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Plant Health Indication Robot

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Abstract: ***Agriculture is very labor intensive field and only field where the robots are not involved. Now-a- days many industries are trying to reduce this human labor by making robots and machines. A vision-based row guidance method is presented to guide a robot platform which is designed independently to drive through the row crops in a field according to the design concept of open architecture. Then, the offset and heading angle of the robot platform are detected in real time to guide the platform on the basis of recognition of a crop row using machine vision. And the control scheme of the platform is proposed to carry out row guidance. Here we are designing an autonomous intelligent farming robot which indicates the plant health by observing the color of their leaves and based on the height of the plant. The robot also notes the surrounding environmental conditions of the plant like temperature, moisture and humidity so that the robot will decide about health of plat and will display on the LCD.***

Keywords: Agriculture, crops, robot, moisture, temperature, humidity

I. INTRODUCTION

Agriculture is the backbone of India. Agriculture is one of our most important sector for providing food, feed and fuel necessary for our survival. Some of the major problems in the Indian agricultural are rising of input costs, availability of skilled labors, lack of water resources and crop monitoring. Leaf diseases on plant are the main element and having superior strength which appear as spots on the leaves. In case of severe infection, the leaf becomes completely covered by disease in terms of spots. Different type of leaf diseases on plant determines the quality, quantity, and stability of yield.

The robotics plays a major role in various fields such as industrial, medical, military applications etc. The robotics fields are gradually increasing its productivity in agriculture field. To overcome these problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts. The robots are being developed for the processes such as fruit picking, monitoring, irrigation, etc. All of these functions have not yet performed using a single robot.

Farmers are cultivating different types of crops. These crops may be affected by fungi, bacteria, viruses and many more. Identification of disease is very difficult for farmers at its early stage. There are number of diseases found in crop. Farmers cannot be determined accurate percentage of observed disease. Patterns of diseases are so many complexes that finding affected area is difficult.

In this proposed system, we are going to make a robot which uses vision based row guidance method to drive through the row crops. A prototype robotic arm has to be designed, developed and constructed, which should be integrated with motors, controllable using specific electronic components and custom computer software. A number of sensors are integrated into the robotic system including temperature, moisture and humidity systems. The system required the use of vision, with custom algorithms being developed to identify plant growth rates. The entire system will integrated into a fully automated package. This provided the potential for plant nutrient levels and the immediate environment to be routinely adjusted in response to continuous sensing resulting in optimized rapid growth with minimal human input.

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By the working of proposed system by measuring temperature, humidity and moisture of plant we check that water and temperature which given to plant is appropriated with requirement. If water and temperature which given to plant is low or high so it's not good for plant. To improve that thing we use this proposed work as to check each and every plant's water level and temperature. By this proposed system we check or monitoring of plant and irrigation of plant. This is how this proposed system is better compare to other by checking following parameter for each plant:

- ✓ Moisture level
- ✓ Temperature level
- ✓ Humidity level

By checking the listed parameter we get as result some value of temperature, humidity and moisture of plant. By that value we take action accordingly to give more water and temperature to plant or not. By this we developed robot for monitoring and irrigation.

II. LITERATURE SURVEY

The work proposed by Manivannan[1] was focused on implementing all the farming process especially on onion crop in a single bot by using Fire bird v robot. The fire bird v robot uses ATMEGA 2560 as master controller, ATMEGA 8 as slave controller, IR, gripper arrangement and other accessories. The proposed system prototype was implemented by selecting an arena which considering the agricultural field of any kind of onion crop. The robot detected the planting area by using sensors and seeds to be planted in the corresponding field using gripper arrangement of the robot. In a continuation, the rest of remaining farming process would be done automatically. That robot would help the farmers for doing the farming process in accurate. The robots were developed to concentrate in an efficient manner and also it was expected to perform the operations autonomously. The proposed idea implements the robot to perform the functions such as planting, irrigation, fertilization, monitoring, and harvesting of an onion crop. These functions can be integrated into a single robot and then performed. The robot was expected to perform the functions such as planting, irrigation, fertilization, monitoring, and harvesting autonomously in the field of onion. That project uses Atmel ATMEGA2560 microcontroller was used which acts as a master (AVR architecture based Microcontroller) and Atmel ATMEGA8 acts as a Slave (AVR architecture based Microcontroller). Firebird V Robot was used to move on the field. The gripper arrangement was used for planting, harvesting of the plant and to spray fertilizers and pesticides to the land. The camera was used for monitoring the plant growth.IR sensor was used to detect the insect in the plant, if found.

The work proposed by Bhagyalaxmi[2] was building a multipurpose agricultural robot which can perform various operations on field. One of the important professions in India was farming so it was essential to look out for automation in field work to reduce man power. Here that project focuses on farming work features like automatic irrigation system, monitoring of the field using parameters as temperature, soil moisture, humidity, raining, presence of any animal on field these all parameters are monitored from field and transmitted to mobile unit using GSM module. As well as here they analyzed disease spread on plant using interfacing of camera and image processing technique by taking a sample of leaf. They could cover the four topics this were automatic irrigation system, weeding, remote monitoring system, disease detection. As irrigation was the main part of agriculture. Labor-saving and water-saving technology was a key issue in irrigation. Microcontroller based automatic plant irrigation system allows a simple and low cost method for irrigating the crops automatically. In the proposed system they used GSM technology. Here they have four sensors were soil moisture and rain drop sensor for irrigation purpose and temperature, motion to monitor and also control the agriculture parameters. When any of these sensors generates a low signal, the controller enables the GSM modem to send the message of the particular parameter and display the status of sensors on LCD. Farmer can give command through GSM to ON/OFF the pump motor as per the input data from sensor. GSM was used to inform the user about the exact field condition. The information was given on user request in form of SMS. GSM modem could be controlled by standard set of AT (Attention) commands. These commands could be used to control majority of the functions of GSM modem and the sensing data will be displayed on the LCD.

The work proposed by Fale[3] autonomous Robot Camera for Detecting the Leaf Diseases of agricultural Plants using Image Theory Algorithm.The objective of this project was to design a simple, ARM-based circuit to monitor and record the values of temperature, humidity, soil moisture and sunlight of the natural environment that were not stable means varies continuously and controlled in order optimize them to achieve maximum plant growth and yield. The controller used was a low power, manufactured by ARM. It communicates with the various sensor modules in real-time in order to control the light, aeration and drainage process efficiently inside a greenhouse by actuating a fan, fogger, dripper and lights respectively according to the necessary condition of the crops. An integrated device LCD was also used for real time display of data acquired from the various sensors and the status of the various devices. The objective of a polyhouse is to create the optimal growing conditions for the full lifecycle of the plants. The robot provides watering mechanism it will provide water to the plants according to their necessity by observing soil moisture and humidity. It also detects the plant health with disease detection and provides the necessary pesticide according to the type of diseases. They concluded that Because of the image processing on plant health detection and identify the disease of leaf with find the number of spot on leaf. With this technique we can increase the crop production with less power and save water. This was done using Matlab software. So this work was very useful for farmer for increase the crop production using sensing and image processing technique.

The work proposed by Wable[4] was design a simple, ARM-based circuit to monitor and record the values of temperature, humidity, soil moisture and sunlight of the natural environment that were not stable means varies continuously and controlled in order optimize them to achieve maximum plant growth and yield. The controller used was a

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The work proposed by Moze[5] was identification of disease was very difficult for farmers at its early stage. Those days so many numbers of diseases were found in crop. Farmers could not be determining accurate percentage of observed disease. Patterns of diseases were so many complexes that finding affected area was difficult. It was very difficult to monitor the plant diseases manually. It required tremendous amount of work, expertise in the plant diseases, and also require the excessive processing time. Hence, image processing was used for the detection of plant diseases. Disease detection involves the steps like moving robot mannerly for image acquisition, image pre-processing, image segmentation, feature extraction and classification. In that proposed work they were using computer software which would extract the feature of leaves of plant by using digital camera. The system required the use of vision, with custom algorithms being developed to identify plant growth rates. The entire system would integrate into a fully automated package. In proposed system, leaf shape was important to detect the type of disease. For that purpose leaf can be extracted for identification of leaf shape. But there was no such application or program to classify the diseases after capturing its image and distinguishing its attributes yet. In the proposed work, they describe the development of software application that gives users the ability to identify plant leaves disease based on captured images of the plant's leaves taken with digital camera and mobile phone. At the heart of this application was an algorithm that acquires morphological features of the leaves, computers well documented metrics such as the HSV techniques then classifies the diseases based on SVM. The algorithm was first trained against several samples of known leaves diseases and then used to classify unknown query diseases. The algorithm was very successful in properly classifying diseases contained in the training library.

The work proposed byMahale[6] was measuring plant leaf color, as an indicator of plant health status, has been developed for plantlets growing in a modified micro propagation system. Using a custom built hand device, sensors located on a pan and tilt system at the end of the device monitor plant growth and the ambient growing environment. Sensors include a compact color zoom camera, RGB (red, green and blue) color sensors. Leaf color sensors provide information, in a non-destructive manner, on the health status of tissue by comparing the sensor outputs to pre-determined optimum values. These low cost color sensors could be incorporated into a continuous automated system for monitoring leaf color of growing plants. Subtle color changes could be an early indication of stress from less than optimum nutrient concentrations. When combined with automated image sensing for growth analysis, and environmental sensing (RH, CO2 and temperature) in a controlled environment, optimized rapid growth with minimal human input can be achieved using a modified micro propagation system. In this project we detail the calibration technique for a RGB sensor and compare it with a high end spectrophotometer. The proposed design electronic device which was helpful for monitoring plant health status. That electronic device would work in remote area with help of wireless technology such as ZigBee. With help of this device, they could prepare database of various stages of plant, so we can monitor plant growth.

The work proposed by Seelye[7] was an agricultural autonomous Robot which will sense the conditions in real time and then decide which plantation is best suited for that particular field. They analyzed for the field parameters such as, Temperature, humidity, soil Moisture etc. Their main purpose of the Robot is the Ability to sense the health of plants using Image processing. They used a special purpose Web-cam which will take photos inside the field and analyze the growth according to the height, colorization of leaves etc. Their Robot also had a Plough to plough the fields, and then a seed dispensing mechanism, Watering mechanism. The advantages of their Robot could be used to know the plant health, for watering and the system also tells at which time cutting process could be done. By doing this project they had concluded that the system used image processing to observed the leaf color which increases further accuracy of the system as it identified color very accurately than human. They also analyzed that their system also observes different environmental conditions such as humidity, soil moisture and temperature which human could not measure accurately by open eyes to decide the plant health so the accuracy of the system is high. Their system also involved watering mechanism and cutting process which reduced human labor and we could reduce labor further by modifying the system further for other agricultural work such as picking, harvesting, weeding.

III. PROPOSED SYSTEM

In this project we are designing the agricultural autonomous Robot which will sense the conditions in real time and then decide which plantation is best suited for that particular field. For this, we are analyzing the field parameters such as, Temperature, humidity, soil Moisture etc. The Robot will also have a Plough to plough the fields, and then a seed dispensing mechanism, Watering mechanism so, in all this is a completely autonomous robot. A vision-based row guidance method is presented to guide the robot platform driven along crops planted in row. And the offset and heading angle of the platform are calculated by detecting the guidance row in real time in order to guide and control the platform. Vision-based row guidance is to use camera to detect and identify crop plants and then to find accurate and stable navigation information from the binary image. The captured image are then processed by using image processing technique, the

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processed are then converted into voltage levels through MAX 232 level converter and given it to the microcontroller unit. In the microcontroller unit, c language coding is predefined, according to this coding the robot which connected to it was controlled. Robot which has several motors is activated by using the relays. Relays are nothing but electromagnetic switch which ON/OFF according to the control given by the microcontroller unit.

The blocks are as follow:

✓ MICROCONTROLLER

Microcontroller is used for control all the components of this robot by programming. Microcontroller is also give and take data from other component.

✓ LCD

LCD is used for display. In this on LCD we display humidity data, temperature data and moisture data.

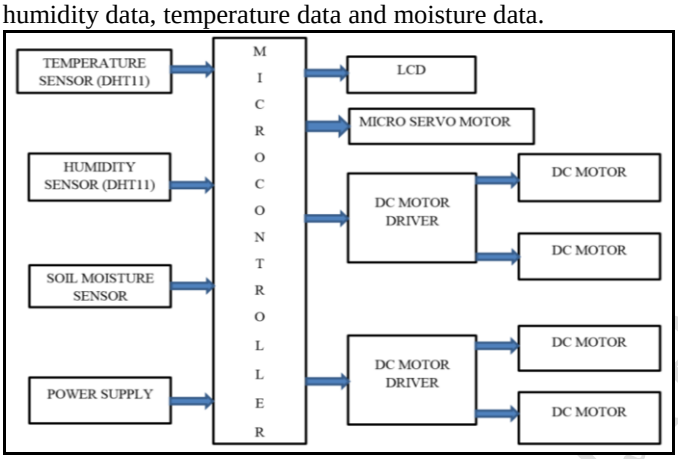

Figure 1: Block diagram of plant health indication robot

✓ MICROCONTROLLER

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LCD is used for display. In this on LCD we display humidity data, temperature data and moisture data.

✓ TEMPERATURE SENSOR

Temperature sensor is used for sense temperature of field or land of plant. By using temperature sensor it gives data to microcontroller and microcontroller send that data to LCD for display the temperature of field or land of plant.

✓ HUMIDITY SENSOR

Humidity sensor is used for sense humidity of field or land of plant. By using humidity sensor it gives data to microcontroller and microcontroller send that data to LCD for display the temperature of field or land of plant.

✓ SOIL MOISTURE SENSOR

Soil moisture sensor is used for sense moisture of soil. Soil moisture sensor gives data to microcontroller by comparing and microcontroller gives data to LCD for display data.

✓ MICRO SERVO MOTOR

Micro servo motor is used as arm of robot. It connected with moisture sensor for shift at particular angle which is defined by user.

✓ DC GEAR MOTOR

DC gear motor is used for move robot forward, backward, right, and left and stops. It controlled by DC motor driver IC.

✓ DC MOTOR DRIVER

DC motor driver IC is used for controlling motor with help of microcontroller. It is 15 pin IC.

IV. RESULTS

A. RESULT OF CIRCUIT OF PLANT HEALTH INDICATION ROBOT

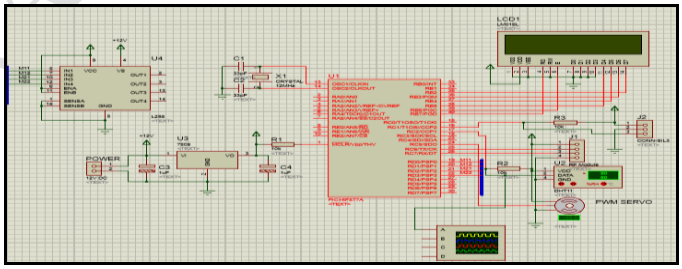

Figure 2: Circuit diagram of plant health indication robot

In this given figure 5.1 it shows circuit connection in diagram of plant health indication robot. In this given circuit we use the microcontroller. In the microcontroller we have done programming to work whole circuit, so we done programming for the microcontroller in programming software. Then we create “hex file” of program for microcontroller.

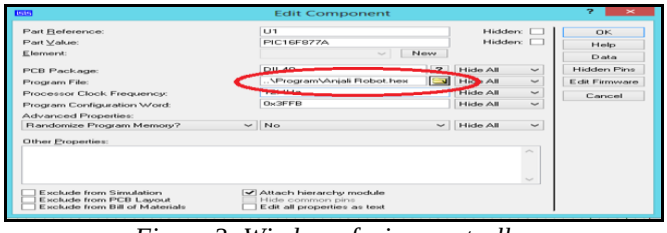

Figure 3: Window of microcontroller

In this given figure 5.2 it shows window of microcontroller from where we can load “hex file”. In the figure 5.2 red color circle it shows where we load the hex file by click on that shown folder symbol. After load “hex file” press ok button. Then circuit takes few seconds to load the hex file in microcontroller. Then we run the circuits we get out put as shown in below figure.

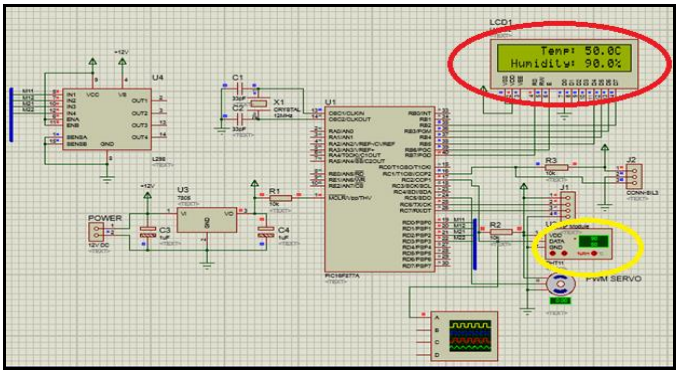

Figure 4: output of circuit diagram

In this given figure 5.3 it shows result of plant health indication robot's circuit. In given figure red color circle shows result of circuit and yellow color circle shows where result comes from.

B. RESULT OF MOISTURE SENSOR

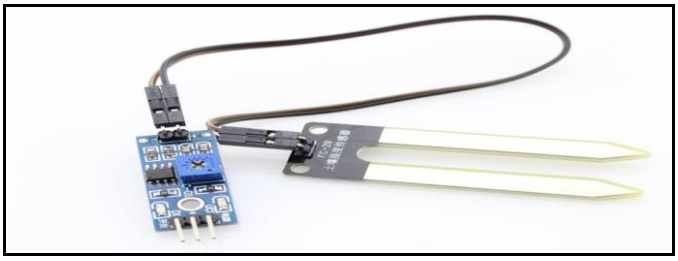

Figure 5: Moisture sensor

There are two types of soil moisture sensor. One is frequency domain sensor, which has an oscillating circuit. It measures the soil water content by measuring the soil's dielectric constant, which determines the velocity of an electromagnetic wave or pulse through the soil. When the soil's water content increases, the dielectric also increases, which can be used to estimate how much water the soil holds.

The other one is neutron moisture gauge, which utilize the moderator properties of water for neutrons. The principle is that fast neutrons are emitted from a decaying radioactive source, and when they collide with particles having the same mass as a neutron (i.e., protons, H+), they slow down dramatically. Because the main source of hydrogen in soils is water, measuring the density of slowed-down neutrons around the probe can estimate the volume fraction of water content the soil holds. Soil moisture sensor and pin description Pin Definition Vcc 5V GND Digital output interface (0 and 1) Analog output interface LM393 Driver LM393 device consist of two independent low voltage comparators designed specifically to operate from a single supply over a wide range of voltages.

Soil moisture	Voltage in sensor
Dry	5v
2ml	4v
4ml	3v
6ml	2v
8ml	1v
10ml	0v

Table1: Result of moisture of soil and voltage according to moisture exists in soil

V. CONCLUSIONS

From The proposed system we have conclude that by using plant health indication robot we check health of plant, by measuring moisture of plant, be also measuring temperature and humidity of plant. If the measuring parameter is proper with condition so there will be no additional work to do, but if measuring parameter is not proper as it should be so we have to maintain temperature and moisture of plant. By maintain all measuring parameter we can indicate that plant is healthy or not. By this robot we have so many advantages like accurate result, take lees time for operation, give accurate data, and also we can check all this parameter output on phone or laptop. We can operate the robot within such given area. Because of the robot is fully automates so it reduces human labour and low cost.by using of smart sensor it make system easy.

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