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Automatic Watering system using Arduino UNO

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ABSTRACT: Watering is the most important cultural practice and most labor intensive task in daily greenhouse operation. Watering systems ease the burden of getting water to plants when they need it. Knowing when and how much to water is two important aspects of watering process. To make the gardener works easily, the automatic plant watering system is created. There have a various type using automatic watering system that are by using sprinkler system, tube, nozzles and other. This system uses Arduino UNO board, which consists of ATmega328 microcontroller.It is programmed in such a way that it will sense the moisture level of the plants and supply the water if required. This type of system is often used for general plant care, as part of caring for small and large gardens. Normally, the plants need to be watered twice daily, morning and evening. So, the microcontroller has to be coded to water the plants in the greenhouse about two times per day. However for most people it becomes challenging to keep them healthy and alive. This system automation is designed to be assistive for the University Park. This system hopes that through this prototype people will enjoy having plants without the challenges related to absent or forgetfulness.

KEYWORDS: ATmega 328 microcontroller, Moisture sensor, program using Arduino IDE, COADING

I. INTRODUCTION

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs- light of sensor, a finger on a button, or a Twitter messages,- and turn it into an output-activating on a motor, turning on an LED, publishing something online. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of markers has gathered around this open-source platform, their contributions have add to up an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Arduino was born at the Lvrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT application, wearable, 3D printing, and embedded environments. All arduino boards are completely open- source, empowering users to build them independently and eventually adapt them to their particular needs. The software too, is open-source, and it is growing through the contributions of users worldwide.

II. RELATED WORK

ARDUINO :

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment)that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in orderto load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions ofthe microcontroller into a more accessible package. Arduino is an open-source electronic platform based on easy-to-easy use Software and Hardware. Arduino module are able to read inputs and turn into an output. You can tell Your board what to do by sending a set of instruction to the Microcontroller on the boardnetwork life. In [6] Authors had modified the route table of AODV adding power factor field. Only active nodes can take part in rout selection and remaining nodes can be idle. The lifetime of a node is calculated and transmitted

along with Hello packets. In [7] authors considered the individual battery power of the node and number of hops, as the large number of hops will help in reducing the range of the transmission power. Route discovery has been done in the

ARDUINO AT mega 328

The Arduino UNO is an open-source microcontroller board based on the MicrochipATmega328Pmicrocontroller and developed by Arduino.cc. The board is equipped with sets of digital andanalog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available."Uno" means one in Italian and was chosen to mark the release of Arduino. Software (IDE)1.0. The Uno board and version 1.0 of Arduino Software (IDE) were thereference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The AT mega328 on the Arduino Uno. comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.[1]The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converte
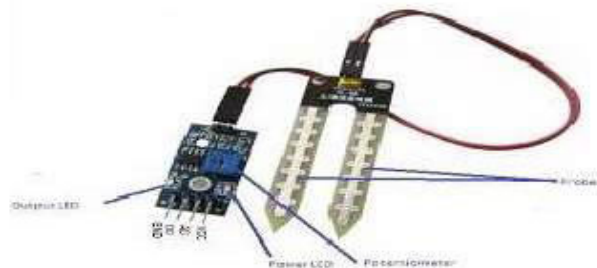
Moisture sensor :

Fig 1.Moisture sensor

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. As the straight gravimetric dimension of soil moisture needs eliminating, drying, as well as sample weighting. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content. The working of the soil moisture sensor is very easy to understand. It has 2 probes with exposed contacts that act like a variable resistor whose resistance varies according to the water content in the soil. This resistance is inversely proportional to the soil moisture which means that higher water in the soil means better conductivity and hence a lower resistance. While the lower water in the soil means poor conductivity and will result in higher resistance. The sensor produces an analog voltage output according to the resistance. The sensor comes with an electronic module that connects theprobe to the Arduino. The module has an LM393 High Precision Comparator which converts the analog signal to a Digital Output which is fed to the microcontroller. We have covered an in- depth Arduino soil moisture sensor tutorial which covers the working of soil moisture sensor module and how to use it with the Arduino. You can check the tutorial if you want to learn more about the soil moisture sensor.

5V Relay Terminal and Pins :

Relays are the switches which aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit. When the relay contact is open

(NO), the relay isn't energize with the open contact. However, if it is closed (NC), the relay isn't energize given the closed contact. However, when energy (electricity or charge) is supplied, the states are prone to change. A relay is an electricallyoperated switch. Many relays use an electromagnet to mechanically operate a switch. This is a 5V4-channel relay interface board, and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V 10A orDC30V 10A. It has a standard interface that can be controlled directly by microcontroller

Fig 2. 5V Relay Terminal and Pins

12V DC motor :

Smaller electric water pumps, such as the kinds used in homes, usually have small DC motors. The DC motor is contained in a sealed case attached to the impeller and powers it through a simple gear drive. In the centre of the motor is a rotor with coils around it. We need a small pump to irrigate the plant, but in the case of a garden, we need to drive a larger pump that can provide a higher volume of water depending on the size of your garden which can't be directly powered by an Arduino. So in case you need to operate a larger pump, a driver is necessary to provide enough current for the pump, to show that I am using a 5v relay. You can also use an AC-powered pump and use a suitable relay. The working will remain the same as shown in this project, you just have to replace the DC power input connected to the relay with an AC power input and have to power your Arduino with a separate DC power source

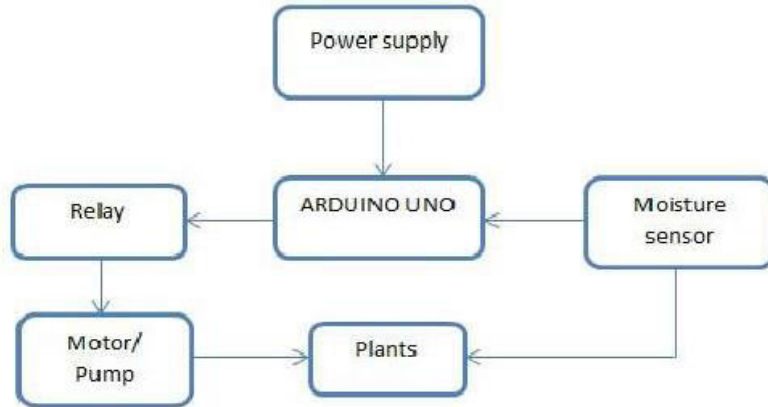Fig 3.12V DC motor

SYSTEM BLOCK DIAGRAM

Fig 4. Block Diagram

There are two functional components in this system. They are the moisture sensors and the motor/water pump. Thus the Arduino Board is programmed using the Arduino IDE software. The function of the moisture sensor is to sense the level of moisture in the soil. The motor/water pump supplies water to the plants. In this project we use two functional components. One is soil moisture sensor and other is water pump. Here we used Arduino Board where programmed is done by using Arduino ID Esoftware. Soil moisture sensor sense the level of moisture in the soil and temperature sensor which sense temperature of soil. The motor/water pump supplies water to the plants. The Arduino Uno can be powered via an external power supply which can come either from an AC-to-DC adapter or battery and use USB connection. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.
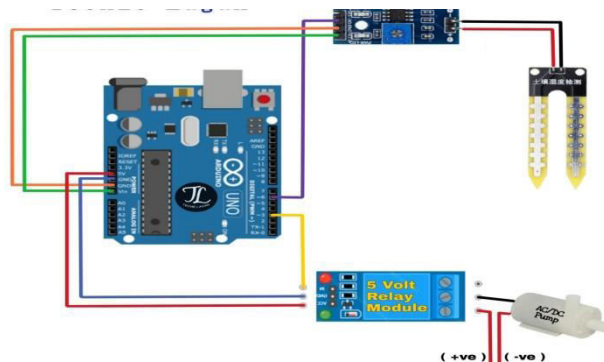
Circuit Diagram:

Fig 5. Circuit diagram of automatic watering system

The complete circuit diagram for the Arduino Automatic Plant watering system is shown below: Arduino Automatic Irrigation System Circuit Diagram In this section, I will explain all the details with the help of the schematic diagram. The Arduino UNO is the brain of this whole project. It controls the motor pump according to the moisture in the soil which is given by the moisture sensor. To power the circuit, I am using an external Battery. You can use any 9v or 12-volt battery. The battery is connected to the Vin and ground pins of Arduino and we can also connect the motor to this battery via a relay. Moisture sensor output is connected to the analog pin of Arduino. Do remember to use the Arduino's 5volt pin to power the sensor and relay module An automatic plant watering system using Arduino microcontroller UNO R3 is programmedsuchthat it gives the interrupt signals to the motor via the motor driver module. Soil sensor isconnected to the A0 pin to the Arduino board which senses the moisture content present in the soil. Whenever the soil moisture content values goes down, the sensor senses the humidity change, giving signal to the microcontroller so that the pump (motor) can be activated. Thisconcept can be used for automatic plant watering system. The circuit comprises an Arduino UNO board, a soil moisture sensor, a 5V motor pump, motor driver IC to run

the water pump. Arduino board uses a 5V to 9V wall wart or plug in adaptor or solar panel. You need a separate5V to 9v battery for the pump motor. The LCD display is connecter to Arduino and it displays the moisture level. When the moisture of soil goes below a threshold value, the microcontroller switch ON the water pump for a certain time set by program.

Write the program using Arduino IDE

The user have had the Arduino IDE software to write the program. Arduino UNO board is connected to the computer using the USB cable. And then, double-click the Arduino application, and then write the program.
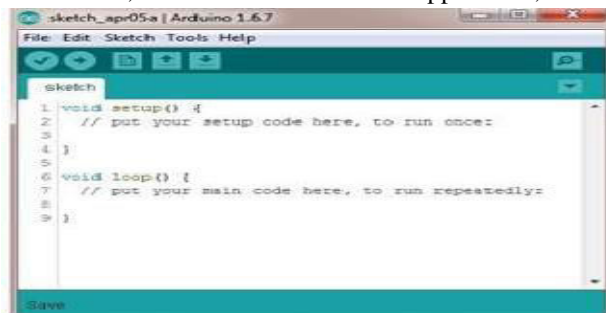

Fig 5. Start creating screen of arduino program

This program uses the functions pin Mode (), digital Write(), and delay(), which are provided bythe internal libraries included in the IDE environment. The user can select the suitable board in the tools bar
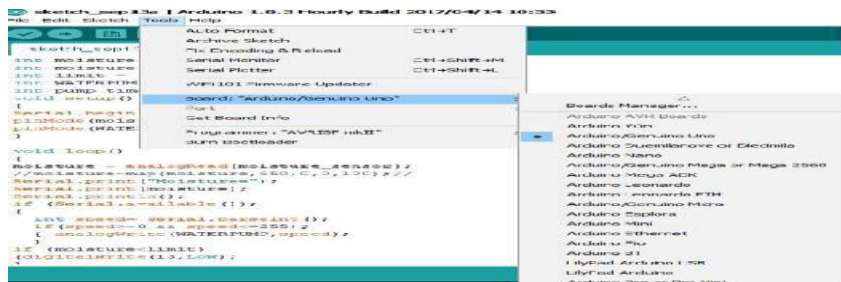

Fig 6. Select the board

And then, select the serial/COM port that Arduino is attached to: Tools > Port > COM 3
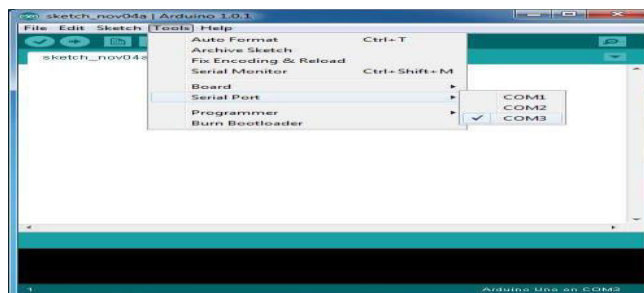

.

Fig 7. Select the serial port

If the users selected the serial port, the users can write the coding for the process. Now, simply click the "Upload" button in the environment. Wait a few seconds – the users should see the RX and TX leds on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar.

Fig 8. Upload the program

COADING:

```
int water; //random
variablevoid setup() {
  pinMode(3,OUTPUT); //output pin for relay board, this will sent signal to the
  relaypinMode(6,INPUT); //input pin coming from soil sensor
}

void loop() {
  water = digitalRead(6); // reading the coming signal from the soil sensor
  if(water == HIGH) // if water level is full then cut the relay
  {
  digitalWrite(3,LOW); // low is to cut the relay
  }
  else
  {
  digitalWrite(3,HIGH); //high to continue proving signal and water supply
  }
  delay(400);
}
```

IV. CONCLUSION

It was observed that the proposed methodology controls the moisture content of the soil of cultivated land or a home-grown plant in a pot. The soil moisture sensor senses the moisturelevel of the soil and the moment it senses low moisture level it sends signal and the water pumpis automatically switched on to supply water and the supply cuts off once the soil regains its moisture level. Further modification in the system can make it useful for large gardens and agricultural land thus helping human to solve the watering problems as well avoid wastage of themost precious water resource

V. FUTURE SCOPE

This automated watering system can be adjusted and Modified according to the changing environment. It is simple To operate it starts by designing the map of your garden and Marking the location of planting. However, this is the Beginning stage of the project and plenty of future work can be implemented. The advanced system will have power Optimization and the ability to provide real time updates About the watering process and the amount of

water Consumed to the user via message or email. An app can be Developed which will help in monitoring the entire process.

VI. RESULT

Thus the "ARDUINO BASED AUTOMATIC PLANT WATERING SYSTEM" has been
designed and tested successfully. It has been developed by integrated features of all the hardware components used. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Thus, the Arduino Based Automatic Plant Watering System has been designed and tested successfully. The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to respective plant using the Rotating Platform/Sprinkler. When the desiredmoisture level is reached, the system halts on its own and the Water Pump is turned OFF. Thus ,the functionality of the entire system has been tested thoroughly and it is said to function successfully.

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