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Autonomous Farming Robot with Plant Health Indication

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ABSTRACT-*Agriculture is a field where robots aren't given a significant importance. During the course of this project we made an attempt to scale down human labour by creating an automaton which is able to indicate plant health. Essentially the aim of this project is creating a farming automaton which is able to work on line following principle which indicates the plant health by observing colour of their leaves. Ultrasonic principle is used for detecting obstacles and avoiding collision. The automaton will note encompassing environmental conditions like temperature, humidity, wetness etc. and it'll be displayed on alphanumeric display, in order that automaton can decide health of the plant.*

Keywords*- Ultrasonic principle, image processing, line follower, robot.*

I. INTRODUCTION

In this era of developing technologies, India finds its monopoly in the field of agriculture. The Indian economy majorly depends on agriculture. But economic loss is caused due to the loss of major crops because of leaf infection. Leaf infection is the invasion of leaf tissues by disease causing agents such as bacteria, virus, fungii etc. leading to degradation of the leaf as well as the plant in itself. This can be characterized by spots on the leaves; dryness of leaves, paling of leaves and causes widespread loss of leaves. It may occur due to environmental changes such as unconditional rain fall, drastic change in temperature, humidity or it may be due to improper maintenance or due to swamps. The process of degradation starts once the disease causing organisms such as bacteria, virus etc. enters into the leaf tissues. As they go on increasing, the strength of the plant deteriorates.

In this project, we are going to make an agricultural autonomous line follower robot to drive through the crop plantations. Ultimately, a unique system has been designed for Plant & Food Research which makes use of a number of electrical systems, computer systems and a plethora of engineering theories. A prototype of a robotic vehicle has been designed, developed and constructed, which should be integrated with motors, controllable using specific electronic components.

A number of sensors are integrated into the robotic system including moisture, temperature and humidity sensors. The system required the use of vision, with custom algorithms being developed to identify plant health. The entire system will be integrated into a fully automated package. This allows the system to autonomously return to specified sites (i.e. individual plantlets) at stipulated time intervals in order to identify subtle changes in plant health and leaf colour.

II. LITERATURE REVIEW

SR NO	PAPER/PATENT	ASSUMPTION	ADVANTAGES	LIMITATIONS	YEAR	PATENT/PAPER SR NO
1.	Automatic adjustment of irrigation schedule according to condition of plants	These irrigation systems can range from simple systems to very complex systems.	This system will automatically vary the watering to optimize plant development until the plants at which time the irrigation controller returns to performing the regular irrigation schedule.	The irrigation schedule may be at least partly derived in fields.	2005	US 6947811 B2
2.	Varying irrigation scheduling based on height of vegetation	A method and system for flexible to varying irrigation system arrangement based data obtained by a set of sensors placed on a mobile machine. It measures the height of undergrowth within the operating environment of the mobile machine.	The vegetation is adjusted based on a difference between the measured height of the vegetation and the calculated height of the vegetation.	Further, different embodiments may provide different advantages as compared to other embodiments.	2011	US 20110166715 A1
3.	Adaptive scheduling of a service robot	An projected height of grass cut by the robotic mower is firm for a fixed number of past mowing tasks.	An embodiment of the present invention provides a method for scheduling mowing tasks by a robotic mower.	Manually operated	2012	US 8295979 B2
4.	A Survey on Autonomous Farming Robot	This project uses AT89S52 Microcontroller and comprises of performing Ploughing and seeding via DTMF decoder commands. This project uses 12V battery rechargeable through the Solar panel.	Thesystem observes completely different environmental conditions and take actions consequently that humans can't do accurately. It requires very less power because it is using solar panel	We can scale back labour any by modifying the system any for alternative agricultural work like choosing, gather and weeding.	2016	ISSN: 2319-8753
5.	Smart system for agricultural development	This system is developed to optimize water use for agricultural crop. It is design to develop and implement sensor network which is in turn connected to GSM technology.	Used for greenhouse system. Applicable for precious and delicate products like grapes and coffee.	Further, can be modified for all types of crops.	-	-
6.	Robots for Precision Agriculture	In this paper we present a multi-purpose agricultural robot to implement accuracy irrigation, and nourishment addition apart from continuous monitoring of crop and soil conditions.	Ability to adapt to unstructured environment.	major concern would be the amount of power used by the robot system.	2007	NaCoMM-2007-111
7.	Fruit Picking Robots	In this paper a harvesting robot system for strawberry was designed moveable strawberry-harvesting robots which can be molded on a travelling platform, were developed and operated practically in a greenhouse.	To unleash from significant, dangerous, or monotonous operations. to extend value of product. to supply uniform merchandise	It was picking 1 at a time which was taking more time, The power consumption & It had a sharp pincher which could damage the strawberry	2016,	ISSN 2320–088X
8.	Robotic Agriculture Machine	This paper presents a system with high speed of operation. The farm is cultivated by the machine, reckoning on the crop considering specific rows & specific columns.	To reduce the human effort. It increases the efficiency and accuracy.	The system can be superior for sowing seeds in farm with exacting distance between seed is adjusted.	2014	ISSN : 2319 – 8753

Table 1. Literature review

The paper **Automatic adjustment of irrigation schedule according to condition of plants** have present invention provides systems and methods in which a microprocessor, disposed in an irrigation controller, is programmed to adjust an irrigation schedule according to a condition of a plant being irrigated. **Irrigation remote sensing system** has presented A data gathering device associated with an agricultural irrigation system including at least one camera movably connected to the irrigation system. **Varying irrigation scheduling based on height of vegetation** have method of controlling application of a substance to vegetation using data obtained via a mobile machine is provided. **Adaptive scheduling of a service robot** has method for scheduling mowing tasks by a robotic mower is provided. An estimated height of grass cut by the robotic mower is determined for a predetermined number of past mowing tasks.

Our project is mainly concerned with indicating health of plant by gathering environmental conditions like temperature, humidity and moisture of soil. It also indicates how much plant is affected or turned yellow by image processing. All gathered information is displayed on LCD. (Humidity, Temperature, Moisture and Dryness).

III. SCOPE OF PROJECT

This project will lead to further advancement in field of agriculture. By reducing human efforts in adverse climatic conditions, the plants health will lie in safe hands. This project will open gates to a new technological advancement in surveillance and will ultimately lead to development in agricultural field.

IV. SYSTEM MODEL DESCRIPTION

For autonomous farming robot it required all system on robot, for that raspberry pi and ATmega8 microcontroller are used to perform robotic operation.

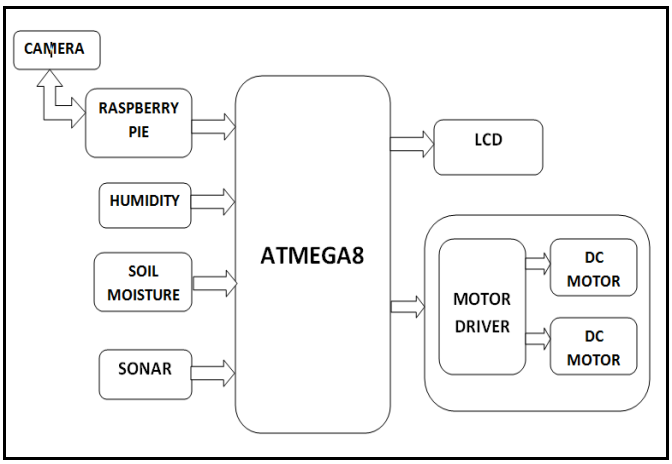

Figure 1. Block Diagram

4.1. Problem statement

In this project, we are trying to build a system that will reduce human effort while increasing the efficiency of the system. Here we are designing an autonomous intelligent farming robot which indicates the plant health by observing the colour of their leaves using image processing. 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.

4.2 Block Diagram Description

4.2.1. DHT 11

DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability.

4.2.2 Soil moisture sensor

Soil moisture sensors measure the water content in soil.All plants need water to grow and survive.Soil moisture sensors used to determine how much water is needed to irrigate the plants.

4.2.3 Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring time interval between sending the signal and receiving the echo to determine the distance to an object.

4.2.4. Camera

It is used for take a image of crops, it's directly connected to the raspberry Pi. There area unit two ways that to attach camera to raspberry Pi initial one is USB camera and second is camera module of raspberry Pi. We tend to area unit victimization camera module of raspberry pi.

4.2.5. LCD Display

Lampex,16*2, Backlit facility LCD is employed in an exceedingly project to examine the output of the appliance. We've used sixteenx2 LCD that indicates 16 columns and a couple of rows. So, total thirty two characters we are able to show on 16x2 LCD.[9] Therefore plays a significant role in an exceedingly project to visualize the output and it conjointly display the standing of plant food tank that's tank is empty or not.

4.2.6. Raspberry Pi

Raspberry Pi is employed for image process. Camera is connected to the raspberry pi, raspberry pi take image through that camera. When taking image of crop image process is beginning on it image and eventually we tend to get the results of image process. By victimization image process we tend to discover the sickness on leaf.

4.3 Flowchart

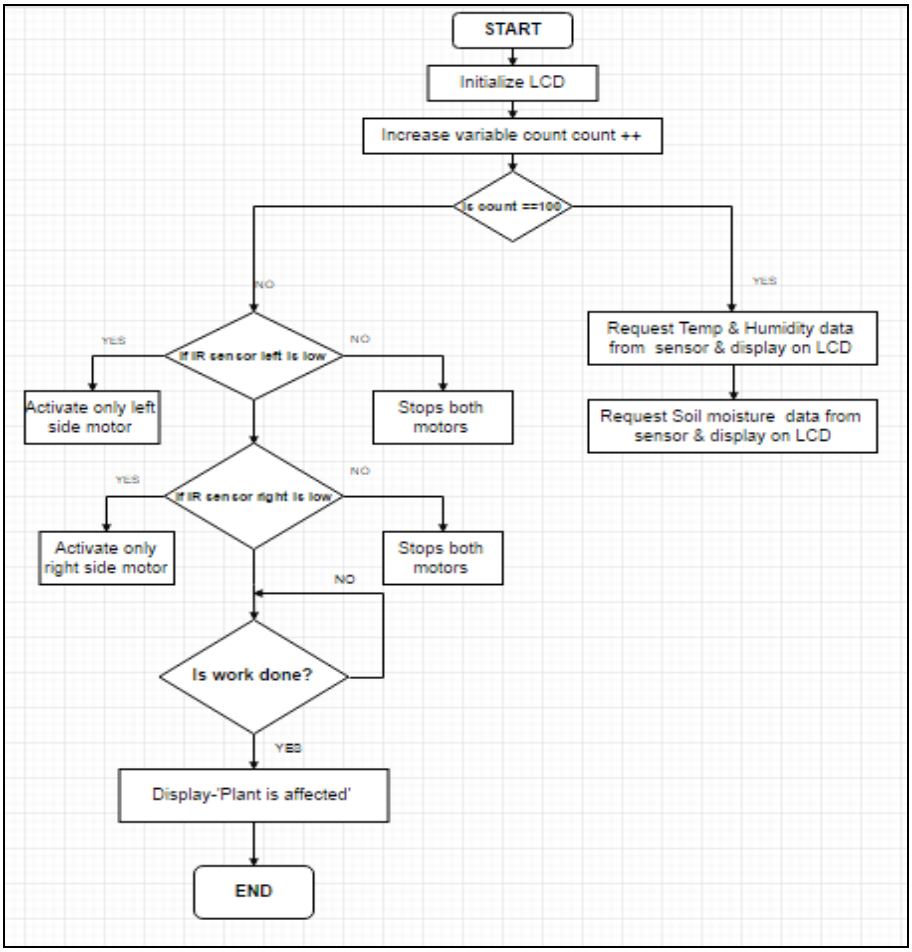

Figure2. Flowchart of algorithm steps followed for Image processing

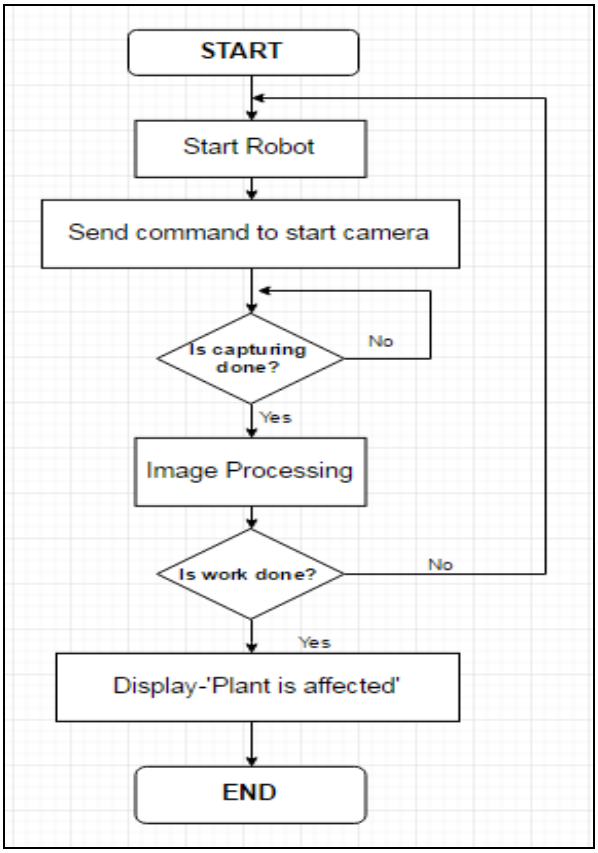

Figure3. Flowchart for plant health indication

4.4 Circuit Diagram

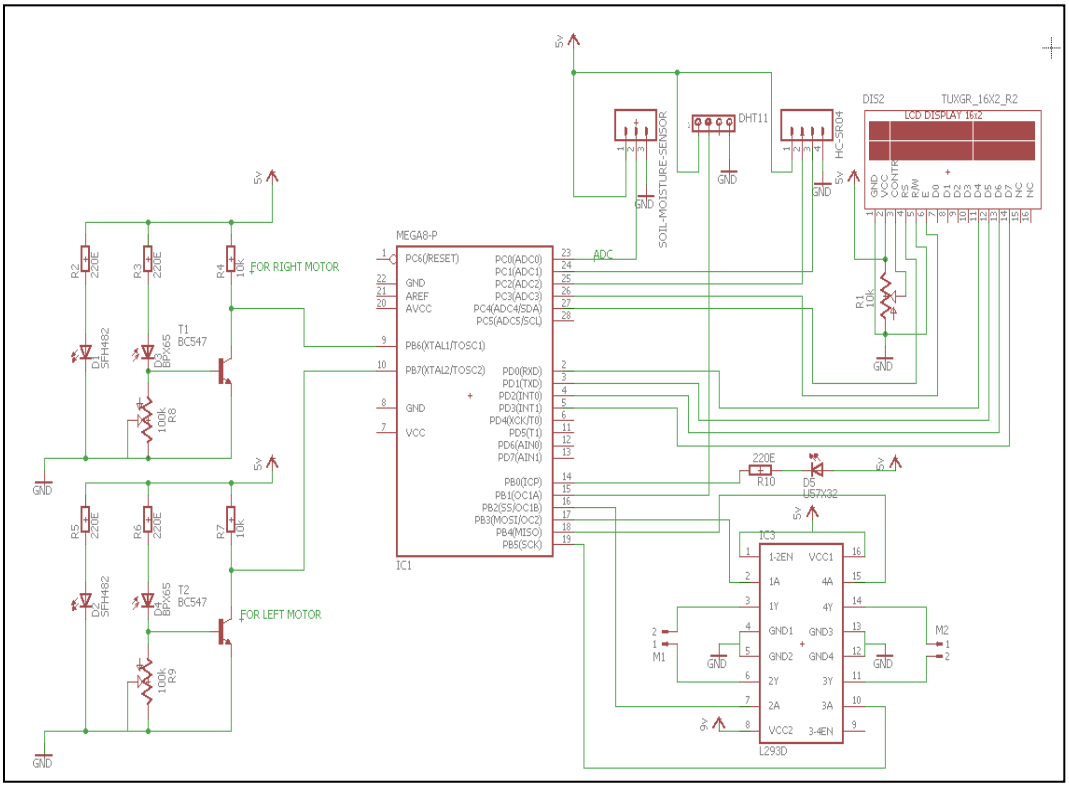

Figure4. Circuit Diagram

Following components are used in this circuit diagram:

- ATmega 8 micro controller
- DHT 11
- Soil Moisture Sensor
- L293D motor driver IC

4.5. Features

1. Fully automatic system so reduces the human labour.
2. Saves time.
3. A ton of accuracy.

4.6. Applications

This system is used only for agricultural purpose.

1. This system will provide surveillance on plant health.
2. It will have constant knowledge about moisture content in the soil.
3. For an infected plant, this system will provide us the accurate knowledge about whether or not to carry on the cutting of plant leaves.

DISCUSSION

The planned system is open style so anyone can produce this type of system pattern any methodology. The system uses image method to look at the leaf colour which will increase any accuracy of the system as a result of it identifies colour really accurately than human. The system in addition observes completely totally different environmental conditions like condition, soil condition and temperature that human cannot live accurately by open eyes to return to a choice the plant health so the accuracy of the system is high. It in addition involves watering mechanism which we are going to cut back labour any by modifying the system any for various agricultural work like choosing, harvesting, weeding.

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