

MICROCONTROLLER BASED AUTOMATIC PLANT IRRIGATION SYSTEM

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Abstract- The main aim of this paper is to provide information about automatic irrigation to the plants which helps in saving money and water. The entire system is controlled using ATMEGA 328 microcontroller which is giving the interrupt signal to the motor. Temperature sensor and humidity sensor are connected to internal ports of micro controller via comparator, whenever there is a fluctuation in temperature and humidity of the environment these sensors senses the change in temperature and humidity and gives an interrupt signal to the micro-controller and thus the motor is activated, along with this buzzer is used to indicate that pump is on.

Key Words: Microcontroller, Temperature sensor, Humidity sensor, Soil Moisture sensor, Motor.

1. INTRODUCTION

Water shortage is one of the major problem in the world. Many different methods are incorporated for conservation of water. We need water in each and every field & is needed for every human beings, animals, plants, etc. Agriculture is one such field where water is required in high quantity. Wastage of water is a major problem in agriculture. Every time excess of water is given to the fields. A number of techniques are available to save or to control wastage of water from agriculture.

Ditch Irrigation: Ditch Irrigation is one of the old methodology, where ditches are dug out and seedlings are planted in horizontally aligned pattern. Water is made to move to different canals via siphon tubes.

Terraced Irrigation: In this process the land is cut into multiple steps and supported by keeping walls while the plain areas are used for plantation and the idea is that the water runs down each step watering each column. This led steep land to be used for multiple crops. This is a very labour involvement method of irrigation.

Drip Irrigation: The most water effective method of irrigation is the drip irrigation method. In this method, water is dropped near the root level of a plant in a slow steady motion. The loss of water through evaporation and

runoff can be decreased to a much high extent if the system is installed effectively.

Sprinkler System: This irrigation system is designed on overhead sprinklers fixed on permanent risers. The system is installed underground and the sprinklers level up when water pressure increases, which is a famous irrigation system for use on golf courses and parks.

Rotary Systems: This method can be used when irrigating area is large. In this method sprinklers can reach the area of up to 100 feet. In this method sprinklers move in circular direction covering larger areas. In this method small amount of water can irrigate large area of a field.

1.1 NEED OF AUTOMATIC IRRIGATION

Automatic irrigation system proves to be very helpful for those who travel. If designed and coded properly, automatic irrigation systems can be very cost effective and can do a lot of water conservation. Watering with a pipe or with oscillator wastes water and none of these method aim plant roots. Automatic irrigation systems can be designed in such a way which gives required amount of water in a targeted area, and which will also promotes water conservation.

2. LITERATURE REVIEW

In this paper, soil moisture sensor is placed in the root zone of plant/field. The sensor sends information and transmits the data to the microcontroller. An algorithm was developed to measure threshold value soil moisture sensor that was programmed into a microcontroller to monitor the humidity content of the soil.

This paper designs a model of automatic irrigation system which is based on microcontroller ATMEGA328. Temperature and soil moisture sensors are placed in the field. Sensors sense the moisture content of the soil and give the information to farmer through GSM Module. Farmer gets to know the status of the pump installed in the field via GSM Module without going into the field. When the moisture content reaches above the desired threshold

value the pump automatically turns off and the message is conveyed to the farmer.

3.SOFTWARE AND HARDWARE PLATFORM

3.1 Hardware Used:

Microcontroller ATMEGA328, Humidity/Temperature sensor(DHT11), Voltage regulator(7805), LCD display, LEDs, diode(IN4007), RC filter circuit, buzzers, potentiometer, oscillator, power supply.

3.2 Software Used:

Arduino (C Programming)

4. SYSTEM DESCRIPTION

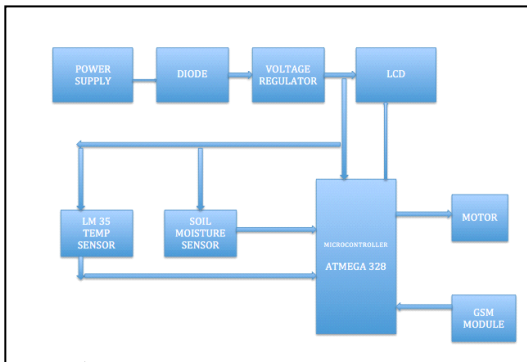


Figure-1: Block Diagram

- Humidity/Soil Moisture Sensor:**
 The humidity/soil moisture sensor just senses the humidity or the moisture of the soil. The change in humidity is proportional to the amount of current flowing through the soil.
- Diode (In4007):**
 It allows unidirectional flow of current/power supply to the system.
- Potentiometer:**
 It is used to control the contrast of the LCD display.
- Voltage Regulator Ic7805:**
 Voltage regulator IC converts fluctuating ac voltage in to constant dc voltage.
- Temperature Sensor (Lm 35):**
 LM35 sensor is used to record the atmospheric temperature which is then displayed on LCD.
- Microcontroller Atmega 328:**
 It is a single chip microcontroller. This 8 bit microcontroller has 32kB flash memory with read-write features. It has 32 general purpose working registers, and 3 flexible timer counters .It also has internal-external interrupts and serial

programmable USART. It has 28 pins out of which maximum 18 pins are used.

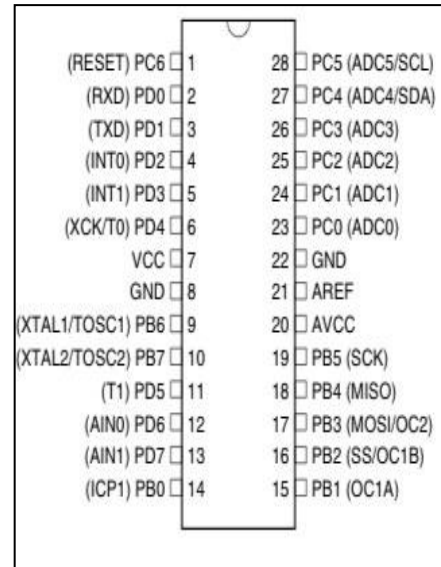


Figure-2: Pin Configuration of ATMEGA328

- Oscillator:**
 A 16MHz oscillator is used to provide constant non-fluctuating frequency to the microcontroller.
- Motor:**
 Motor is used to indicate the on/off state of pump when soil is wet/dry. It is controlled by microcontroller as programmed.
- LCD (16x2):**
 This is the first interfacing example for the Parallel Port. It is used to display the current statistic on the screen.
- Power Supply:**
 Power supply of 12V is used for running this hardware system.
- Reference Voltage:**
 It is the ideal defined voltage.
- GSM Module:**
 This system is connected to a communication device called "GSM Module". It can be connected to different devices such as modems, cellular phones or satellite terminal to activate the remote collection of recorded data or alarming of certain parameters. The connections between the two mobiles are done using GSM. When the soil moisture sensor senses the low moisture content of the soil, it gives a signal to the microcontroller. The microcontroller then gives a signal to the GSM

Module which further sends a message to the mobile.

5. PROPOSED WORK

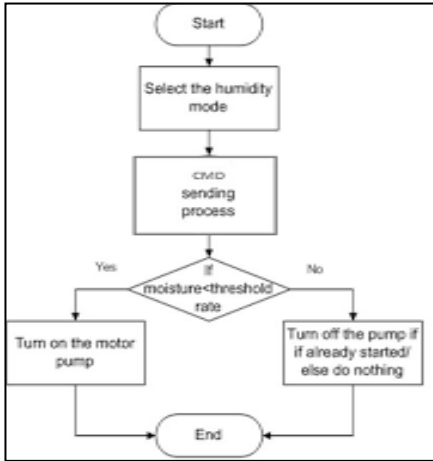


Figure-3: Flow Chart of the System

The project is designed to function as an automatic irrigation system which turns the pump/motor ON/OFF depending upon the humidity content of the soil. The project uses ATMEGA 328 microcontroller which is programmed to receive the input signal of varying moisture condition of the soil through the sensing arrangement. This is achieved by using an op-amp as comparator which acts as interface between the sensing arrangement and the microcontroller. An LCD display is also interfaced to the microcontroller to display status of the soil and water pump. The sensing arrangement is made by using two stiff metallic rods inserted into the field at a distance.

S.No.	Humidity (%)	Status Of Pump	Temperature (Degree Celcius)
1.	1	ON	28.84
2.	42	ON	23.46
3.	49	ON	27.86
4.	68	OFF	31.28
5.	85	OFF	26.82

Table-1: System Output

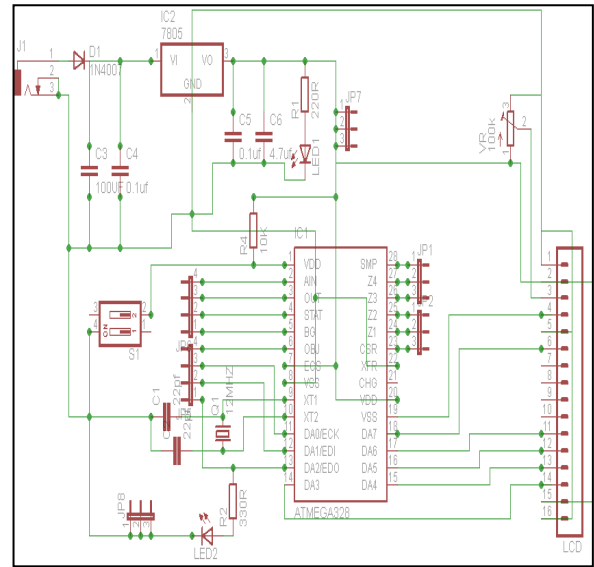


Figure-4: PCB Layout of the System

6. RESULTS AND DISCUSSIONS

The system used provides us with the readings of the temperature of the atmosphere along with the humidity content of the soil. These data are used to keep a track of the requirements if the field and to keep a check on the proper functioning of the system.

Automatic plant irrigation system is basically designed for the introduction of the embedded technology in irrigation sector. This system will help the farmers to reduce their work pressure. This system will be helpful for the farmers to save their precious time and can yields more crops. Certainly it will be helpful for the farmers in improving their economical condition. The automatic operational capability of this system requires the minimum quantity of water for the irrigation work and extends its contribution

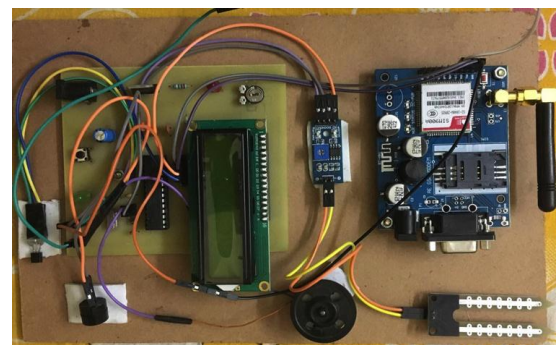


Figure-5: Hardware Setup

7. ADVANTAGES

- Saves water
- Improves growth
- Discourages weeds
- Saves time
- Helps control fungal diseases
- Adaptable
- Eliminates the manual operation of opening or closing valves
- Adaption of the advanced irrigation systems and the new technologies, especially the new irrigation systems that are complex and difficult to operate manually.
- The system will be operated in night also which results in minimization of the water loss due to evaporation.
- Irrigation process starts and stops exactly when required, thus optimizing energy requirements

8. CONCLUSION

During the implementation, number of conclusions has been considered based on the practical results obtained from the implemented systems and the following are the most important ones:

The system designed is cost effective when compared with other approaches to build such systems.

The purpose of designing of Automatic Plant Irrigation System is successfully achieved and fulfills the desired objectives. The hardware and software used performed their function properly to produce desired result which is the required for the farmers in the irrigation field. Interfacing of run time switches with microcontroller makes it flexible in respect of time settings for running a water pipe line. Using this system, farmers will get the protection while doing the irrigation work in extremely odd weather conditions, hard work of repeated assembly and will get rid of poisonous reptiles. The system, which is designed, will help the farmers to do the irrigation process in night also. The system designed do not requires the physical presence of the farmers during irrigation in the fields. The system is automatically monitored and controls the pump on and off.

REFERENCES

[1] S. V. Devika, Sk. Khamuruddeen, Sk. Khamurunnisa, Jayanth Thota, Khalesha Shaik, "Arduino Based Automatic Plant Watering System", Devika et al., International Journal of Advanced Research in Computer Science and Software Engineering 4(10), October -2014, pp. 449-456 Volume 4, Issue 10, October 2014

[2] Deweshvree Rane, P.R. Indurkar, D.M. Khatri, "Review Paper Based On Automatic Irrigation System Based On RF Module", IJAICT Volume 1, Issue 9, January 2015

[3] Archana P, Priya R, "DESIGN AND IMPLEMENTATION OF AUTOMATIC PLANT WATERING SYSTEM", International Journal of Advanced Engineering and Global Technology Vol-04, Issue-01 , January 2016, ISSN No: 2309-4893

[4] S. Darshna, T.Sangavi, Sheena Mohan, A.Soundharya, Sukanya Desikan, "Smart Irrigation System", IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p-ISSN: 2278-8735.Volume 10, Issue 3, Ver. II (May-Jun.2015), PP 32-36

[5] 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) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue 4 Ver. I (Jul-Aug. 2014), PP 49-55

[6] Y. P. Patil, N. D. Pergad," Review Paper on GSM based Water Management in Irrigation System Using ARM7", International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.61

[7] Karan Kansara, Vishal Zaveri, Shreyans Shah, Sandip Delwadkar, Kaushal Jani, "Sensor based Automated Irrigation System with IOT: A Technical Review", Karan Kansara et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (6), 2015, 5331-5333

[8] Yogesh G. Gawali, Devendra S. Chaudhari, Hitendra C. Chaudhari, "A Review on Automated Irrigation System using Wireless Sensor Network" ,International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 5, Issue 6, June 2016 ISSN:2278 -909X

[9] Abhinav Rajpal, Sumit Jain, Nistha Khare and Anil Kumar Shukla, "Microcontroller based Automatic Irrigation System with Moisture Sensors", Proceedings of the International Conference on Science and Engineering, 2011, pp. 94-96

[10] Venkata Naga RohitGunturi, "MicroController Based Automatic Plant Irrigation System", International Journal of Advancements in Research & Technology, Volume 2, Issue4, April-2013