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AUTOMATED IRRIGATION SYSTEM BASED ON SOIL MOISTURE USING ARDUINO

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Abstract: In this project an automation of farm irrigation and soil moisture control by Arduino using soil moisture sensor and L293D module. This automatic irrigation system senses the moisture content of the soil and automatically switches the pump when the power is on. A proper usage of irrigation system is very necessary because the main reason is the shortage of land reserved water due to lack of rain, spontaneous use of water as a result large amounts of water goes waste. For this reason, we use this automatic plant watering and soil moisture monitoring system and this system is very useful in all climatic conditions.
India is the agriculture based country. Our most of peoples are completely depended on the agricultural harvesting. Agriculture is a source of employment of majority Indians and has great impact on the economy of the country. In dry areas or in case of lacking rainfall, irrigation becomes difficult. So, it needs to be automated for proper watering a plant and handled remotely by farmer. When soil goes dry pump will start watering. The aim of the implementation is to reduce water use and automatic irrigation can be used for save time and low power monitor device.
The aim of the implementation this project was to demonstrate that the automatic plant irrigation can be used to reduce water use, and save your time.

Keyword's: Automatic Watering System, ArduinoI. board, sensors, relay, motor, Internet of things

1. Introduction

The main aim of this project was to provide water to the plants or gardening automatically using microcontroller (Arduino Uno). We can automatically watering the plants when we are going on vacation or don't we have to bother my neighbors, Sometimes the neighbors do too much of watering and the plants end up dying anyway. There are timer based devices available in India which waters the soil on set interval. They do not sense the soil moisture and the ambient temperature to know if the soil actually needs watering or not. Assimilation is that the artificial application of water to the land or soil It is used to assist in the growing of agricultural crops [3], maintenance of landscapes, and re vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. When a zone comes on, the water flows through the lateral lines and ultimately finally ends up at the irrigation electrode (drip) or mechanical device heads. Several sprinklers have pipe thread inlets on the lowest of them that permits a fitting and also the pipe to be connected to them. The sprinklers are usually used in the top of the head flush with the ground surface [9]. As the method of dripping will reduce huge water losses it became a popular method by reducing the labor cost and increasing the yields. When the components are activated, all the components will read and gives the output signal to the controller, and the information will be displayed to the user (farmer). The sensor readings are analog in nature so the ADC pin in the controller will convert the analog signals into digital format [8]. Then the controller will access information and when the motors are turned On/Off it will be displayed on the LCD Panel, and serial monitor windows [10]. There are many systems are available to water savings in various crops, from basic ones to more technologically advanced ones. For instance, in one system plant watering status was monitored and irrigation scheduled based on temperature presents in soil content of the plant.

2. Working

An automatic plant watering system using Arduino microcontroller UNO R3 is programmed such that it gives the interrupt signals to the motor via the motor driver module. Soil sensor is connected 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. This concept can be used for automatic plant watering system. The circuit comprises an Arduino UNO board, a soil moisture sensor, a 5V motor pump, a Motor driver L293D (IC1), motor driver IC to run the water pump. You can power the Arduino board using a 5V to 9V wall wart or plug-in adaptor or solar panel. You need a separate 5V to 9v battery for the pump motor.

3. Block Diagram

There are two functional components in this project. They are the moisture sensors module and the motor driver for motor pump. Thus the Arduino Board is programmed using the Arduino IDE software. The function of the moisture sensor is to sense the temperature content present in the soil, and also it measure moisture level in the soil. The motor driver interrupts the signal to, water pump supplies water to the plants. This project uses microcontroller Arduino Uno board to controls the motor and monitor soil moisture. Follow the schematic to connect the Arduino to the motor driver, and the driver to the water pump. The motor can be driven by a 5 volt battery, we can also supplies power from external source or from Arduino board. The Arduino Board is programmed using the Arduino IDE software.

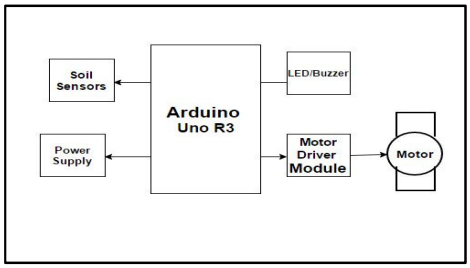

Figure 1. Block diagram

4. Componet & Requirment

4.1 Arduino

In figure 2 it is showing an Arduino board is an open source platform used for building electronics projects. Arduino is a programmable circuit's board which we can write a program based on your projects. Arduino program will be uploading with IDE (Integrated Development Environment) software that runs on your computer, it is used to write and upload computer code to the Arduino physical board. Arduino language is merely a set of C/C++ functions that can be called from your code.

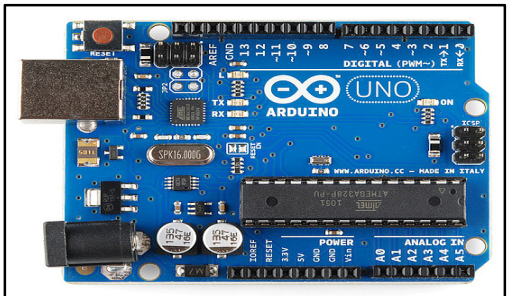

Figure 2. Arduino Uno R3 board

4.2 Relay

In figure 3, shows are a relay is an electrically operated switch. Several relays use a magnet to automatically operate a switch, however alternative in operation principles are used, like solid state relays. Relays are used wherever it's necessary to regulate a circuit by a separate low-power signal, or wherever many circuits should be controlled by one signal. The essential relays were handling in long distance communicate circuits as amplifiers, they unbroken the signal coming back in from one circuit and re-transmitted it on another circuit.

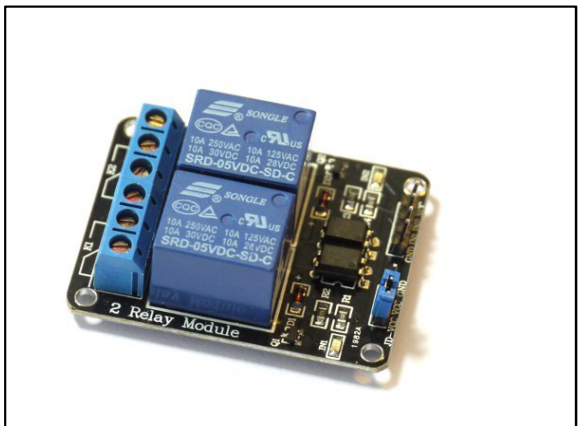

Figure 3. Relay

4.3 Soil Sensor

In figure 4, Soil moisture sensors measure the humidity of water content in soil. Since the direct hydrometric measuring of free soil wetness needs removing, drying, and coefficient of a sample, soil wetness sensors live the meter water content indirectly by victimization another property of the soil, like electrical phenomenon, nonconductor constant, or interaction with neutrons, as a proxy for the wetness content[6].

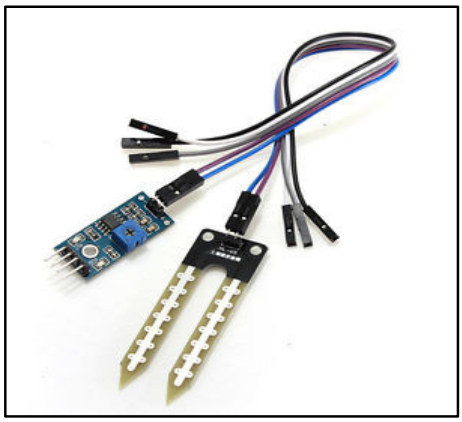

Figure 4. Soil moisture sensor

4.4 Motor Driver L293D

In figure: 4, L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that we can control more than two DC motor with a single L293D IC at same time.

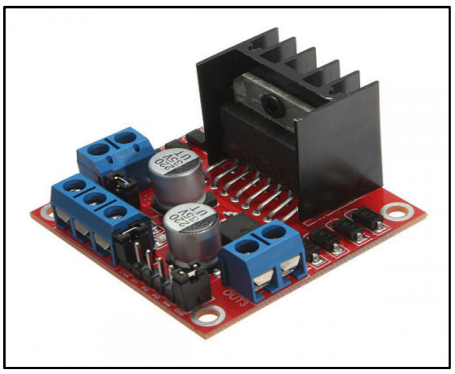

Figure 5. Motor driver module

4.5 Motor 5V

An AC motor is an electrical motor driven by Associate in alternating current (AC). In figure: 5, The AC motor normally consists of two basic components, an outdoor stationary stator coil having coils furnished with AC to supply a rotating flux, and an indoor rotor connected to the output shaft manufacturing a second rotating flux. The rotor flux could also be made by permanent magnets, reluctance striking, or DC or AC electrical windings.

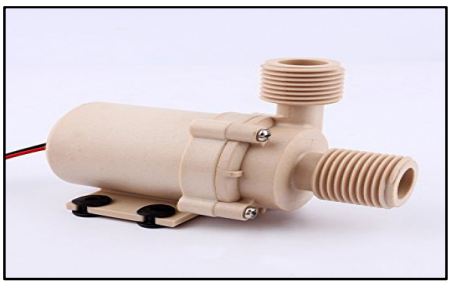

Figure 6: Motor pump

4.6 Transistor

The 2N2222 may be a common NPN bipolar semiconductor device; bipolar junction transistors (BJT) used for general purpose low-power amplifying or switch applications. It is designed for low to medium current, low amplifying current, low power, medium voltage, and might operate at moderately high speeds. It had been originally created within the TO-18 metal.

II.

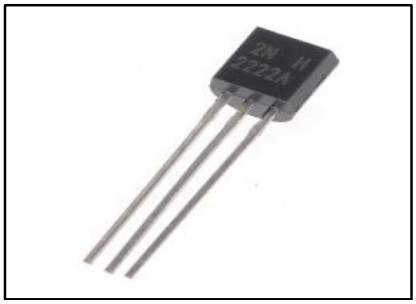

Figure 7. Transistors

4.7 Resistor

Here in figure 7, it is an electrical device may be a passive two-terminal electrical part that implements resistance as a circuit component. In electronic circuits, resistors unit of measurement accustomed reduce current flow, alter signal levels, to divide voltages, bias active components, and terminate transmission lines, among completely different uses.

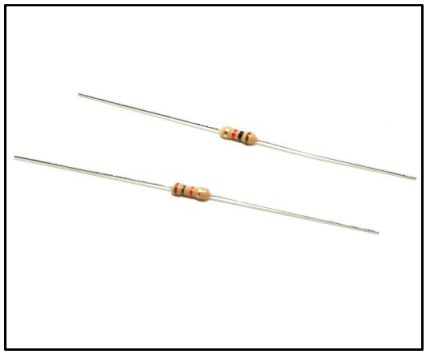

Figure 8. Resistors

4.8 Pipe

Here it is used as a water channel, and pipe has been used for watering plant.

4.9 Circuit Diagram

Here In this figure: 7 soil moisture sensors are connected to Arduino A0 pin for analog input, so we can get temperature content present in soil. Vcc pin is connected through 5V Arduino pin; GND pin is representing ground to connect all components. D7 is known as a digital pin, so it connected with transistors to amplifying low power. Motor driver module VCC pin connected through D13 pin of Arduino board, based on temperature monitor it pass the current to the motor pump, D7 pin is used for Ground. We can write values as output. D7 connected through resistors 1k and same connection goes through transistors for low amplifying current. In transistor has three pin which we called as Emitter, base and collector.

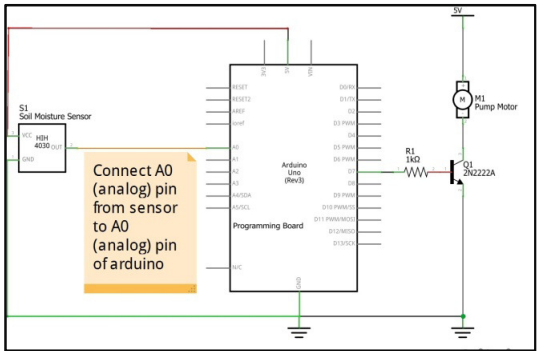

Figure 9. Architecture diagram

5. Conclusion

Thus the "Automated Irrigation system based on soil moisture using Arduino" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. In this figure 9 is showing pin diagram of project. 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 [5]. 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 goes to be below the desired and limited 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 desired moisture level is reached, the system halts on it's 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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