ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 4, Issue 10, October 2015

Design and Development of Indore Plant Monitoring System

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Abstract **- As Technology is developing there is opportunity to make work done by electronic applications. Arduino processor solves some issues. In this controlling water for plants is primary adage. The focal point is save the water; no labor obliged and save the time. If the owner of garden or plants wanted to go away from the home, then what happens to his/her garden? This task gives water supply consistently and naturally to the plants/cultivate how much water it requires. This method will take care of this issue by sensors and Arduino processor. Sensors are put inside the water pump, which will consistently screen the state of soil moisture and if water level is low it will send data to Arduino which set the sprinkler to ON and OFF. A model of controlling facilities is help millions of peoples. This model uses sensor technology with arduino to make smart switching device.**

Key words **- Arduino mega2560, Soil Moisture sensor, Water level sensor, 2Relay module, Water pump for aquarium, Buzzer, Resistors, LEDs, Arduino IDE software.**

I. INTRODUCTION

As technology growing there is always chance to reduce risk and human effort using electronic equipments. In this application, controlling water system for plants is main motto. Watering to the plant is most important task in daily green house operation. In watering system, knowing when and how much to water is required are important aspects of watering process. To make gardener work comfortably and easily, the automatic plant monitoring system is created.

The aim of project is save the water, no man power required and save the time. If the owner of the plant or garden wanted to go away from the home, then what it happen to garden or plant. This project provides water supply automatically and regularly to the plants when and how much of water it requires based on humidity content in soil.

This application will solve the problem using soil moisture sensor, water level sensor and water pump and Arduino mega 2560 [1]. Arduino programming is used for implementing this process. This paper has advantages as

- Gadget is in small in size.
- Low cost.
- Flexible design.
- Power consumption low.

II. LITERAATURE SURVEY

There are so many techniques are there providing watering to the plants.

1. Drip irrigation system is the most watering efficient technique in watering system. In this process, water slowly drops near the roots of plants. In this system, system is installed properly the system can steadily reduce the loss of water through evaporation and runoff.

In this system, a proper connection is required and maintained to work well, it may need professional help. High quality drip parts are high cost.

2. Sprinkler system is another one it is based on over head sprinkler, sprays, or guns, installed on risers.

When water pressure increases, then the sprinkler rise up which is popular system used in parks.

It has disadvantages that are hard to avoid over spray, uneven watering patterns, water loss from evaporation. And also some peoples are using micro controllers for automatic watering to the plants. It is expensive and required more effort.

III. PROPOSED METHOD

The proposed system is automatic watering to the plants using arduino with sensors. By using the proposed method, the problems are avoided easily in the existing method. The main aim of this project is to recognize moisture level in the soil and send the information to the arduino. If moisture is low then the arduino will turn on the motor and particular LED will glow then watering to the plant. If moisture level is high that is enough water to the plants then the arduino will turn off the motor [2]. The relay is used to turn on/off the motor and also protect the Arduino processor [3]. When the moisture level and water level will change that displayed on the LCD screen. When the moisture level and water level decreases in the tank then the buzzer will gives sound. For implementing this proposed system, the following equipments are required.

3.1 Hardware Requirements

1) Arduino Mega 2560.

2) Soil moisture sensor.

3) Water level sensor.

4) 20X4 LCD with I2C communication.

5) 4 – LED's (2-green, 1-red, 1-yellow)

6) 2Relay module

7) 4 – Resistors

8) Buzzer and power cables

3.2 Block Diagram

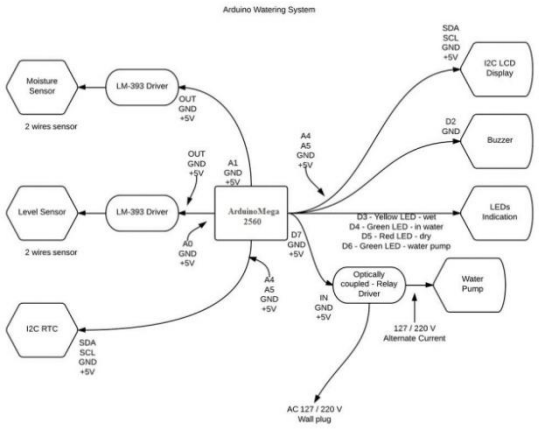

Fig.1 Block Diagram

The above figure 1 describes the block diagram of the proposed system. Arduino mega2560 has been chosen as the processing unit for this system because of user friendly feature and economical benefits. Further arduino code has been used for this system. The arduino code should be uploaded into the arduino microcontroller through USB cable which is used to interface the sensors and motor to the arduino microcontroller. The LCD display which can be used for the display. The proposed system introduces an essential application of watering to the plants that can be controlled through the sensors.

3.3 Hardware Implementation

The figure 2 shows the Arduino mega2560. It controls the all functions of sensors and motor. Sensors and motor works based on the processor instructions.

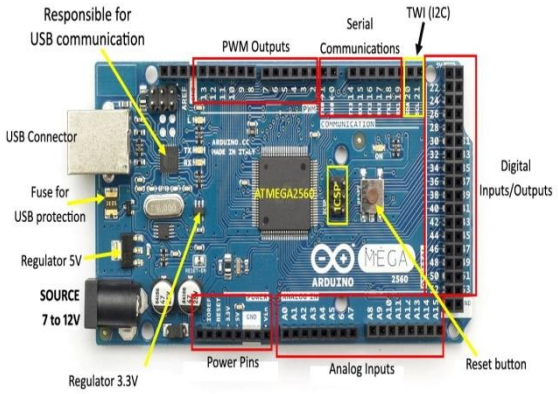

Fig. 2 Arduino Mega2560

Arduino Mega2560 is a type of micro controller board. It consists of a 54 input/output digital pins. In this system, 15 pins are used as PWM outputs, 16 pins are used as analog inputs, 4 pins are hardware serial ports that is UARTs, a USB connection, a 16MHz crystal oscillator, an ICSP header, reset button and the power jack . It consist of everything whatever needed to support the micro controller; this Arduino processor simply connect to a computer with USB cable or power with a battery or DC to AC adapter to get started.

3.4 Soil Moisture Sensor

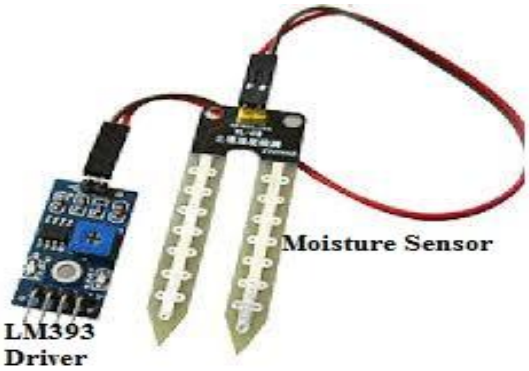

Fig. 3 Soil Moisture Sensor

Figure 3 represents soil moisture sensor. The soil moisture sensor is a device it is used to identify the moisture level in the soil. This sensor uses a capacitance to identify the dielectric permittivity of the soil. In the soil, dielectric permittivity is a function of water content in the soil. The moisture sensor provides the voltage proportional to the dielectric permittivity of the soil and the how much of water content in the soil.

Data of the Soil Moisture Sensor:

When the water level is low that is soil is dry, then the impedance will be high and the LM393 will high value at the output. When the soil is wet, it will show the low value at the output. The pins are described in table 1.

The 3 LEDs range can be defined as

Soggy soil- moisture between 0 and 500

Wet soil- moisture between 500 and 800

Dry soil- moisture between 800 and 1023

Table 1: Pin Description of the Soil Moisture Sensor

Pins	Definition
GND	GND
V_{CC}	5V
A_0	Analog output interface
D_0	Digital output (0 & 1)

3.5 Water Level Sensor

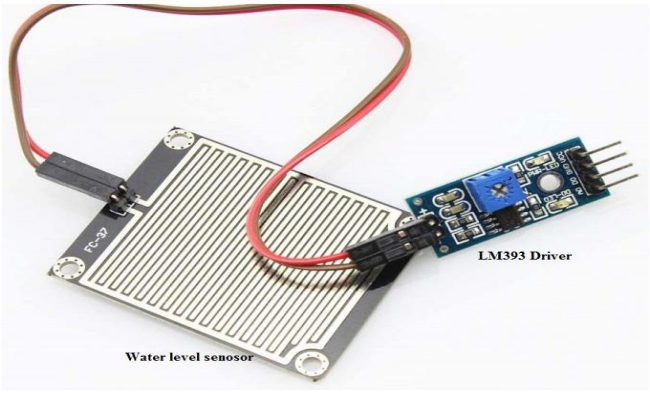

Fig. 4 Water Level Sensor

This sensor must be made on a phenolite board as shown in figure 4, with spacing of 1 mm between trails and trails with 1 mm thickness.

This water level sensor consist a series of traces. This sensor works by having a series of exposed traces connected to ground and interlaced between the grounded traces are the sense traces. This sensor board has 5.0 cm X 4.0 cm. There is an on board potentiometer to adjust the sensitivity and get the amount of water induced contact between the sensor traces and the ground. The comparator LM393, user can get both analog and digital signal. It will send the information to the Arduino processor. Table 2 represents pin description of the water level sensor.

Table 2: Water Level Sensor Pin Description

Pins	Definition
GND	GND
Vcc	5V
A0	Analog output interface
D0	Digital output (0 & 1)

3.6 LCD Display with I2c Communication

Fig. 5 LCD Display with I2c

Figure 5 depicts LCD Display with I2c. For using this type of LCD display directly by Arduino processor, 6 pins are required to connect: RS, EN, D4, D5, D6 and D7 to talk the LCD. For simple project, the usages of pins are reduced in normal LCD shield. For this system, the I2C interface LCD module is used, by using this module the system required only two lines to display the data of the moisture and water level. There are only 4pins on 12C bus that is

VCC: 5V

GND: GND

SDA: Analog pin 4

SCL: Analog pin 5

3.7 2Relay Module and the Motor

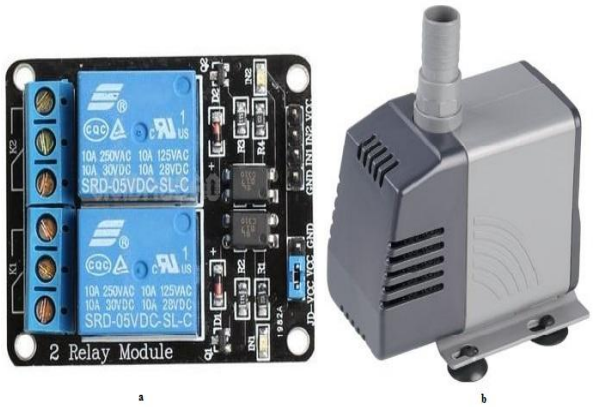

Fig. 6 a. 2Relay Module b. Motor

Arduino controls high power devices like lights, motor, pumps, doors, many more is one of the most interesting and useful applications. But, it can be little difficult and possibly dangerous when power line voltages are being controlled. There is significant different in controlling AC power compare to DC. 2Relay Module and Motor are represented in figure 6.

To reduce these problems, 2relay module is used to switch the motor. Now, there is small LED blinking on and off the same as the LED on arduino. And the system can listen relay clicking on & off.

3.8 Power Supply

Arduino mega2560 can be powered through the external power cable or with USB connection. The external power (without USB) can come either from AC to DC adapter or battery. This adapter power cable can be connected through plugging a 2.1 mm centre positive plug to the power jack board. The power source is selected by automatically. Battery pins can be connected to the GND and Vcc pins of the power cable. The Arduino board can operate on only an external power supply in the range between 6 to 20 volts. If the power supply is below the 7V, then the Arduino board may not get the stable state. May be the supply power using above the 12V, then the voltage regulator may get more heat and the Arduino board may get the damage. So for this recommended Arduino voltage range is 1 to 12 volts.

IV SOFTWARE IMPLEMENTATION

Software implementation of this project work uses arduino software. The programming code is developed on arduino software, which supports the arduino package. Firstly, the integer variables are initialized, that controls the input and output pins of the sensor. Here, the pins variables are declared that will be used for communication with all devices.

V CIRCUIT DIAGRAM

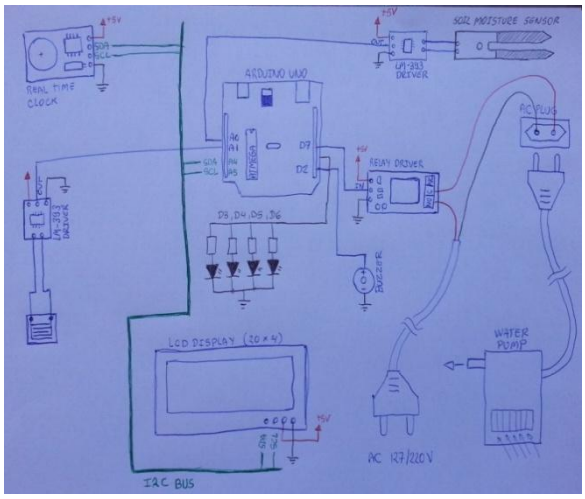

Fig. 7 Circuit Diagram

The figure 7 represents the physical connection of the proposed system.

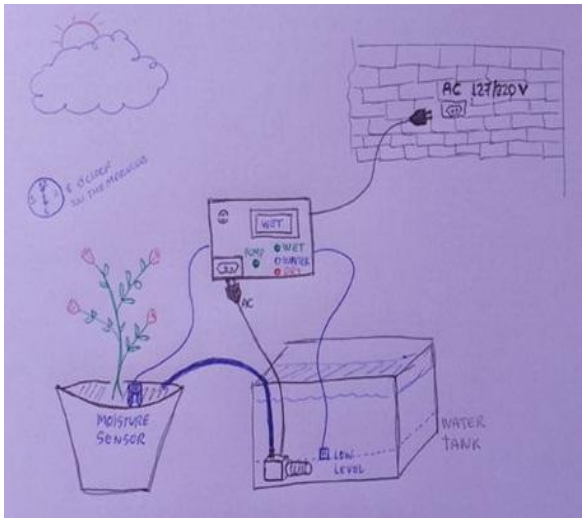

Fig. 8 Automatic Watering To the Plant

In figure 8, the soil moisture sensor will detect the water content in the plant. If water level decreases then resistance value is high. That identify the moisture sensor and information sends to the arduino. Then the arduino will turn ON/OFF the motor.

VI RESULT & DISCUSSION

There are lots of disadvantages in existing methods that are hard to avoid over spray, uneven watering patterns, water loss from evaporation and more expensive. In proposed system is automatic watering to the plants using arduino with sensors. By using this method, the problems are avoided easily in the existing method. The main aim of this project is to recognize moisture level in the soil and send the information to the arduino. If moisture is low then the arduino will turn on the motor and particular LED will glow then watering to the plant. If moisture level is high that is enough water to the plants then the arduino will turn off the motor [2]. The relay is used to turn on/off the motor and also protect the Arduino processor [3]. When the moisture level and water level will change that displayed on the LCD screen. When the moisture level and water level decreases in the tank then the buzzer will gives sound.

VII CONCLUSION

In this project, Indore plant monitoring system designed and developed using Arduino mega2560 with moisture and water level sensor. In previous, they are using different techniques for providing automatic watering to the plants. In this system, a method is designed to make easily provide the automatic watering to the plants. The gadgets work without the necessity of pc if once programmed and also it is portable, less expensive. Finally, the conclusion is a system for automatic water supply using humidity has designed and developed in a simple way.

VIII ACKNOLEDGEMENT

We extend my sincere thanks to Dr. A R Reddy, Head of ECE department and MITS Management for providing necessary facilities to carry out this work.

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