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SOLAR POWERED AUTO IRRIGATION SYSTEM

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ABSTRACT:

This project gives the idea to develop Solar powered auto irrigation system. The main objective of this project was to design a small scale irrigated system that would use water in the most well organised way in order to prevent excess water loss and minimize the cost of labour. The following aspects are considered in the choice of designing installation cost, water saving, human intervention, reliability, power consumption, maintenance, expandability. Hence we proposing a prototype model to reduce those difficulties from gross route by employing sensors and minimizing water waste.

Keywords—Photovoltaic cell, Battery, Servo motor, Node MCU sensors.

INTRODUCTION:

In India agriculture is the main occupation, agriculture involves many methods for producing good yield. Now-a-days farmers are facing many problems due to lack of water availability energy shortage, Labour availability. To avoid all these problems, We developed solar powered auto irrigation system. In this proposed system the energy is fed through the solar panels in order to reduce the energy shortage and this system can prevent the crops from water logging effect by measuring the moisture of the field using soil moisture sensor. The DHT11 sensor is used for sensing the temperature and humidity on the fields if the temperature and humidity varies above the threshold values then the bio-shed will operate.

The main objective of the proposed model is to develop an intelligent irrigation system through which the farmers can monitor the fields from distant places through the IOT platform.

BLOCK DIAGRAM:

The following block diagram shows soil solar panels using photovoltaic cells, soil moisture sensor, servo motor, power supply, relay driver, water pump, micro controller i.e. Node MCU.

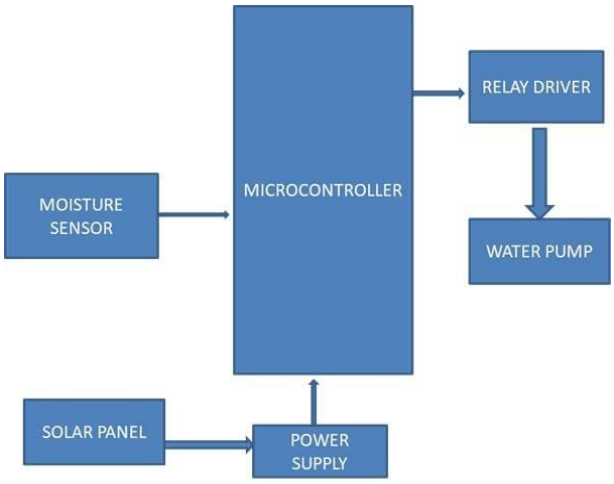

Figure 1: Block diagram of Solar powered auto irrigation system

SCHEMATIC AND CONNECTIONS:

The Node MCU is configured in the BCM mode (Broadcom mode) in which the pins of the Node MCU are declared based on the General Purpose input/output port numbers whereas the other available mode i.e., “Board” mode in which the pins of the Node MCU are declared by their serial numbers.

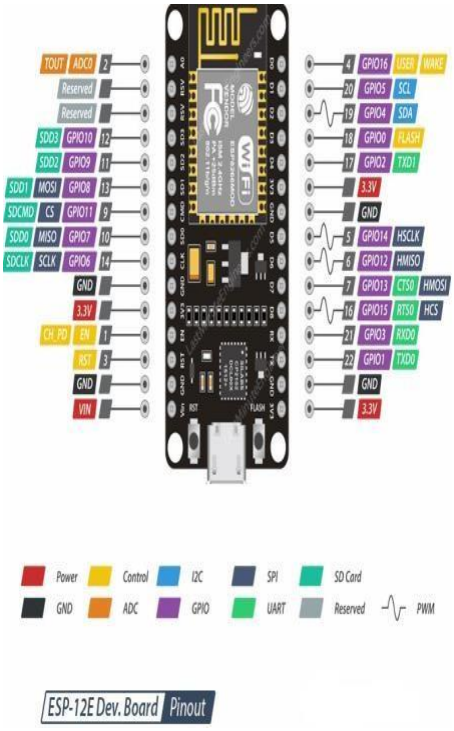

Figure 2: Schematic of Solar powered auto irrigation

• Pin 1 (3.3v o/p) – Enable

• Pin 2 – ADC0

• Pin 3 (GPIO 02 /SDA1) - Reset

• Pin 4 (GPIO 16) – Wake from sleep

• Pin 5 (GPIO 14) – Serial Clock

• Pin 6 (GPIO 12)- MISO

• Pin 7 (GPIO 13) - MOSI

• Pin 8 (GPIO) – Reserved

• Pin 9 (GPIO 11) – Flash Connection

• Pin 10 (GPIO 7) – Flash connection.

• Pin 11 (GPIO 9) – Flash connection.

• Pin 12(GPIO10) – Flash Connection

• Pin 13 (GPIO 8) -Flash connection

• Pin 14 (GPIO 6) - Flash connection.

• Pin 15 (GPIO22) – Reserved

• Pin 16 (GPIO 15) – SS (SPI)

• Pin 17 (GPIO 2) – Boot mode select TX1

• Pin 18 (GPIO 00) – TX0

• Pin 19 (GPIO 04) - SDA

• Pin 20 (GPIO 05) – SCL

• Pin 21 (GPIO 03) – RX0

• Pin 22 (GPIO 01) – TX0

• Pin 23 – GND

Pin 24 – 3.3V

• Pin 25 – GND

• Pin 26 – Vin

• Pin 27 – 3.3V

• Pin 28 – GND

• Pin 29 – 3.3V

• Pin 30 – GND

WORKING:

Farmers can monitor various conditions like soil moisture, water level, humidity. It is difficult to obtain data of the farm lands with the size of hundreds or thousands of square yards through the conventional methods. Hence with the IOT, this difficulty can be minimized. The soil sensors, which are placed uniformly maintain distances across the farmland, can alert farmer to any irregular conditions like high temperature or low moisture. The farmers can get an accurate soil data either by the dashboard or through a customized mobile application. Monitoring of plant and soil can lead to higher ROI for farmers. As a part of precision farming, the soil and plant monitoring include the following aspects like moisture monitoring, water usage monitoring for optimal plant growth and weather condition reporting. This project proposes, solar powered automation of agriculture using smart

farming technology to develop a prototype model of plant watering system and temperature control. This technology works through the sensors like temperature, humidity and soil moisture sensors. The information is processed when the temperature in the shed rises to predefined value and the bio shed closes. When the moisture level decreases to a certain value, which is sensed by moisture sensor and given to Arduino. The Arduino turns on the solenoid pump. The sensed parameters transfer to farmer mobile for monitoring using Wi-Fi module.

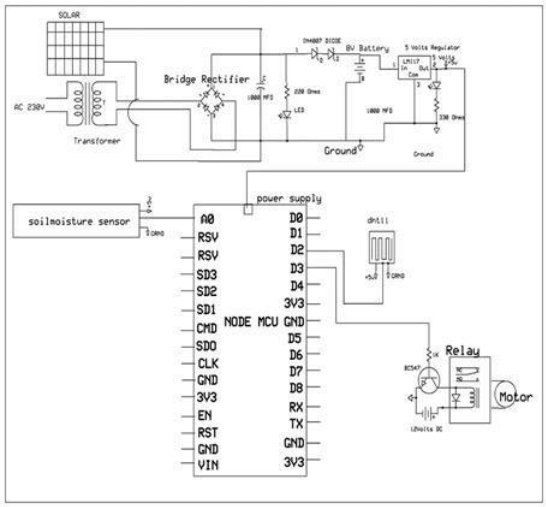

Figure3:Workingprinciple

Soil moisture sensors measure the water content in soil. Soil moisture sensors used to determine how much water are needed to irrigate the plants. It can use either resistance or capacitance to measure the water content in the soil. There are two types of soil moisture sensors. One is resistive and the other is capacitive. The resistive soil moisture sensor measures the water content through resistance of soil. If the water content is more, then the resistance of soil is less. If the water content is less, then the resistance of soil is more.

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.

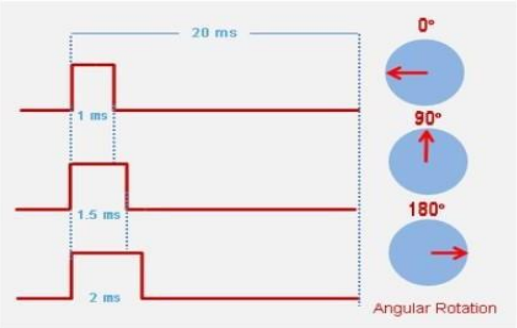

Figure 4: Servo motor controlling

The sensors like moisture, humidity and temperature sensors are placed in the field for automatic plant watering when the moisture level is below the required level for the plant to grow and to reduce the temperature in the field. The bio- shed is the place where small seeds to be germinated up to some height, so the automatic system take care about the plants the sensors in bio- shed interfaced to node MCU where this total system works as a closed loop control system and solenoid pump and servo motor are connected to Node MCU as output.

RESULTS:

The motor pumps ON when the soil moisture level is less than the required level i.e., 40% and the motor pump is OFF when the soil moisture level is more than the required level. The bio-shed is open when the temperature is less than 35 degree Celsius and closes when temperature is more. This shed can also be used to protect the crops from rainfall.

Figure 5: LCD display

The blynk app displays the moisture, temperature, humidity levels of the field. Hence the automatic control of submersible pump based on the soil moisture sensor reading and control of bio–shed opening and closing from the temperature sensor can be observed through the blynk application dash board. Thus the farmers can monitor the field remotely from distant

place. This can be done by the node MCU the sensor data and sending this data into the blynk application. Node MCU module will control the door with the help of servo motor when the humidity is above 85% and temperature above 35 degrees.

Figure 5: Real Time result of smart irrigation system

SIMULATION RESULT:

After linking the code file to the simulation project, the circuit start compiling and the result is shown. The soil moisture level is observed in a popup display and the temperature and humidity levels are observed in led display. The pump turns on and starts to run when the moisture level is less than the threshold level. The servomotor turns on when the temperature and humidity level is more than the threshold values.

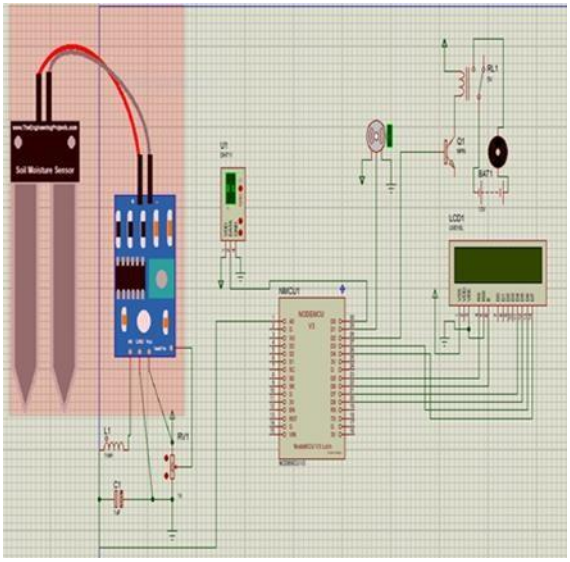

Figure 6: Simulation result

CONCLUSION:

The device provides an automated solution to continuously monitor the soil moisture availability in the fields and turns OFF the motor automatically when the required moisture is available in the field and turns ON the motor when the soil moisture is less than the required level. It reduces the burden to human beings and being a device the OFF timings are strictly implemented which is going to be important in cultivation.

FUTURE SCOPE:

In this system only limited sensors like soil moisture, temperature and humidity sensors are used. This can be further extended to other sensors like rain water sensor also. The renewable energy source can be replaced with any other sources like wind where it is feasible as the solar energy will not be available all over the year. This can be also done with other chips like Arduino.

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