

ADVANCE IRRIGATION SYSTEM

Shoaib Mazid Khan¹, Shubham Srivastav¹, Sunny Kushawah¹, Uday Pratap Singh¹

¹*Student, Dept. Of Electronics and Communication Engineering, IMSEC, Uttar Pradesh, India*

- **Abstract** –The purpose of this paper is to deliver us with a comprehensive study of a system that uses technology that would be a preeminent way of watering garden and Agriculture fields. In today's world one of the prevalent problem is water paucity and agriculture is water intensive .Advance irrigation system evaluate the prevalent moisture of the soil and start operating. This system refers to the operation with no or just a minimum of manual involvement making irrigation less labour intensive. This system has been programmed with the help of microcontroller in a way such that when the system goes ON, it gives the output information to the controller, and the information can be store in a database and it can be send to the owner with the help of GSM Module, Then the owner(farmer) can access information and use it to turn the motors on and off and at the time of rain too motor turn themselves OFF with the help of Rain Sensor. Over and above, high-tech designs make the system very efficient i.e. making the system much more efficient in terms of saving water and growing Crops. An Internet Based Monitoring System using server can be used. The useful information can be access by the owner for making decision related to his field no matter in which part of world he would be in.
- **Key Words:** Soil Moisture Sensors , Rain sensor , Atmega328 , Relay , Irrigation system , Watering system

1. INTRODUCTION

Agriculture is a water intensive process, therefore crop production needs a plenty of water. which creates need of a system that on one hand saves water and on the other is suitable to produce high yield simultaneously . Almost every electronic component can be programmed and work independent of the human intervention. By putting our knowledge in controller we gave it ability to take decision on our behalf. One of the important thing that should be kept in mind during working with such

controller is that they are hypersensitive because They work on 5 volt and Our household supply is 240 volts. Large voltage can burn the controller shut down the system. So an efficient interfacing required between controller and the water motor. This system makes crop production much easier and.This project uses a microcontroller, which commands the water pump and there are also soil-moisture sensors, which sense the moisture in the field. A rain sensor is been employed to spot rain and make the decision accordingly. If the farmer is at distant from his agricultural field he will be having a notion of current conditions. Thus, it saves farmer's effort, water, time and his Agriculture.

In this paper we discussed various research and development that has been done in Advance Irrigation System

2. SYSTEM DISCRIPTION AND ARCHITECTURE

2.1 ARDUINO

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. We can tell board what to do by sending a set of instructions to the microcontroller on the board. To do so we use the Arduino programming language (based on wiring), and the Arduino Software (IDE), based on Processing.



Fig -1: Arduino Board

2.1.1 SPECIFICATIONS

FEATURE	SPECIFICATION
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

2.2 RAIN SENSOR

The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and it can also be used for measuring rainfall intensity. The module features, a rain board and the control board that is separate provides much more convenience with a power indicator LED and an adjustable sensitivity though a potentiometer.



Fig -2: Rain Sensor

2.2.1 SPECIFICATIONS

- Adopts high quality of RF-04 double sided material.
- Area: 5cm x 4cm nickel plate on side,
- Anti-oxidation, anti-conductivity, with long use time
- Comparator output signal clean waveform is good, driving ability, over 15mA
- Potentiometer adjust the sensitivity

- Working voltage 5V
- Output format: Digital switching output (0 and 1) and analog voltage output AO
- With bolt holes for easy installation
- Small board PCB size: 3.2cm x 1.4cm
- Uses a wide voltage LM393 comparator

2.3 SOIL MOISTURE SENSOR

Soil moisture sensor measures the volumetric water content in soil. The basic technique for measuring soil water content is the gravimetric method. It is the standard with which all other methods are compared. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting 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 neutron as a proxy for the moisture content.

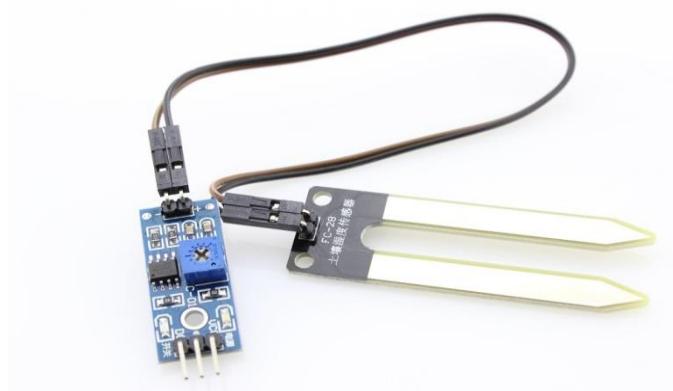


Fig -3: Soil Moisture sensor

2.4 LCD PANEL

It consists of 16 rows and 2 columns of 5x7 or 5x8 LCD dot matrices. The module talking about here is type number JHD162A which is a very popular one. It is available in a 16 pin package with back light, contrast adjustment function and each dot matrix has 5x8 dot resolution

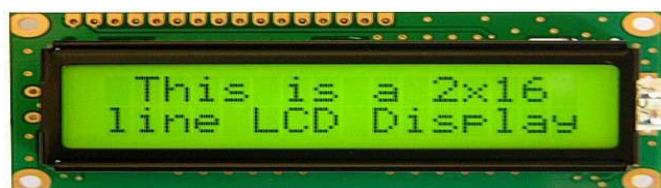


Fig -3: LCD

2.5 WATER PUMP

The water pump is used to artificially supply water for a particular task. It can be electronically controlled by interfacing it to a microcontroller. It can be triggered ON/OFF by sending signals as required. The process of artificially supplying water is known as pumping. There are many varieties of water pumps used. This project employs the use of a small water pump which is connected to a H-Bridge.



Fig -5: Water Pump

2.6 Motor Driver

Because of very low current requirement, these motors can easily operate with small batteries and solar panels. Quiet and smooth operation of this motor makes it a perfect choice for indoor and long hours of operation. Direction of rotation: Counter-Clockwise when viewing from the output shaft end with positive voltage applied to positive terminal.



Fig -6 Motor Driver

3. METHODOLOGY

The system conducts the process of irrigation management. This is done with the help of sensor which study the moisture content of soil and then the sensed readings are compared with available reading stored in microcontroller. It is compared with two set of values taken during the testing period and controller will perform action after comparing them and do as instructed. When the moisture reading goes down to the lower limit the system turn ON the pump in order to start irrigation and it will continue to do so until the moisture level reaches the upper limit set in the controller .Irrigation process will stop at the upper limit and starts again only when it reaches its lower value. That's how it saves the water and kept the soil moisture under optimum level in order to get high yield.

4. INTERFACING

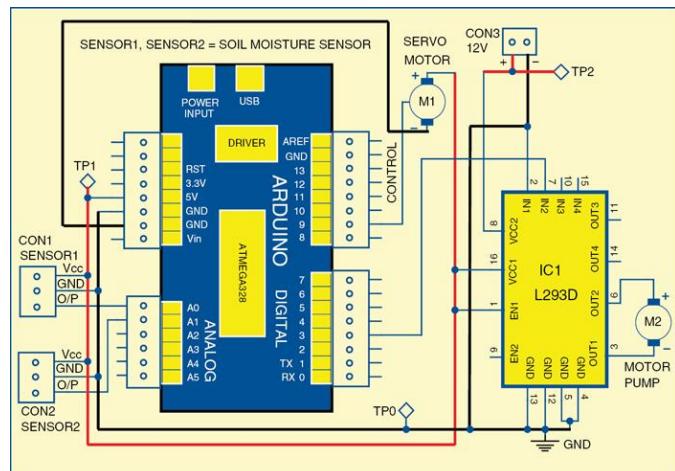


Fig -7: Interfacing of the component

5. Results

The Advanced irrigation system was tested on a plant. The daily water needed by the plant is approximately 580-770mm and the temperature demand of the soil ranges from 50°C-90°C. In the programming code, the moisture and temperature range were set (which convert the resistance into a digital signal). Moreover the system is very much affordable and very well efficient in reducing water wastage.

Automated irrigation system is completely checked. The reliability of the system is checked by running trial on different conditions. The system is successfully capable of

watering the plants at the time of need. Controller sense the situation when the soil is dry and operates the pump accordingly after irrigating the field it will turn itself OFF.

6. Advantages

The main application of this project is to provide a less labor and less water intensive irrigation and saving time and money of the farmer or gardener. This system can be used to create self irrigating gardens and self irrigated farmlands. By using different water saving method like rain water harvesting million gallons of water can be saved. Parts of the world where rainfall is very low this system could be a boon for the irrigation there.

7. Future Scope

The capabilities of the project can be further boosted by boosting controller's operating speed, memory capacity, and instruction cycle. More number of sensors can be interfaced in order to get desired number of channels. For the further improvement data logger can be implemented on the system and graphical LCD can also be employed in order to get the output on the screen. By using the concept of IOT, the system can go online which enables the user to collect data related to field or alarming when certain parameter goes down. Performance of the system can further enhance by giving the power to the project through a battery and by least usage of the main power.

8. Conclusion

There are some imperfections which need to be improved in the upcoming time. A system needs to be implemented which can handle complexity easily and give precise results. As the cost of electronics software and hardware is decreasing continuously. It can be used to increase the quality and quantity of the Crop and saving a lot of water by efficiently using the system. Further improvements can be made as better sensor which are specially made for irrigation purpose are employed in Crop production.

ACKNOWLEDGEMENT

We would like to show our gratitude to the whole Electronics & Communication department of IMSEC for sharing their pearl of wisdom with us during the course of this Research. We would also like to thank Prof. R.P.S

Chauhan who provided insight and expertise that greatly assisted the research

REFERENCES

- [1] Fang Meier, D.D., Garrote, D.J., Mansion, F. and S.H. Human.1990. Automated Irrigation Systems Using Plant and Soil Sensors
- [2] Google Images
- [3] <https://www.arduino.cc/en/uploads/Hacking/Arduino-To-Atmega8->
- [4] Wikipedia
- [5] [https://en.wikipedia.org/wiki/Dual-tone multi-frequency signaling](https://en.wikipedia.org/wiki/Dual-tone_multi-frequency_signaling)
- [6] "Biography". Majid Majidi. Retrieved 30 January 2017.
- [7] http://www.tehrantimes.com/Index_view.asp?code=206295
- [8] Decagon Devices "[List of peer-reviewed publications using Decagon soil moisture sensors](#)
- [9] [Tanzania water blog](#) - example of grass roots researcher telling about his study and work with the rope pump in Africa.