the farmers and the buyers which helps in avoiding the involvement of middle man.

III. METHODOLOGY

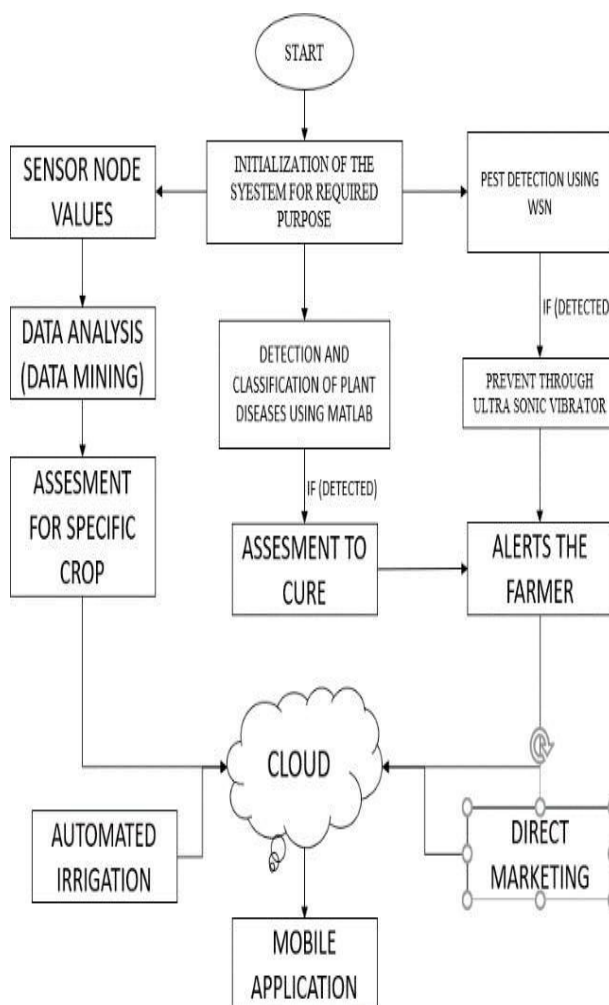


Figure no: 1 Architecture of Proposed system

In figure1, A system is been developed to increase the agriculture production by nutrient analysis like pH, moisture, temperature, humidity and NPK using sensors and the data Analysis Is done through the data mining technique and assessment for specific crop is made via mobile application. In further stages the plant diseases are detected through image processing using a tool developed through MATLAB, also pest is detected through WSN, which is controlled through Ultrasonic sound emitters and also alters the farmers through message. This system also proposes of automated irrigation based on soil moisture. Finally, the direct communication is set between the farmers and the buyers which helps in avoiding the involvement of middle man.

I. Soil testing

The system consists of many sensors to measure the pH, moisture, humidity, temperature and also soil nutrients like Nitrogen, Phosphorus, and Potassium(NPK).

- **Soil Moisture Sensor**

Soil moisture sensors are mainly used for the volumetric analysis of the moisture present in the soil. Which helps in the suitable irrigation of plants. It increases the quality and yield of the crop, by providing the required amount of water using relays through microcontroller.

- **pH sensor**

A pH sensor consist of electrodes which measures the concentration of hydrogen ions, which indicates whether the soil is acidic or alkalinity. Here pH sensor used is a analogy pH meter. The output is obtained by connecting BNC connector and PH2.0 sensor interfaced to microcontroller.

- **Humidity sensor**

A humidity sensor measures moisture content present in the air. The amount of moisture present depends on the air temperature. The humidity changes with change in air temperature.

- **NPK sensor**

The NPK sensor detects the amount of nutrients present in the soil. Where NPK are the major nutrients for the growth. of the plant. based on the NPK value received from the sensor which is sent to cloud through Zig Bee and analyzed through data mining technique. Thus, the suitable crop is suggested to farmer via mobile application

- **MSP430**

MSP430 is a microcontroller which operates at low power. it is very effective for the low power applications where the batteries cannot be replaced repeatedly. A 9V battery is enough to operate the microcontroller over a period of 10 months. The sensors are connected to the MSP430 via I2C bidirectional bus to process the data received from each of the sensors. The I2C bidirectional bus provides a direct communication link between integrated circuits. The program of the sensor collects the temperature, pH, soil moisture, humidity, NPK values and analysis for specific crop is done through data mining technique. The collected data is processed and extracted parameters are transmitted to the cloud through the Zig Bee protocol. A mobile application Is developed that delivers results to person. The information delivered by the app helps the farmers to increase the yield and can minimize the crop production cost.

II. Automated irrigation

This proposed system consists of sensors like soil moisture sensor, humidity sensor and temperature sensor. These sensors collects the present soil moisture, humidity and temperature of the surrounding. This data is taken by microcontroller and sent to cloud through Zig Bee protocol. This data analyses the water required for the proper irrigation of the plants. We also gather the moisture requirement for various crops in different climatic conditions. This helps the system to start the irrigation on its own by analyzing the data. The moisture sensor measures the moisture content present in the soil for the specific time interval. If the moisture content is lesser than the threshold value the system directs the microcontroller to open the valves using the relays and allows the required amount of water to the field. When the values are reached to its threshold the valves are automatically closed. By this technique we can improve the crop yield and also avoid the wastage of water.

III. Pest detection and prevention

- **Pest detection**

Pest detection and prevention plays a major role in improving the crop yield. Here Pests are detected using WSN, here we make use of acoustic sensor which is non toxic, remotely operated and very efficient in the detection of hidden infestation. This sensor is the best for detection of pest with more efficiency and less cost. This system has been designed in such a way that it monitors the crops by monitoring the sound level produced by the Pest. When the sound reaches above the threshold, it alerts the farmers of the specific area from where the infestations are taking place.

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- **Pest control**

Pests are one of the main reasons for the reduction of crop yield. Hence prevention of the pest using proper pesticides in proper quantity is necessary. Unnecessary usage of pesticides leads to loss of crop yield. Hence in this proposed system we use alternative technique i.e. we use ultrasonic sound emitter which is placed in different places of the field. They emit high frequency, short wavelength sound waves which is about 20KHz, which is too high hence that cannot be heard by human ears. This sound waves varies from 50KHz to 240KHz which scientifically proved to get rid of pests. It affects the pests nervous system by causing irritation and keeps the pest away from the farm. By using ultrasonic sound emitter we can avoid the pest which is cost effective and also helps the plants to grow healthy and reduces the usage of pesticides in fields.

- **Plant Diseases**

The elementary steps for recognition and classification of plant disease through image processing using the MATLAB tool.

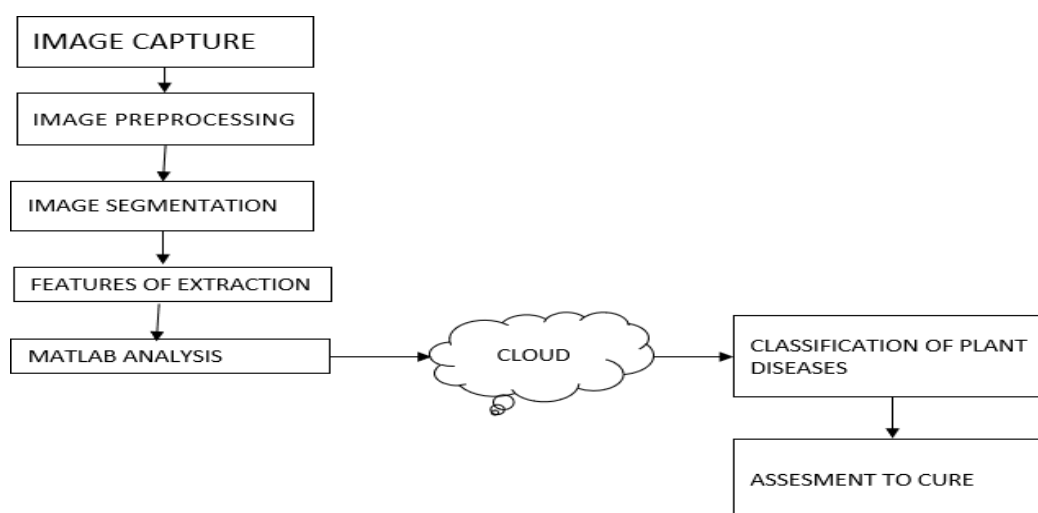


Figure no: 2 Disease Detection and Prevention

In this review to study the effect of salt stress on seed germination by using optical coherence tomography for this experiment and conduct with variance molar concentrations of NaCl. The seed were monitored to establish the optimal focus for the seed growth in nine consecutive days. The images of seeds that were developed using sterile distilled water before treatment. The seeds were analyzed with the help of vivo two-dimensional OCT images. Germination of seeds is a increase procedure when the plant is contained within its seed. Generally, strength of profile study was utilized to help the result. Variety of inside factors and external can be affected germination.

A. Image capture

The plant leaf images are taken through the various cameras placed in the field. This images are classified into Red, blue and green form the image taken by the values.

B. Image Pre-processing

The image processing technique is been used to remove noise and other unwanted objects present in the images by different image pre-processing techniques.

The images are cropped to get the necessary image region. The smoothing filters are used to smoothing the image. The RGB images are converted into grey images for further processing.

C. Image Segmentations

Here the images are divided into many parts of having similarity. The separation of images can be done through different methods k-means clustering, and by converting RGB images into the HIS model etc.

D. Feature Extraction

Feature extraction plays an major role in the recognition of an object. The feature of extraction are used in many applications of image processing. Color, texture, morphology and edges are the main features in detection of plant diseases.

E. MATLAB analysis

After feature extraction is done, the special tool is developed through MATLAB which detects and plants diseases. Which is sent to cloud through ZigBee protocol and suggests the farmers to cure via mobile application.

Finally, the crops are rated based on the quality (high, medium, low). And a direct communication link is set between farmers and the consumers through mobile application through this we can make all farm products easily accessible. Through this farmers wont face any middle man entry and can sell his products by himself. Farmers can become more connected to society and form cooperatives (like amul, more, reliance) through mobile application.

IV. RESULTS

The proposed system is implemented and tested. The sensor functionality is verified and tested by requesting ,receiving and evaluating the sensors data, transmitted from sensing nodes to the base station. The data transmission is realized via the wireless ZigBee protocol. Later the working of this proposed system is tested by sending data to and receiving data from the platform. The nit measures humidity, temperature and other parameters. And this crop details are logged at the CPU and is saved; it is logged on cloud by the MATLAB. This data in cloud can be obtained by mobile application. The cloud-based log gives the users the opportunity to obtain this information from any place and anytime.

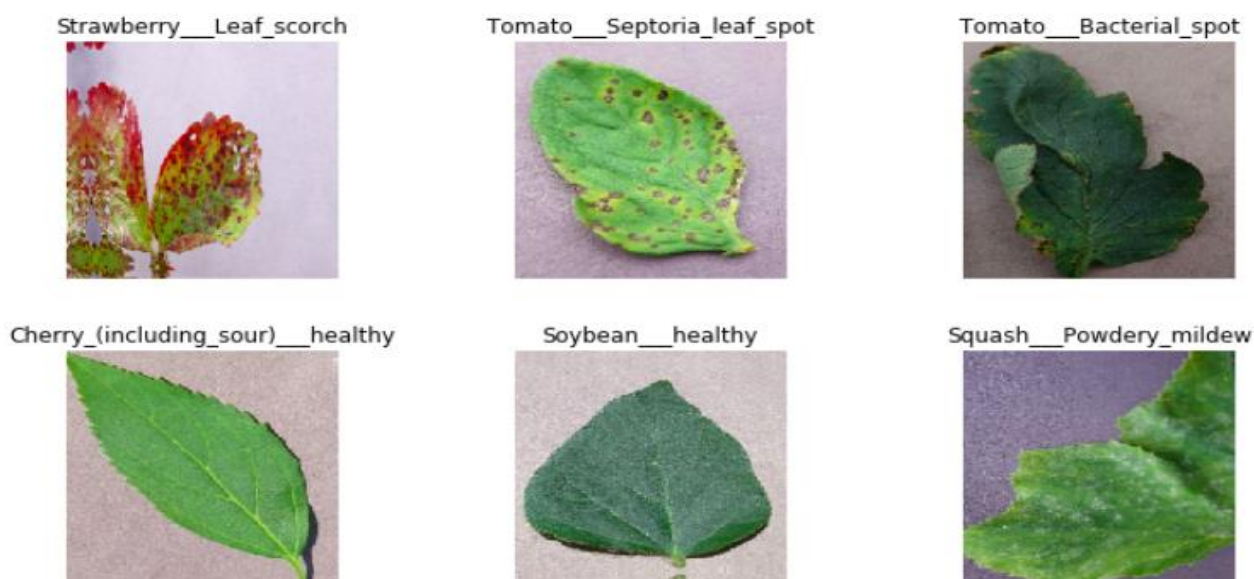


Figure no: 3 Diseases in various Plant leaves

V. CONCLUSION

The proposed technology helps in determining the nature of soil by extracting the contents of the soil using variety of sensor nodes. This particular system helps the farmers in finding the suitable crop for their field. It provides the suggestion about the suitable crop that can be grown by analyzing the sensor values. In the cloud the comparison of sensor values with the threshold values takes place. The images of the crops are taken and monitored in such a way that they can protect the crops from pests and insects. Detection of diseases of plants is also done using MATLAB processing in order to protect plants and produce good quality plants. This helps to monitor the crops anytime from any place using the developed app. The main purpose of this system is to increase the agricultural yield and reduce the investment of the farmer to a great extent by avoiding unnecessary worry about the yield of the plan

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