Integrated autonomous ground vehicle design for green house irrigation control with intelligent feeder system

[1]Nilofar S. Mulla , [2] Nandkishor M. Dhawale
[1] Research Scholar, [2] Associate Professor
[1] Department of Electrical Engineering,[2]Department of Instrumentationl Engineering
[1]Padmabhooshan Vasantraodada Patil Institute of Technology, Budhgaon Tal -Miraj, Dist –Sangli,Pin – 416304
[2]Padmabhooshan Vasantraodada Patil Institute of Technology, Budhgaon Tal -Miraj, Dist –Sangli,Pin – 416304

Abstract-Parameter monitoring and control of greenhouse environment play an important role in greenhouse production and management. Sensor network that is used to monitor and control the essential greenhouse parameter, such as temperature, humidity, moisture, EC-PH, day/night. This implementation supports the farmers to increases the crop production. All monitored parameter are transmitted through a wireless link to computer via coordinator to be analyzed, and the initiate suitable commands to the specific device to overcome the drifts in an environmental parameter inside greenhouse. The greenhouse vegetable production needs less labour, less capital, has faster returns than normal vegetable production. In recent scenario of climate change and its effect on the environment has motivated the farmer to install greenhouse in their fields. But maintaining a greenhouse and its plantation is very labour intensive and majority of them perform vital operations and monitor the growth conditions inside the greenhouse closely. To demonstrate the feasibility and effectiveness of the system, device such as soil moisture sensor and temperature sensor have been integrated along with the proposed greenhouse control system.

Keywords- Greenhouse, Sensors, Robo, Polyhouse.

I. Introduction

In this era most of the countries do not have sufficient skilled man power in agriculture sector and India is one of it. Agriculture sector is most important sector of Indian economic. Grass domestic product (GDP) of Indian agriculture is about 18% and provides employment 50%. Also, 70% people in India are dependent on agriculture. So in India there is a need to automate the sector and over comes this problems.

The approach of this project is to develop a complete robot base greenhouse system. There are different process in pharmacy stream like poling, cultivating, weeding, harvesting, etc. which required huge & continues man power. So, this process require move effort, more time and more money. So, the use of robot system will reduce time and money and will make it more productive. It is a robot base system. Which will make agriculture process much easier than traditional.

It is a autonomous farming robot which itself operating, high speed machine, energy saving, highly accurate, and based on solar energy.

II. Methodology

This system is based on micro controller and sensor assembly, where they control and navigate the entire assembly for the entire following process.

This system consists of three parts.

1. Robo
2. Robo control
3. Controlling circuit

Part 1:- Robo

First part consists of solar panel, MPPT controller, battery.

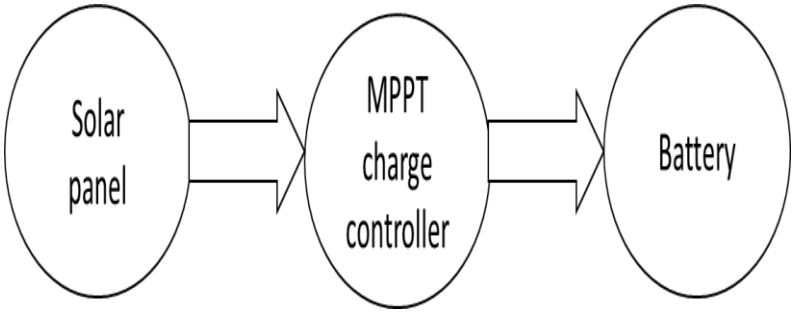

Fig.1: Robo circuit

Solar panel is used as 12 volt, 40 watt. Requires 3 ampere current but we are going to use 8 ampere current in system. It takes about 2-3 hrs to fully charged. MPPT is used to sac. Also MPPT is used to check at how much speed the battery should be charge as per PWM and if battery voltage goes above 14.5 volt it cuts of for higher battery life. A 12 volt battery is also used. The first part gives energy to drive the robot.

(A) Solar panel:

- Specification:

1) Capacity – 40W, 12V.
2) Voltage – voltage at max power (Vmax)- 18V, open circuit voltage (Voc)- 22V.
3) Current- current at max power (Imax)-2.23A, short circuit current (Isc)- 2.42A.

- Features :

1) High strength aluminium frame design to offer high torsion resistance.
2) Anti-reflective coating for more light absorption.

Fig.2: Solar Panel

(B) MPPT charge controller:

An MPPT (maximum power point tracking) charge controller optimizes the connection between solar panels and battery.

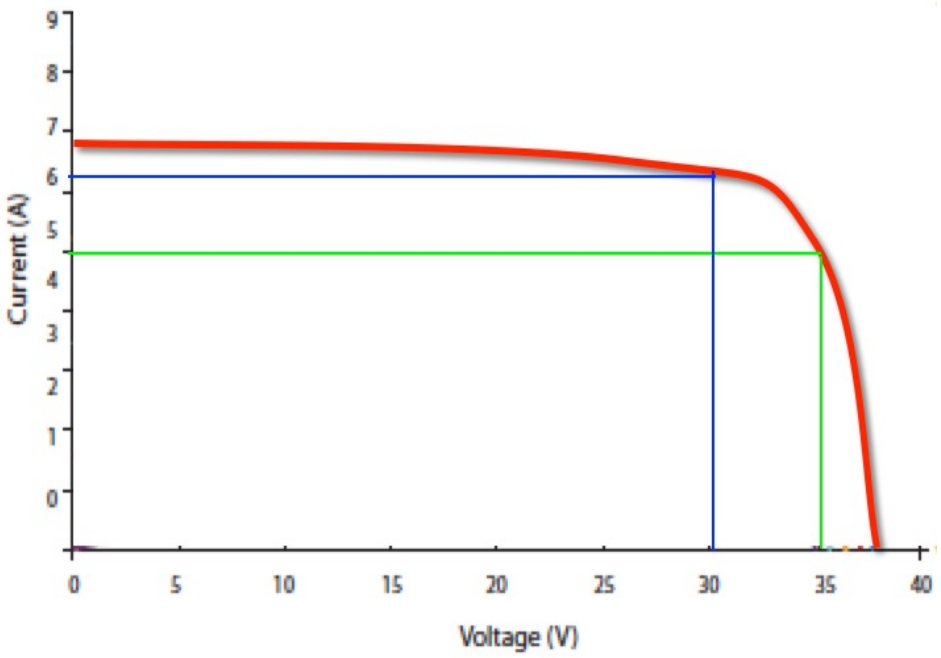

Fig.3: MPPT system

The maximum power point (MPP) is the ideal point on an IV curve where current and voltage multiply to provide the maximum power that the given PV system can produce at a given moment.

- Features:

1) More efficient and greater flexibility of design.
2) Can be built for larger systems.

Part 2:- Robo Control

In this part we are going to install an app linked with this robot device to operate it as per site condition. It will be used to measure the distance and plough the seeds.

Here, we can drive the robot by use of Bluetooth and determine the distance for Sowing seeds. So, L298 motor driver is use to drive the motor and actuators is used to sow the seeds as per the specified distance. Either we can fix the distance of sowing or specify number of seeds to sow.

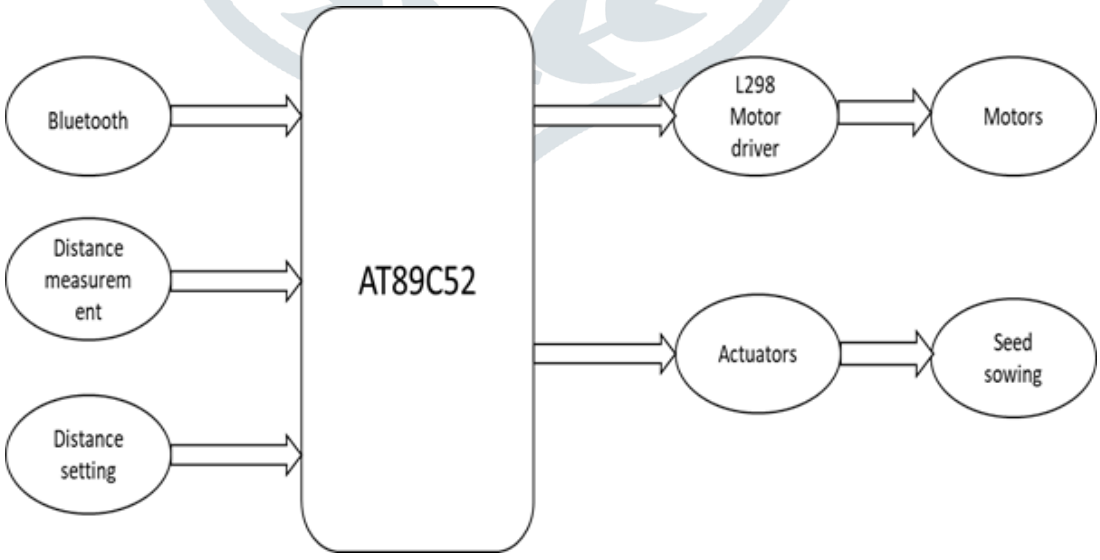

Fig.4: Robo control

Part 3:- Controlling Circuit

The third part measures actual site condition like humidity, temperature, moisture, day/night, EC-PH, and AVR 328P-PU and combines with AT89c52. To determine amount of pesticides and fertilizer to be used. It also displays present value on the screen.

Sensor use for humidity is SYHS230, for measuring temperature thermistor is used, sensor for day/night condition for LDR. To measure EC-PH copper electrodes used for checking conductivity.

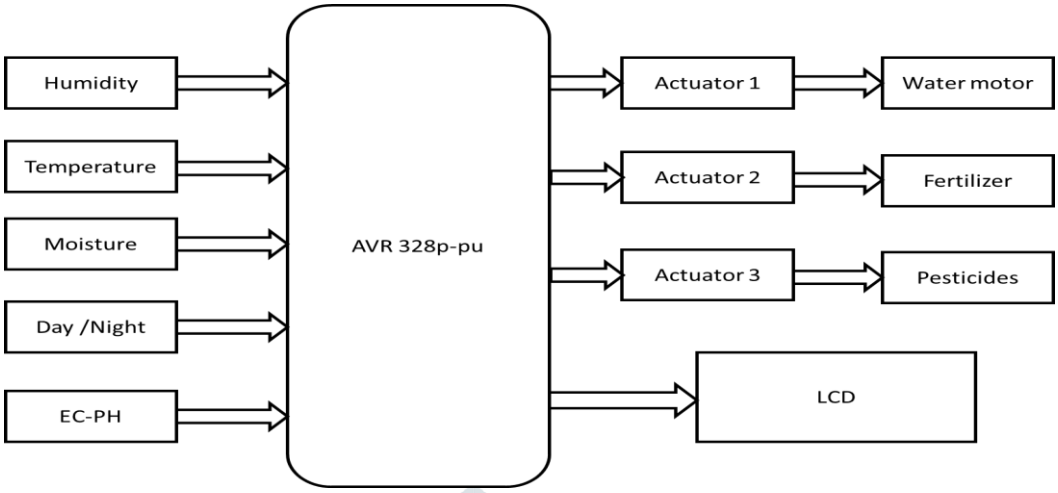

Fig.5: controlling circuit

A. Humidity: these modules converts the relative humidity to the output voltage.

i. Rated voltage - DC 0.5V

ii. Rated power - < 3.0mW

iii. Operating temperature- 0-60 C

iv. Operating humidity- 10-90%RH

v. Storage humidity- within 95% RH

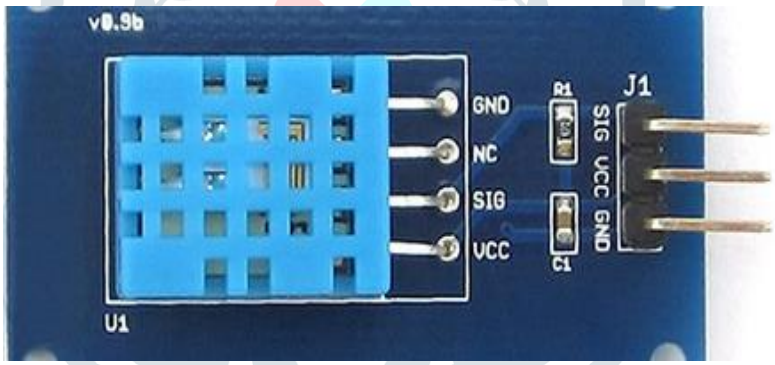

Fig.6: Humidity sensor

B. Temperature: NTC thermistor sensor: the temperature sensitivity of an NTC sensor is expressed as "percentage change per degree c." depending on the materials used and the specifics of the production process ,the typical values of temperature sensitivities range from -3% to -6% per degree C.

Fig.7: Temperature sensor

Thermistor are temperature sensing elements made of semiconductor material that has been sintered order to display large changes in resistance in proportion to small changes in temperature. These solid state temperature sensors actually act like electrical resistors that are temperature sensitive.

C. Moisture: the moisture sensor is used to measure the water content of soil. When the soil is having water shortage the module output is at high level, or the output is at low level. This sensor recall the owner to water their plants and also monitors the moisture content of soil.

Fig.8: Moisture sensor

i. Working voltage: 5V

ii. Working current: < 20mA

iii. Working temperature: 10`C ~ 50`C.

D. EC-pH sensor:

Fig.9: EC-PH sensor

The EC and pH concentration of the nutrient solution affects the availability of the nutrients to plants. The pH and EC concentrations are controlled to prevent barrier growth. Their measurement is essential because the solubility of minerals in acidic, alkaline, and ion concentration of all the species in solutions is different and the solution concentration changes with solubility.

III . Conclusion

An internet based greenhouse controlling using Arduino microcontroller and monitoring and controlling system on android mobile phones depending upon user authentication is proposed and implemented. The android based greenhouse monitoring system communicates with the micro web-server via internet fully based web service thing speak. Any android supported device can be used to install the green house, and control and monitoring the environment inside the green house. A low cost greenhouse monitoring system has been developed which does not require a PC as all processing is handled by the microcontroller. The system may be implemented with wireless sensors may little cost but it works with more effectively. The system may be implement, works effectively and easy to operate.

IV. Acknowledgement

Authors would like to acknowledge department of Electrical Engineering, PVPIT, Budhgoan for providing solar panel and workshop of testing facilities.

IV. References

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