ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

A NOVEL SMART IRRIGATION SYSTEM FOR AGRICULTURAL LANDS

M.Pradeep[1], E.Pon Esakki Muthu[2], Ayyappa srinivasan M G[3]
[1,2]U.G.Scholors, St.Mother Theresa Engineering College,Vagaikulam,Thoothukudi
[3]Assistant Professor, St.Mother Theresa engineering College, Vagaikulam,Thoothukudi

ABSTRACT
In the present day Scenario farmers are manually irrigating their lands. They feel it difficult to irrigate their lands at their convenience.It will be good, if there is a system by which one can automatically irrigate their lands. In this work, an Arduino based smart irrigation system has been proposed.A soil moisture sensor senses the moisture content of the soil .Based on the moisture content in the soil sensed by it,the Arduino system will tur on and Off the motor for irrigating their land. As the system is more automatic in nature, the farmers can do remaining agricultural work at their convenience.The prosed system has been developed as a prototype and tested for irrigation.The results were found to be satisfactory.

KEY WORDS: ***Arduino,Smart Irrigation,soil moisture sensor***

1. INTRODUCTION

V.N.Rajendranath et al implemented a VH400 sensor interfaced with micro controller based system , in which ordinary micro controller unit was used for automatic irrigation[1].Also, they made a provision to send SMS to the land owner about the irrigation details based on SIM900A module.S.rathika et al made a complete review of all automatic irrigation systems available in and around the world[2].Vijendra babu et al proposed a system with remote monitoring of irrigation system based on the amount of water spent on the soil during drtyness,but without auto switch on and off[3].

U.Igharkpata et al proposed a new wireless activation of pipeline walls based automatic irrigation system, wherein they used CADMAN mini traveller controlled by IoT based controller[4].Rashmi Jain et al used a wireless sensor with RF module for auto irrigating wherein they sent the data to a centralised server system and monitored the data completely[5].

Anusha et al.,proposed a GSM based automatic water irrigation system , by sensing the water content in the soil moisture sensor and transmitting the data through GPS to the mobile of the land owner, but the system only made manual ON and OFF of water flow[6].An android based moisture content based automatic water irrigation system was proposed with the data being transmitted to a centralised server using Zigbee method and also an automatic control of water irrigation throughGSM methodology was also implemented[7].R G Ghodake et al proposed a micro controller and GSM based automatic water irrigation system , in which they controlled the overflowing of water in the land being irrigated[8].

Pavithra et al propsed a new GSM based water irrigation system in which they used GSM technology for transmitting the data to the land owner whether or not the land is automatically irrigated, to maintain the land as if in the case of uniform environmental conditions[9].Darshana Chaware et al proposed a new a sensor based over irrigation avoiding over irrigation using micro controller[10].

In this work an soil moisture sensor and Arduino based automatic water irrigation system has been proposed .When the soil moisture is less or the land is dry, the system is automatically the Arduino Controller and the motor starts running to irrigate the system.When the land is completely irrigated, the soil moisture is full,then the soil moisture sensor gives signal to Arduino and the single channel relay cuts off the motor.Also, the information about whether the land is completely irrigated or not, is sent to the landlord to his mobile phone through android system.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

2. PROPOSED SYSTEM

Fig.1., shows block diagram of Proposed system

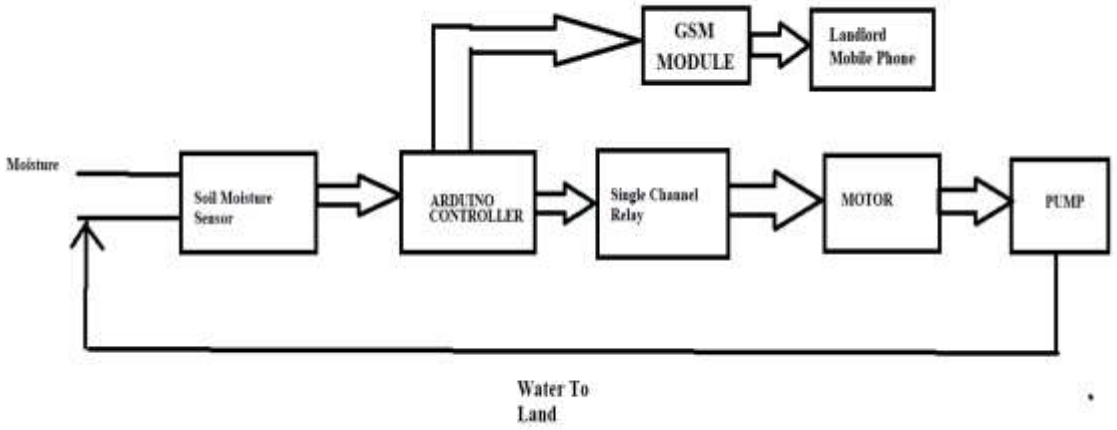

Fig1.Block diagram

The soil moisture sensor senses the moisture content of the soil..If the soil moisture is below certain level, or it is "dry",then, the output of sensor is an analog voltage.It is converted into digital signal by ADC.The Arduino controller has been coded to compare it with set reference.If it is less, then, it actuates the single channel relay.So, the motor starts to rotate and hence pump irrigates land.The land is thus being irrigated and moisture content increases.When moisture content is high, this level is also sensed by sensor.It gives signal in the form of analog voltage and it is converted again into digital signal by ADC.The atduino compares it with reference and the as the signal is higher than set reference, it cuts off the single channel relay.The motor stops.

3. COMPONENTS USED

The following are the components used in this work, which have been eleaborately discussed:

A.Soil Moisture Sensor:

In order to determine how much water is held in the soil horizon, soil moisture sensors monitor the water content of the soil. Water in the soil is not immediately measured by soil moisture sensors. Instead, they track changes in another soil characteristic that is predictably connected to water content. Each sensor company measures soil moisture content using a different technology. A soil sensor needs to make touch with the soil in order to function. When the soil sensor is completely encircled by soil and there are no gaps between the probe and the soil, the accuracy will be at its greatest. In this work, Gro point TDT5 type soil moisture sensors have been used. TDT calculates the amount of time it takes an electromagnetic wave to traverse a specific distance along a transmission line buried in the ground. The signal travels more slowly the more moisture there is around the probe. TDT sensors typically offer more accuracy and use less power than TDR sensors. The measurement's bandwidth is what gives the other edge over the other approaches. TDT is less prone to interference than other techniques like Frequency Domain Reflectance since it has a wider bandwidth.

B. ARDUINO Controller

Arduino is a hardware controller that runs on open-source software and has a lot of functions. One of the least expensive options for automation and control at a smaller scale is Arduino. The features of Arduino controllers are numerous:

(i).Inexpensive: One of the most affordable controllers for DIY projects and home automation is Arduino.

(ii).Cross Platform: Windows, Mac OS, and Linux are just a few of the platforms where the Arduino programming software is available.

(iii).Simple Programming Environment: The Arduino IDE's programming environment is fairly straightforward. The environment of the software was created with end users in mind and is user-friendly.

(iv).Extensible hardware: The Arduino's open-source hardware is small and lightweight. There are numerous models available, each with unique functionalities.

In this work, Arduino controller ATMega 328P has been used. It also includes additional parts to support the ATmega328P microprocessor, including a voltage regulator, serial connectivity, and crystal oscillator. The Arduino Uno comes with a USB connection, a Power barrel jack, an ICSP header, 6 analogue input pins, 14 digital input/output pins (of which 6 can be utilised as PWM outputs), and other features.

When programming an Arduino, the pinMode(), digitalRead(), and digitalWrite() functions can be used to control the 14 digital input/output pins as input or output pins. Each pin operates at 5V, has an inbuilt pull-up resistor of 20–50 KOhms that is by default unconnected, and may provide or receive a maximum of 40mA of current.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

Fig.2., SHOWS the Pin Fiagram

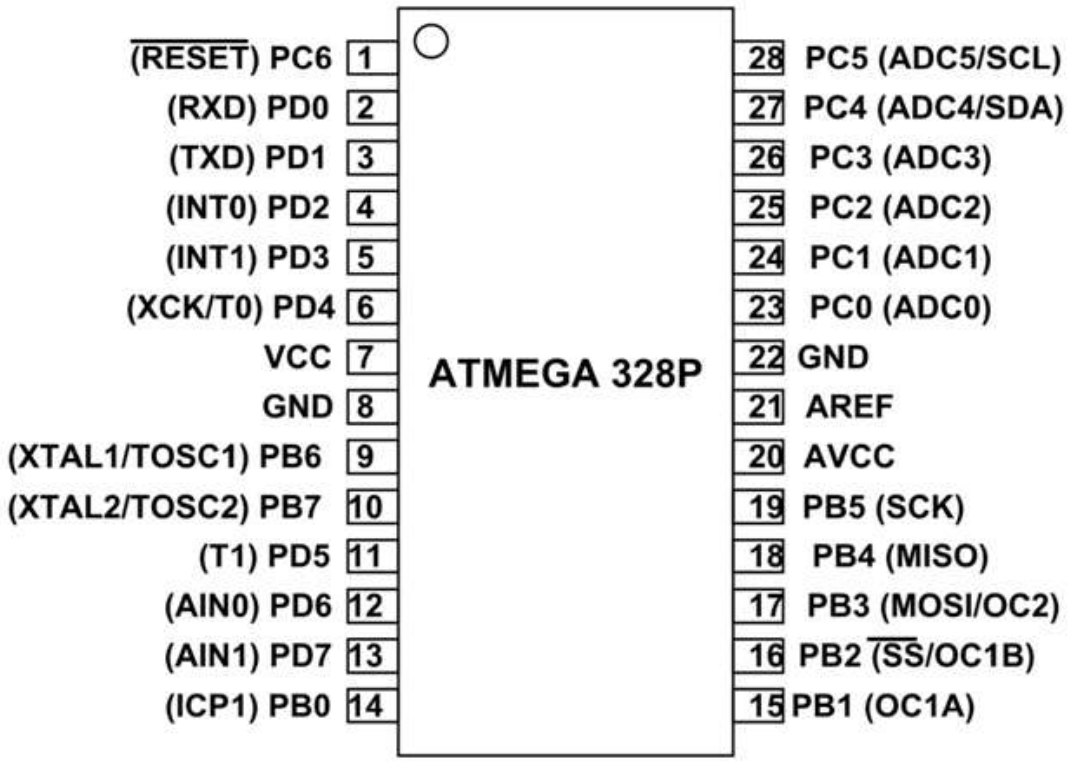

Fig.2.ATmega 328P Pin Diagram

C. Single Channel Relay

Single Channel relays are cost-effective, easily-connected modules.Further,they are perfect for DIY projects that call for switching small amounts of AC or DC power. An electromagnet resides at the centre of a relay (a wire coil that becomes a temporary magnet when electricity is passed through it). A relay can be compared to an electric lever; when it is turned on, it turns on one device with a relatively modest current and another with a considerably bigger current.

The NC, COM, and NO high voltage terminals on a relay link to the object being controlled. A relay normally has five pins. Depending on whether the device should remain normally on or off, the connection is made between the COM (common) terminal and either the NC (normally closed) or NO (normally open) terminal. An electromagnet coil (coils 1 and 2) is located between the two remaining pins.

The NC terminal and the NO terminal are normally open, and the COM terminal is connected to the NC terminal. The electromagnet becomes activated when electricity passes through the coil, which moves the switch's internal contact. After then, the COM disconnects from the NC terminal and connects to the NO terminal. The internal contact is put back in place when the coil's current stops flowing through it, re-connecting the NC terminal to the COM and re-opening the NO terminal.Fig.3., shows the photograph of single channel relay.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

Fig.3.Single Channel Relay

D.Motor

The motor used in pump sets is three phase induction motor. A 3-phase induction motor is an electromechanical energy converting machine that transforms 3-phase electrical input power into mechanical power at the output. A stator and a rotor make up a 3-phase induction motor. While the rotor has a short-circuited winding known as rotor winding, the stator carries a three-phase stator winding. The three-phase supply powers the stator winding. Through electromagnetic induction, the rotor winding receives its voltage and power from the stator winding, thus the name.

It is driving the pump.This pump is used to irrigate the land.

But, in this work a DC motor has been used to simulate the realtime one.

E.GSM Module

A modem belongs to the class of wireless modems that are created specifically for use with GSM and GPRS networks. Similar to mobile phones, it needs a SIM (Subscriber Identity Module) card to start communicating with the network. For identification, they also have IMEI (International Mobile Equipment Identity) numbers that are similar to those on cell phones.

1.For interaction with the processor or controller, which is done through serial transmission, the MODEM requires AT commands.

2.The processor/controller is the one whics transmits the commands.

3.When the MODEM gets a command, it responds with a result.

4.The processor, controller, or computer can send any of the AT commands that the MODEM supports in order to communicate with the GSM cellular networks.

In this work, a SIM 900A GSM module has been used.

The photograph of the same has been shown in fig.4.,

Fig.4.,SIM900A Module

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 1| January 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

4. HARDWARE PROTOTYPE

The hardware prototype of the work has been shown in fig.5.,

Fig.5.Hardware Prototype

The hardware proto type was fabricated with the above components but with the motor being DC motor.The proposed system worked well and completely filled the plant under consideration with fully water.Also, it automatically cut off the water, when the sample plant was completely irrigated.So, the proposed system works well as required.

5. CONCLUSION

Thus a novel Arduino and GSM based automatic water irrigation system has been proposed in this work.. It not only saves time of the farmers bu also saves their money due to energy consumption.Also, manual labour is also reduced.Hence, the benefits opf the work is manifold. Further works are going on to consider the temperature also as a parameter so as to consider the present day status of crops and intimate it to the farmers in order to take necessary steps.

REFERRENCES

1. *Udathu, Rajendranath & Hency, V.. (2015). Implementation of an automated irrigation system: Smart irrigation system . International Journal of Applied Engineering Research. 10. 16261-16265.*
2. *Selvaraj, Rathika & Ramesh, Thanakkan & Priyadharshini, V. & Prasanth, A. & Palanisamy, Shanmugapriya. (2020). Automation in Irrigation - A Review. International journal of Current Microbiology and Applied Sciences. 9. 2974-2990. 10.20546/ijcmas.2020.912.352.*
3. *D Vijendra Babu et al 2020 IOP Conf. Ser.: Mater. Sci. Eng. 993 012077*
4. *Ororomu Ighrakpata , Mohamed Chouikha , O'tega A. Ejofodomi,"AUTOMATION OF IRRIGATION SYSTEMS AND DESIGN OF AUTOMATED IRRIGATION SYSTEMS", International Journal Water Resources Management and Irrigation Engineering Research Vol 2, No.1, pp.11-27, September 2019*
5. *Rashmi Jain, Shaunak Kulkarni, Ahtesham Shaikh, Akash Sood. " AUTOMATIC IRRIGATION SYSTEM FOR AGRICULTURE FIELD USING WIRELESS SENSOR NETWORK (WSN)", Volume: 03 Issue: 04, International Research Journal of Engineering and Technology,2016*
6. *A. Anusha , D. Gouthami, " Wireless Network Based Automatic Irrigation System", International Advanced Research Journal in Science, Engineering and Technology, Vol. 3, Issue 7, July 2016*
7. *Nilesh Kuchekar, Rajendraprasad Pagare," DESIGN & IMPLEMENTATION OF AUTOMATIC IRRIGATION SYSTEM USING WIRELESS SENSOR NETWORK & ZIGBEE MODULE", International Journal of Innovation in Engineering, Research and Technology [IJIERT], ICITDCEME'15 Conference Proceedings,2015,pp1-8.*
8. *Rahul Ganpat Ghodake, A.O. Mulani, "Sensor Based Automatic Drip Irrigation System", Journal for Research, Volume 02, Issue 02, April 2016*
9. *Pavithra D. S , M. S .Srinath , " GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), Volume 11, Issue 4 Ver. I (Jul- Aug. 2014), PP 49-55*
10. *Ms. Darshana Chaware, Ashwini Raut, Ms. Mrunal Panse, Aniruddha Koparkar, "Sensor Based Automated Irrigation System", International Journal of Engineering Research & Technology (IJERT), Vol. 4 Issue 05, May-2015*