

ENVIRONMENT BASED IRRIGATION SYSTEM USING WIRELESS TECHNOLOGY

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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 arduino. Moisture sensor, humidity sensor and ultrasonic sensor are connected to the arduino, 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. The acoustic mic is used to identify the pest and it observes the sound produced by the pest in particular frequency and then it sends to the bandpass filter. Here we can set the frequency level if it reaches the level then it gives us a alert sound. It shows us the plant is surrounded by some pests.

Key Words: Arduino, Temperature sensor, Soil Moisture sensor, Ultrasonic sensor, Acoustic mic, Zigbee, Motor, GSM module.

1. INTRODUCTION

We need water in each and every field. Water is needed for 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.

Capturing and storing water:

Many farms rely on municipal water or wells (ground water), while some have built their own ponds to capture and store rainfall for use throughout the year. Properly managed ponds can also create habitat for local wildlife. Marin roots farm relies on two ponds for all of their water needs, helping to minimize their impact on the surrounding watershed

Irrigation Scheduling:

This system is to avoid under- or overwatering their crops, farmers carefully monitor the weather forecast, as well as soil and plant moisture, and adapt their irrigation schedule to the current conditions. Tory Farms, which uses flood irrigation in their orchards, waters at night to slow down evaporation, allowing water to seep down into the soil and replenish the water table.

Drought-Tolerant Crops:

Growing crops that are appropriate to the region's climate is another way that farmers are getting more crop per drop. Crop species that are native to arid regions are naturally drought-tolerant, while other crop varieties have been selected over time for their low water needs. Olives, Armenian cucumbers, tepary beans, and orach are a few of the more drought-tolerant crops you can find in the ferry plaza farmers market.

1.1 NEED OF AUTOMATIC IRRIGATION

The technology revolution and lack of man power surpass the agriculture field, because the income from the technology side is much higher than the income from the agriculture field. If this thought grows, in future it will create huge food shortage problem. To avoid this problem we need to implement some advanced technique in this field, especially in the field of watering. Here such a system developed to monitor and control the moisture level of the soil and 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 sensors send information and transmit 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 arduino 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. Ultrasonic sensor measures the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back.

By this, farmers 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. We can also use PC(Personal Computer) to monitor this system.

3. SOFTWARE AND HARDWARE PLATFORM

3.1 Hardware Used:

ARDUINO ATMEGA328, Humidity/Temperature sensor(DHT11), Ultrasonic sensor(HC-SR04) , Acoustic mic, Zigbee, GSM module, Voltage regulator(7805), LCD display, Keypad, Diode(IN4007), Buzzers, Filter, Relay, Power supply.

3.2 Software Used:

Arduino (C Programming)

4. SYSTEM DESCRIPTION

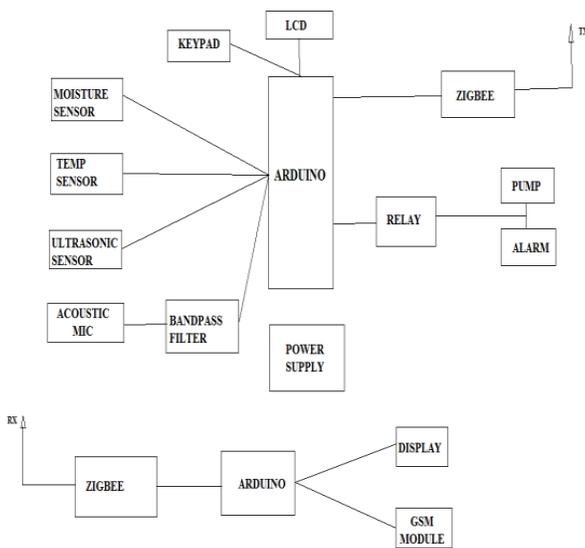


Figure-1: Block Diagram

➤ 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.

➤ Temperature Sensor (DHT11):

DHT11 sensor is used to record the atmospheric temperature which is then displayed on LCD.

➤ Ultrasonic sensor:

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back.

➤ Acoustic sensor:

Acoustic wave sensors are so named because their detection mechanism is a mechanical, or acoustic, wave. As the acoustic wave propagates through or on the surface of the material, any changes to the characteristics of the propagation path affect the velocity and/or amplitude of the wave.

➤ 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.

➤ Zigbee :

Zigbee is an IEEE 802.15.4 based for a suite of high-level communication protocols used to create personal area networks with small ,low-power digital radios, such as for home automation, medical device data collection and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection. Hence Zigbee is a low power, low data rate and close proximity(i.e., Personal area)Wireless ad hoc network.

➤ **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.

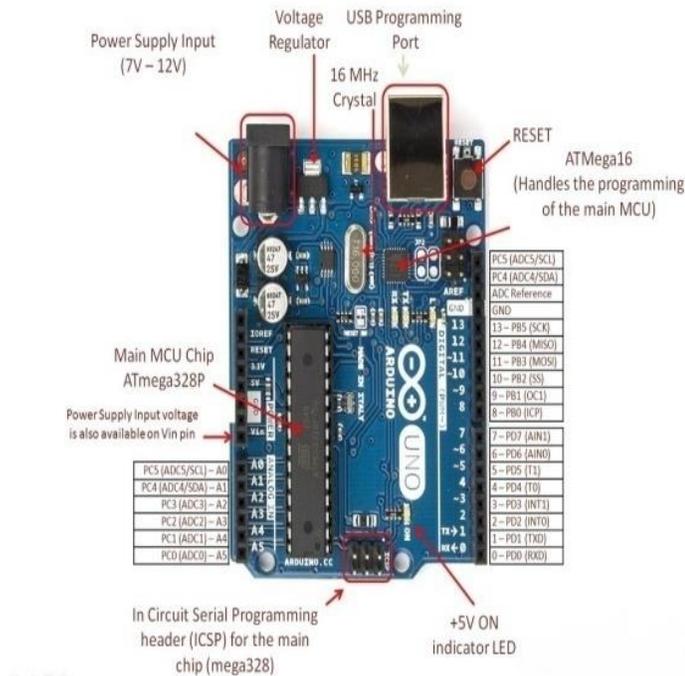


Figure-2: Pin Configuration of ATMEGA328

➤ **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.

➤ **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.

5. PROPOSED 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 the moisture sensor, temperature sensor and ultrasonic sensor which are connected with ATMEGA 328 arduino. And the arduino is programmed to receive the input signal of varying moisture condition of the soil through the sensing arrangement .Here the acoustic mic is used to identify the pest by its frequency. This is achieved by using an op-amp as comparator.r which acts as interface between the sensing arrangement and the arduino. 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.

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.

S. No	Humidity(%)	Status of Motor	Temperature (Degree celcius)
1.	3	ON	30.33
2.	29	ON	27.22
3.	49	ON	31.64
4.	72	OFF	22.82
5.	83	OFF	25.10

Table-1: System Output



Figure-3: Hardware Components

The proposed system based on ATMEGA328 arduino is found to be more compact, user friendly and less complex, which can readily be used in order to perform .Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology (Atmel microcontroller) used this” ENVIRONMENT BASED IRRIGATION SYSTEM USING WIRLESS TECHNOLOGY” is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems.

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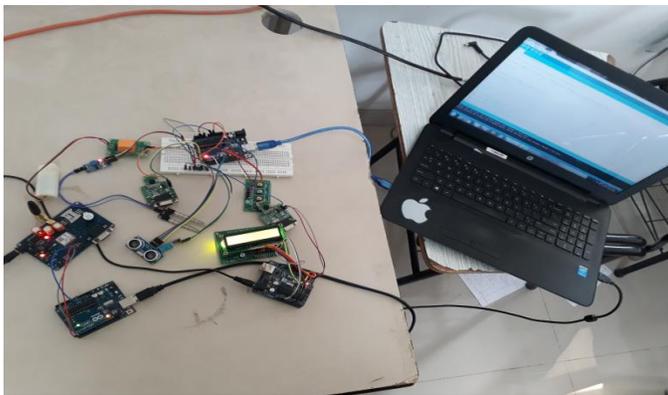


Figure4: Working Model

7. ADVANTAGES

- Prevents uneven watering.
- Healthy lawn.
- Efficient.
- Irrigation process starts and stops exactly when required, thus optimizing energy requirements.
- Low power consumption
- Reduces the time
- Low cost to design the circuit, maintenance of the circuit is good
- By using this microcontroller IC we can create much more controlling action
- Reliability
- Compatibility

8. CONCLUSION

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place.