Journal of Energy Research and Environmental Technology (JERET)
p-ISSN: 2394-1561; e-ISSN: 2394-157X; Volume 3, Issue 4; October-December, 2016; pp. 257-259

http://www.krishisanskriti.org/Publication.html

Arduino based Automatic Irrigation System

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Abstract—*Agriculture in India is largely dependent on the monsoons which is not a trustworthy source of water for irrigation. Hence there is a need for an irrigation system which can provide steady water supply to the agricultural fields according to their soil types. This paper presents the prototype design of Arduino based automatic irrigation system which allows selective irrigation by allowing irrigation to take place in different sections where watering is required, while escaping sections where sufficient soil moisture is indicated.*

1. INTRODUCTION

We live in a country where agriculture still has a major importance in the lives of people and about 65% of the Indian population is still engaged in agricultural activities. In spite of that the productivity is not that good and its contribution in our GDP is still below 20%.

The farmers have been using manual irrigation technique in India in which they irrigate the land at the regular intervals manually. This process often consumes more water or sometimes the water doesn't reach to the crop at proper time and crops get dried *. Manual irrigation also requires more workforce and results in low human resource optimization.

So there is a need for an irrigation system which performs selective irrigation by responding to soil moisture sensors and irrigating individual sections of the farm where watering is required this conserves more water*. There are many features which should be present in an ideal irrigation system e.g. it should be user friendly, easy to design and program, requires less

Maintenance and should be easy to operate. It should perform selective irrigation by supplying water in sections where watering is required, while escaping sections where soil moisture sensor indicates sufficient moisture. It should be designed in such a way that modifications can take place easily like selective individual deactivation of the moisture sensors can be done if there is any randomness in the system performance caused by the sensor inputs. The system should be such that easy maintenance and troubleshooting can be done in case any failure occurs in different sections.

2. ARDUINO BASED AUTOMATIC IRRIGATION SYSTEM

2.1 Description of the circuit diagram

Most important component of the automatic irrigation system is Arduino board. It is a microcontroller based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It operates on 5v. It has 32 kb of flash memory and 2 kb of SPRAM and 1 kb of EEPROM. A moisture sensor is mounted on the each of the different sections of the field. Each moisture sensor checks for the moisture level of the soil periodically and gives the output in the form of analog voltage which is proportional to the amount of moisture in the soil in which the sensors are planted.

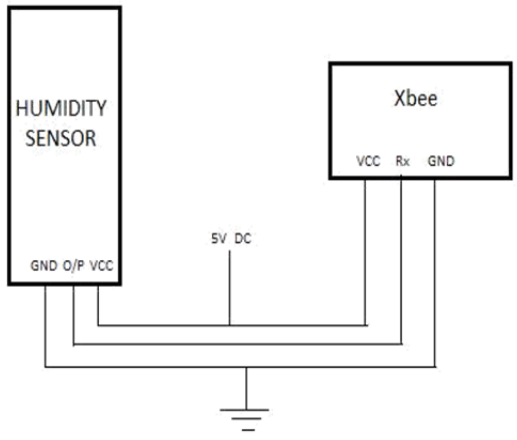


Fig. 1: (Circuit diagram of router end)

Zigbee series 2 is used which has two module Zigbee(R) as Tx module and Zigbee(C) as Rx module. Analog voltage signal is fed to the zigbee(R) by the moisture sensor. Zigbee is a device which transmits and receives the data wirelessly and establishes a communication media with the Arduino. Zigbee(C) receives the analog signal which is transmitted by zigbee(R) and again sends it to the Arduino. This data is read

by the Arduino and it takes a decision to ON or OFF the pump set, based on the code written for irrigating any specific crop. 16x2 LCD is used to display the moisture level and status of the pump set whether it is ON or OFF.

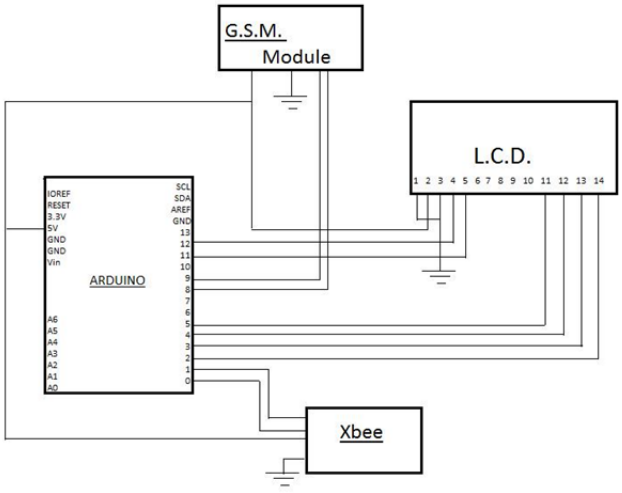


Fig. 2: (Circuit diagram of router end)

GSM SIM 800 module is used for establishing the communication between the irrigation system and farmer via message or call. It informs the farmer about the moisture level of the field if it is below or above the required range of the moisture level for any crop by making a phone call to farmer.

The electronic relay is used to start the pump sets (which operate at 220v ac) in different sections of the field. Relay remains in the OFF state until it gets a 5v dc supply which is given by the Arduino board.

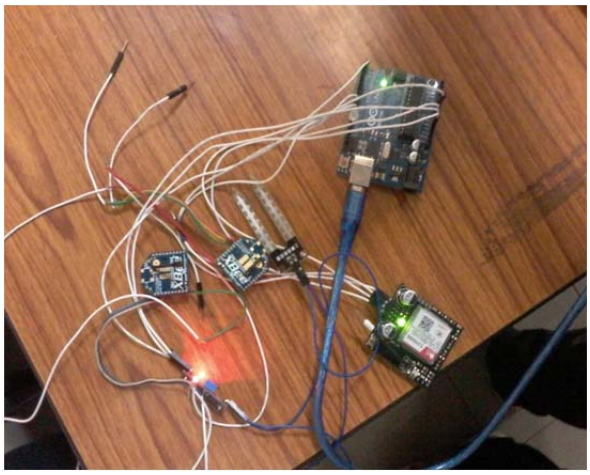


Fig. 3: (Prototype design)

2.2 Working of the system

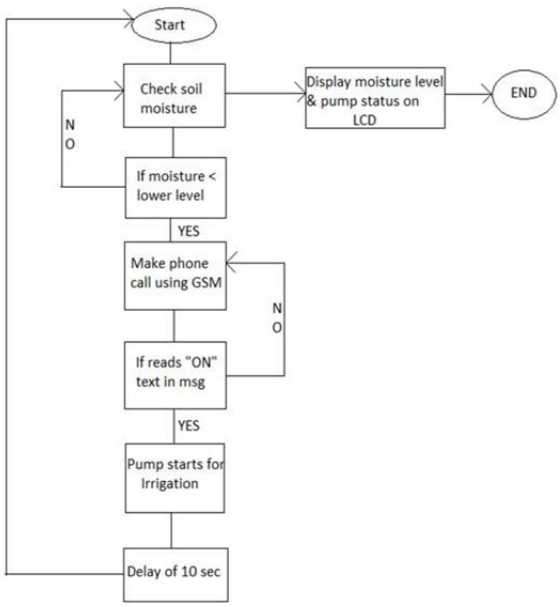
The agricultural field which is to be irrigated will be divided into various sections of possibly different soil conditions. There is at least one sprinkler head and soil moisture sensor placed in each section of the field. Soil moisture sensor checks the moisture level of the different sections of the field and gives the analog voltage output which is proportional to the moisture level of the soil.

This analog signal is fed to the Zigbee(R) which further transmits this to the Zigbee(C). Now Zigbee(C) receives this signal and sends it to the Arduino. The Arduino takes the further decision based on the prewritten codes which is uploaded on the Arduino board. If soil moisture level is less than the required lower level which is different for the different crops then GSM Module informs the farmer by making a phone call and the moisture level and status of the pump will be displayed on the LCD.

Now farmer sends the text message “ON” to the registered mobile number and the sprinklers of those sections get started where watering is required, while bypassing the sections where sufficient soil moisture is indicated. Soil moisture sensor periodically monitors the moisture level of the field and when moisture is reached to the predetermined upper moisture level Pump set get stopped automatically. Again Soil moisture sensor checks the moisture level of the field and sends output to the Arduino for further decision making. This is a never ending continuous event because this whole process is executing in a non-terminating loop.to the pre written codes.If moisture level is less than the cut off value of moisture then a phone call will be made to the farmer and he can turn ON the pump by sending a message “ON” to the registered number. If moisture level is equal to or greater than the cut off moisture level then the pump will be remain in OFF state and no information will be send to the farmer.

This whole process repeats itself continuously because it is in a non-terminating loop.

2.3. Flow chart of software :



3. CONCLUSION

This Arduino based automatic irrigation system is a perfect combination of hardware and software which is easy to implement and very user friendly. It performs selective irrigation which conserves more water. This is the automatic process of irrigation which reduces the human efforts and in turns optimizes the human resource. The technologies used in this Irrigation system make it highly efficient and accurate.

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