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Smart Irrigation System

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ABSTRACT

Agriculture is the most important practices from very beginning of human civilization. The smart irrigation system is an automated irrigation system which drives the motor automatically by detecting the moisture content of the soil with help of sensors. The main objective is to develop a wireless 3 level controlled smart irrigation system, to improve the health of the soil, avoid the wastage of water and also it indicates the moisture of the soil.

Keywords- Arduino microcontroller, sensors, relay, LCD.

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I. INTRODUCTION

Agriculture is the backbone of India's economy. In India around 22% of India's GDP is depended on the agriculture. Agricultural growth in India is largely dependent on water management. Since agriculture gives so many people livelihood, however they cannot practice agriculture due to some issues such as water security.

Now a day, farmers are struggling hard in agriculture field and the task of irrigating field is becoming quite difficult. In India most of irrigation system is operated manually. Irrigation system requirements depends on the soil properties like moisture, temperature, quality and the type of crop grown in the soil. In India, agricultural area receives power supply usually in non-peak hours. Frequent power cuts and fluctuations in the supply is a big problem. Sometimes farmer fails to attend the irrigation which leads to the wastage of water, electricity and also excess of watering leads to soil damage. To overcome this problem, we have implemented some techniques in order to control and monitor the irrigation process using Arduino microcontroller.

The main objective of the project is to maintain the temperature and humidity required for the crop. It analyzes the temperature and humidity of crops for optimal growth and maintain it according to the desired range using temperature control system.

II. LITERATURE SURVEY

YETHIRAJ et al (2012): There is a growing number of applications of data mining techniques in agriculture and a growing amount of data that are currently available from many resources. This is relatively a novel research field and it is expected to grow in the future. There is a lot of work to be done on this emerging and interesting research field.The multidisciplinary approach of integrating computer science with agriculture will help in forecasting/managing agricultural crops effectively.

AnjumAwasthi et al, (2013): The proposed system in this paper is designed by considering the requirement of a sugarcane crop for Indian climatic conditions. The WSN in agriculture is new technology for information acquisition and processing in sugarcane field. It is more advantageous than the traditional agriculture techniques. This work structured the precision agriculture monitoring system by wireless sensor nodes and base station to record the data of sensor nodes. This is low cost system where the recorded information is transmitted to remote location using a GSM network via a SMS. The farmer may use the received information to control the parameters. This kind of wireless detection and control improves the effectiveness and efficiency of resources used, which leads to the improved production. The drawback of system is its dependency on the GSM network.

III. SYSTEM DESCRIPTION AND DESIGN

Smart irrigation system is based on a Arduino microcontroller. This prototype model monitors the content of moisture in the soil. A predefined value of soil moisture content of the soil is set at a specified range, then the watering system is turned ON/OFF.

This project utilizes two Arduino microcontrollers in a master/salve configuration to obtain sensor readings and operate the system temperature controls. For the master controller an Arduino is used. The master controller contains the code for web server which is uploaded through an Ethernet shield. Additionally this controller transmits control signals and receives sensor data from the slave controller through a pair of transmitter receivers. For the slave controller an Arduino UNO R3 is used which is responsible for collecting and transmitting the data. This includes temperature, humidity, and light intensity reading, receiving and relaying control signal input by the user to the motor controller. The slave controller is also connected to a LCD screen which displays the readings from the monitoring system locally.

The main purpose of the monitoring system is to achieve temperature reading from the system which to be relayed to a remote user. Additionally the system has been expanded to include humidity and light intensity monitoring as desired parameters. These parameters are fed back to the control system to allow for automated control.

The monitoringsystem consists of four sensors that are interfaced with the Arduino UNO microcontroller. These sensors include a temperature sensor, a light intensity sensor, humidity sensor. Sensor data is relayed to the Arduino.

3.1 Arduino UNO

The Arduino UNO is an open source microcontroller board which is based on the microchip ATmega328P microcontroller. The board is equipped with sets of digital and analog input/output(I/O) pins that can be interfaced to various expansion boards and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins. It can be powered by using USB cable or by an external 9 volt battery.

3.2 Sensors

Sensor is a device, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other devices. A sensor is always used with other electronics devices.

3.2.1 Temperature Sensor And Humidity sensor

DHT11 is a humidity and temperature sensor, which generates calibrated digital output. DHT11 can be interfaced with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low cost humidity and temperature sensor which provides high reliability and long term stability.

In this system, we will build a small circuit in which Arduino is interfaced with DHT11 temperature and humidity sensor. One of the main applicationof connecting DHT11 sensor with Arduino is weather monitoring.

3.2.2 Soil Sensor

Soil moisture is basically the content of water present in the soil. This can be measured using a soil moisture sensor which consists of two conducting probes. It measures the moisture content in the soil based on the change in the resistance between the two conducting plates. The resistance between the two conducting plates varies inversely with the amount of moisture present in the soil.

3.3 Relay

Relay provides isolation between the controller and the device, as the device works on both AC as well as DC supply. The relay is extremely useful when we need to control a large amount of current and voltage with the small electrical signal.

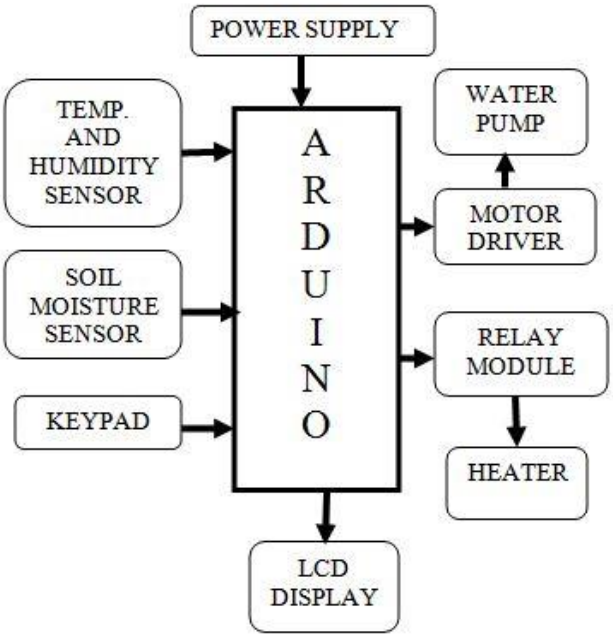
3.4 Liquid Crystal Display

LCD modules are very commonly used in most of the embedded system. 16x2 LCD is named so because, it consists of 16 columns and 2 rows. There are lots of combinations available like, 8x1, 8x2, 1x2, 16x1, etc. but the most used one is the 16x2 LCD. So, it will have (16x2=32) 32 characters in total and each character will be made of 5x8 Pixels Dots.

3.5 Keypad

The buttons on a keypad are arranged in rows and columns. A 4x4 keypad has 4 rows and 4 columns. Beneath each key is a membrane switch. Each switch in a row is connected to the other switches in the row by a conductive trace underneath the pad.

Block Diagram:



IV. EXPERIMENTAL WORK

- In this system first we learn about Arduino UNO pin diagram, microcontroller and its basic programming.
- After that we learn about sensors information such as temperature and humidity sensor, soil moisture sensor, light sensor, and other instruments which are DC water pump, relay and LCD display.
- We studied the interfacing diagram of Arduino with sensors and other instruments.

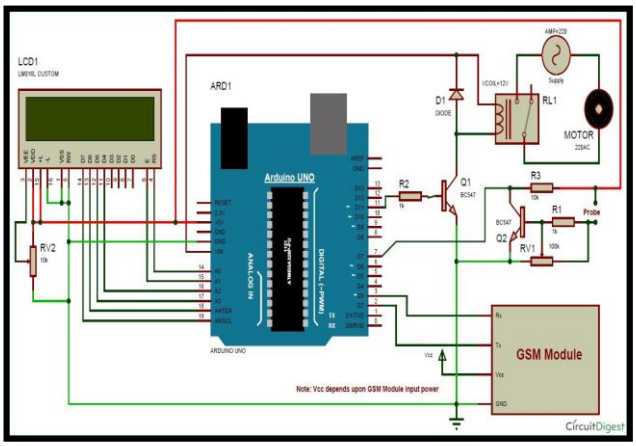


Fig. 4.1 Arduino interfaced with sensors and instrument.

V. CONCLUSION

In the present era, the farmers use irrigation technique through a manual control in which the farmers irrigate the land at regular intervals.Hence the automatic irrigation system is important for farmers to save the water.This system is used for optimization use of water in the agricultural field without the intervention of farmer by using soil moisture sensor, temperature sensor, humidity sensor that senses the moisture content of the soil, the temperature and humidity required for the growth of crops using microcontroller that can turn ON/OFF the desirable system automatically.

VI. FUTURE SCOPE

- The status of different parameter can be displayed on the computer using serial interface with PC.
- The records for the different reading can be maintained by adding memory chip in the system. It can be also stored in PC.
- The status of the different parameters can be send on mobile through SMS to the concern person.
- The system can be made user friendly by making it android based.

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