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Intelligent Agriculture Monitoring and Control System Based Arduino UNO Microcontroller

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ABSTRACT: Nowadays, there is a significant diminution in agricultural production due to the unpredictable control of crop climate conditions. Thus, to alleviate the crops exposure from excess cold or heat and unwanted pests, an intelligent environment monitoring and control system based Arduino UNO board consisting of ATmega 328P microcontroller has been developed for a small-scale agriculture namely greenhouse. The system user can monitor and control the greenhouse climate conditions. To deliver the environmental conditions in a timely manner, low-cost sensor is used to monitor the temperature, humidity, soil moisture and automatic control of the pump motor of the agriculture land. The developed system is implemented and tested in laboratory conditions using Proteus toolkit. Arduino Integrated Development Environment (IDE) tool is used to develop the necessary software. The results show that the proposed system can closely monitor and evaluate greenhouse farming field conditions accurately. Finally, the user can send control decisions instantly to boost the yield growth conditions and thus, increase the crop production considerably.

KEYWORD: Arduino, moisture level, motor, humidity sensor, temperature sensor, cut off the range.

I. INTRODUCTION

Arduino Uno is an open-source microcontroller board dependent on the Microchip ATmega328P microcontroller and created by Arduino.The board is furnished with sets of computerized and simple information/yield (I/O) sticks that might be interfaced to different extension sheets (shields) and other circuits.] The board has 14 advanced I/O pins (six fit for PWM yield), 6 simple I/O sticks, and is programmable with the Arduino IDE (Integrated Development Environment), through a kind B USB cable. It can be controlled by the USB link or by an outer 9-volt battery, however, it acknowledges, pages somewhere in the range of 7 and 20 volts. It is like the Arduino Nano and Leonardo. The equipment reference configuration is dispersed under a Creative Commons Attribution-Share and is accessible on the Arduino site. Arduino uses both Physical programmable circuit board and piece of software. They use a simplified version of C++ for coding.

1.1 Characteristic

- Inexpensive
- Cross-Platform
- Simple & Clear Programming Environment
- Open Source & Extensible Software
- Open Source & Extensible Hardware
- Compact

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1.2 Working principle

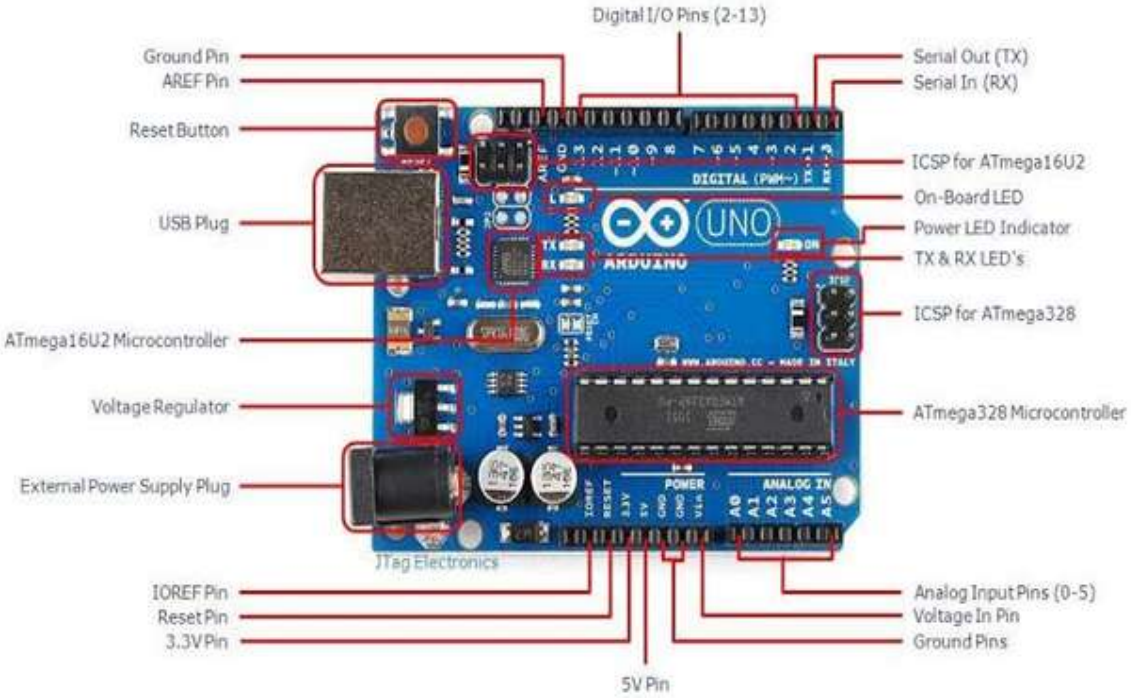

Fig 1- Architecture of Arduino UNOcontroller[2].

There are a few I/O computerized and simple pins put on the board which works at 5V. These pins accompany standard working appraisals running between 20mA to 40mA. Interior draw up resistors are utilized in the board that restricts the current surpassing from the given working conditions. In any case, an excess of expansion in current makes these resisters futile and harms the gadget.

Driven. Arduino Uno accompanies worked in LED which is associated through pin 13. Offering HIGH benefit to the pin will turn it ON and LOW will turn it OFF.

Vin. It is the information voltage given to the Arduino Board. It is unique about 5 V provided through a USB port. This pin is utilized to flexibly voltage. If a voltage is given through force jack, it very well may be gotten to through this pin.

1.3 Board Breakdown

- Reset Button
- AREF
- Ground Pin
- Digital Input/Output
- PWM (PinMarked Symbol)
- TX /RX (transmit and receive data)
- Power LED analogue pins
- DC power barrier.

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II. COMPONENTS OF UNO MICROCONTROLLER

Fig 2- Components of UNO Microcontroller[3].

- **USB Connector**- This is a USB port used for coding a program from Arduino IDE into Arduino board. It can also be powered using this port
- **Power Port**- It can be powered using AC to DC battery. It operates in 5V but can withstand 20V when high voltage is applied it converts them to voltage regulator which protects the board from burning out.
- **Microcontroller** -It acts as a brain of Arduino, it has 28 pins in it. They use ATmega 328p by Atmel.ATmega 328P is a pre-programmable with the bootloader. This controller is made up of

Flash memory– to store data, it is made up of 32kB.
RAM-Read-only memory, which is made up of 2KB.It is a run-time memory.
EEPROM- Electrical Erasable programmable read-only memory of 1kB, It is a non-volatile memory, it stores data even when the device is RESET or RESTART.
CPU- control all device from fetching program instruction from flash memory and runs in RAM

- **Analogue Input pin**- It has 6 analog input pins, labelled from 0 to 5, these pins can read signal from analog sensor such as humidity sensor and convert them into digital values. They are used to measure voltage not current, because only a small amount of current flows through these pins.
- **Digital pin**- can be used to input and output pins, when used as output pins they act as power supplier source.

III. IMPLEMENTATION

In this paper, we have made a design for agriculture system to cultivate crops and yield a good profit to the farmers. Agriculture is the backbone for Indian Economy, the Indian Government must take necessary set to help farmers in making the production level high. In our system, we have designed a motor in which we have used Humidity sensor, Temperature sensor andor, Moisture sensor. We have set the motor with a monster level percentage, in which the motor will off automate theirthe monster level goes high, the motor will turn off, and when the monster level goes low, the motor will turn on immediately, this, in turn, will help incultivatingthe crop. Using this technology we can yield more profit to farmers.

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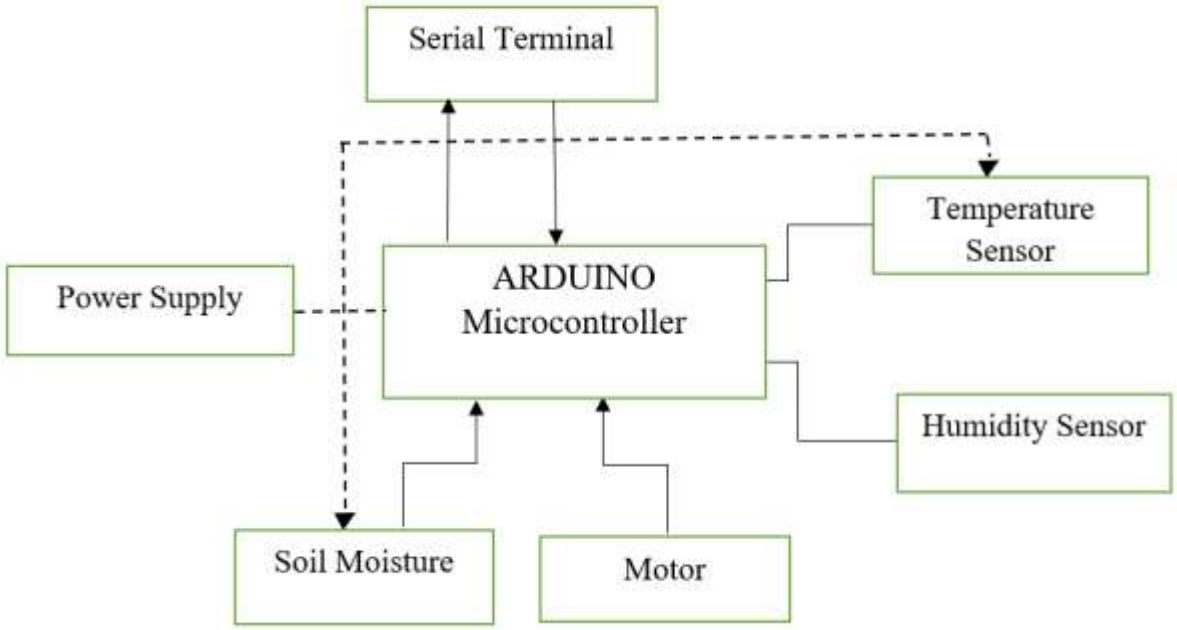

Fig 3 – block diagram for motor process[5].

3.1 Types of Sensor used

- Temperature Sensor
- Humidity Sensor
- Soil Moisture Sensor

3.1.1 Temperature Sensor

This sensor is used to determine the temperature for the cultivation of the crop .This sensor is used to sense the temperature from 0 degree to 180 degree, this works with a 5v power supply.

Fig 3.1.1 -Temperature Sensor

3.1.2 Humidity sensor

This sensor is used to sense the temperature and humidity up to50 degreesthis we can measure the humidity with 20 % - 90% accuracy. This sensor has proven to be efficient inall field.

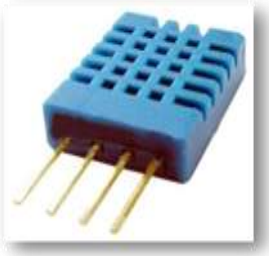

Fig 3.1.2 - Humidity sensor

3.1.3 Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

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Fig 3.1.3 - Soil Moisture Sensor

IV. RESULTS

We have measured the moisture of soil at different temperature of the day and figures below show the results of all the sensor readings at different temperature.

4.1 Output Screenshot

4.1.1 MotorON Screenshot

When the value of moisture of the soil reaches below a certain threshold value which results the relay to get ON that leads to switching ON of the motor automatically.

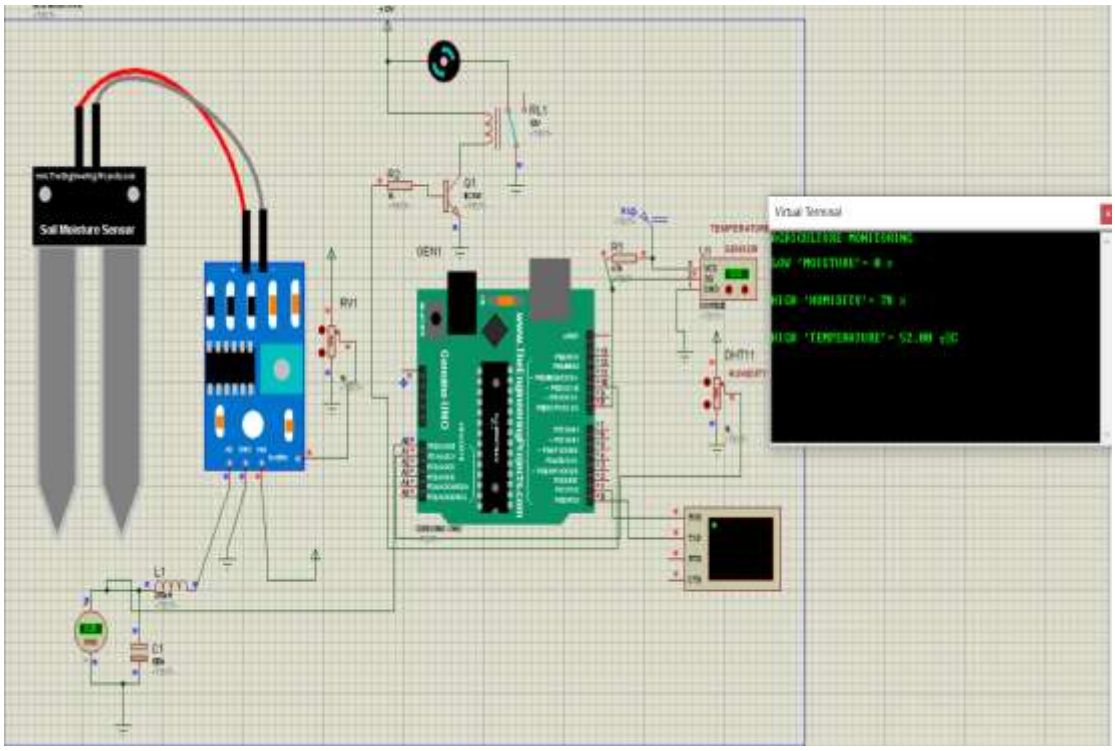

Fig 4.1- Motor ON screenshot

4.1.2 Motor OFF Screenshot

Whenever the moisture value reaches the threshold level relay automatically switches OFF the motor.

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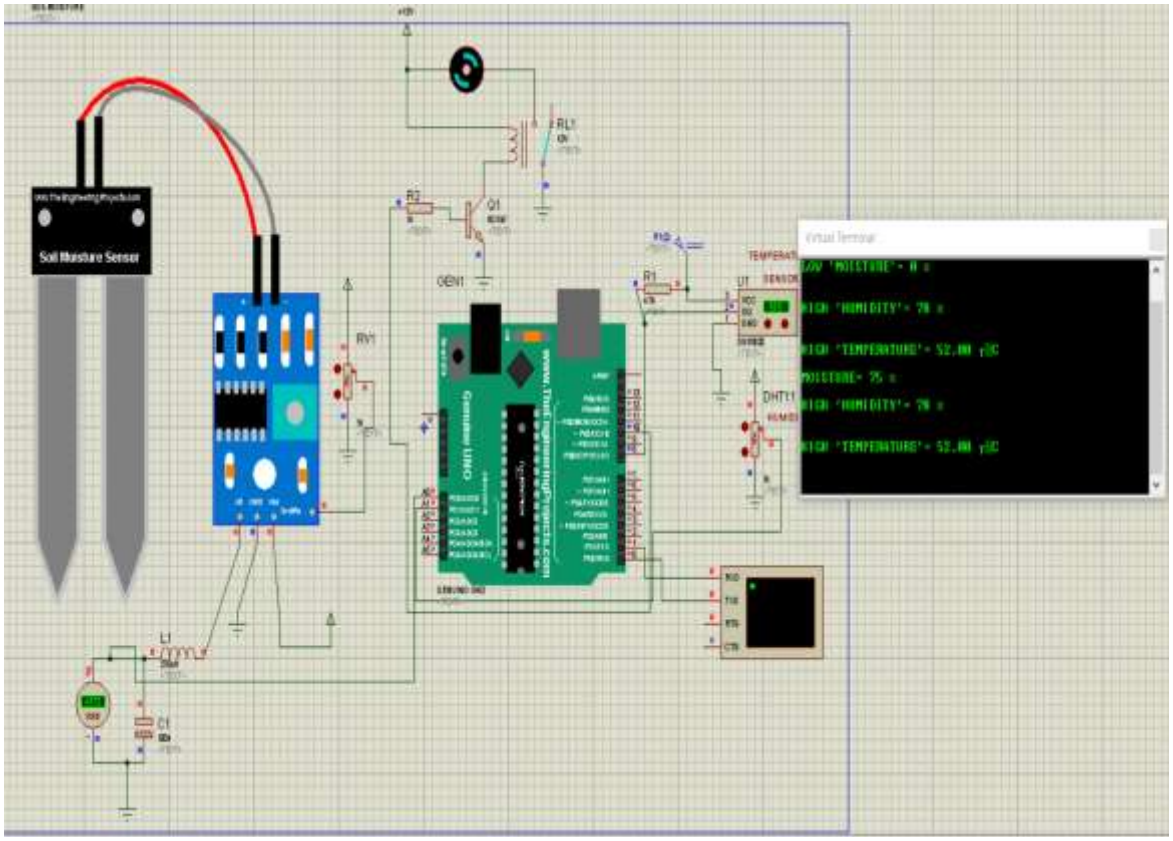

Fig 4.2 - Motor OFF Screenshot

V. CONCLUSION

This, in paper we have analysed the complete working principle of Ardunio UNO Microcontroller and it's basic coding principle , we have also added our motor design for agriculture field using this Arduino and sensors to gain high efficiency and accuracy. Using this sensor the we have set a moisture level percentage, in which the motor will turn on when monster level goes high , and motor turn off when monster level is low. This paper deals with usage of this method in agriculture will help farmers to cultivate crop in an efficient way.

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