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Measuring and Monitoring Of Soil for Smart Irrigation Using IOT

M.Thirunavukkarasu[1]; LV. Sai Prasanth[2]; E. Naveen Reddy[3]
[1,2,3]CSE Department, SCSVMV University, India
[1]mthiru@kanchiuniv.ac.in; [2]lvsaiprasanth@gmail.com; [3]enreddy1998@gmail.com

Abstract*— Irrigation is a very important factor when it comes to industrial farming. Here we introduce a system to monitor a single plant other than whole field. This method is very effective than normal field monitoring system. It can be used for monitoring expensive crop. Water is an expensive commodity when it comes to most of the places in the world. In this paper we proposed and implement a prototype automatic irrigation system with IoT. In this case sensors are used to determine whether it is time to water the field or not by measuring different parameters. Sensors are connected to arduino. These sensors can be placed at the plant side to read moisture, humidity and temperature. In this project, the sensors read the values and it is transmitted to the server through IOT. Based on the sensor details the motor will turn ON and OFF automatically.

***Keywords*— Include Soil moisture, Humidity sensor, temperature monitoring, IOT**

I. INTRODUCTION

Agriculture is the strength of Indian Economy. However, for agriculture water consumption is more than rainfall every year. Improving farm yield is essential to meet the rapidly growing demand of food for population growth across the world. By considering and predicting ecological circumstances, farm productivity can be increased. Crop quality is based on data collected from field such as soil moisture, ambient temperature and humidity etc. Advanced tools and technology can be used to increase farm yield. Developing IoT technologies can help to collect large amount of ecological and crop recital data. "IoT encompasses many new intelligent concepts for using in the near future such as smart home, smart city, smart transportation, and smart farming" [1]. The technique can be used for application of accurate amount of fertilizer, water, pesticide etc. to enhance productivity and excellence. Sensors are hopeful device for smart agriculture. The real-time environmental parameters like soil moisture level, ambient temperature and tank water level have continuous influence on the crop lifecycle. By forming sensor network, good monitoring of water regulation in the agriculture field can be achieved. This paper presents irrigation monitoring and controlling system. The system uses the wireless sensor network to monitor the environmental conditions such as temperature, soil moisture content, humidity and water level of agriculture land for controlling the irrigation. The system has sensor network to monitor the environmental conditions such as temperature, soil moisture content, humidity and water level of agriculture land for controlling the irrigation. The system has automatic and manual mode. The real time sensed data is stored on the cloud server for decision making and controlling actions. The user can monitor the controlling actions taken at the farm as well as control the irrigation via android app on farmer's mobile phone.

II. EXISTING SYSTEM

In the existing system farmers have to travel to fields often at odd hours just to switch ON/OFF the motor due to erratic power supply. Existing aids like auto-starters are unreliable and incapable of communicating the operating state of the motor, to the farmer, especially when a farmer has more than one motor pump set; he has to run around to make sure that all the motor pumps are working when the power is available. At times, motor pumps are left running for longer than what is necessary because of the effort involved in switching OFF the motor. This leads to wastage of both electricity and water. Sowing of seeds is the largest process. Soil pH testing is also a large complicated process as the need to check with the labs.

Disadvantages of Existing System

- The availability of water is decreasing day by day due to the increase in population, industrialization and short rainfall.
- Farmers have to travel to fields to switch on/off the motor.
- There will be the wastage of both electricity and water.
- Pumps are left running for longer period.

III. PROPOSED SYSTEM

To overcome the drawbacks of existing system like high cost, difficult in maintenance and more wired connection, we introduce a new system which will have wireless connection between nodes and user. We introduce a new design of embedded making use of IOT technology in this project. These valves may be easily automated by using controllers. Auto sowing of seeds will make the process easy and ph testing is also become easy.

Advantages of proposed systems

- It is easy to maintain.
- Cost will be less compared to existing systems.
- Water usage level will be reduced
- Electric power will be reduced

IV. HARDWARE REQUIREMENTS

1. Micro controller - Arduino
2. Humidity Sensor
3. Temperature Sensor
4. Soil moisture sensor
5. Relays
6. IOT modem
7. Pump motor
8. Power supply

V. WORKING OF PROPOSED SYSTEMS

a) PIR Sensor

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects.

b) Humidity Sensor

The Smartec humidity sensor is a two terminal capacitor, which increases in value as water molecules are absorbed into its active polymer dielectric. The capacitor plates consist of a base plate and a water permeable platinum top plate.

c) Soil Moisture

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, and else the output is at low level.

d) Temperature Sensor

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device is rated to operate over a −55°C to 150°C temperature range.

e) Ardunio UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers

f) Relay Board

A relay is an electromechanical switch which is activated by an electric current. A four relay board arrangement contains driver circuit, power supply circuit and isolation circuit. A relay is assembled with that circuit. The driver circuit contains transistors for switching operations. The transistor is use for switching the relay.

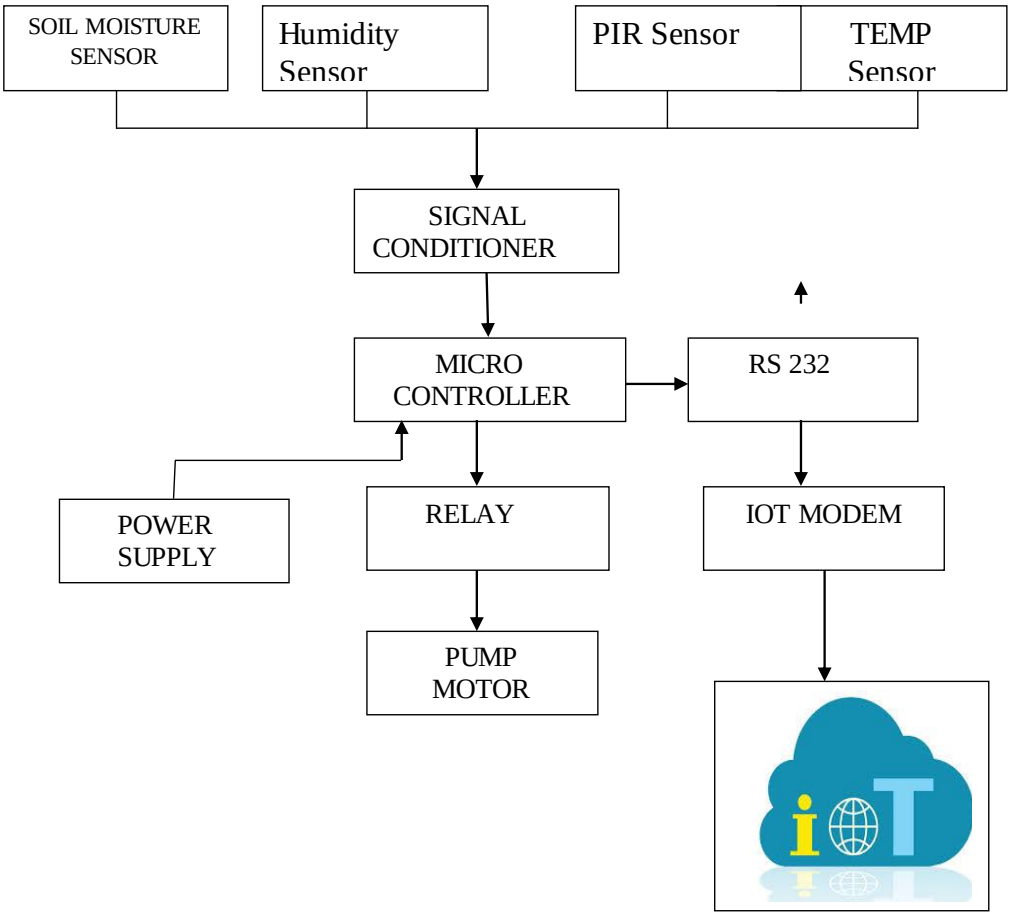

Fig. 1 System Architecture

Figure 1 represents proposed system architecture which is explained below step by step.

1. Supply from the power supply is given to the VCC and GND pins of the arduino.
2. The temperature sensor is connected to the A0 pin of the arduino.
3. The Humidity sensor is connected to the A1 pin of the arduino.
4. The Moisture sensor is connected to the A2 pin of the arduino.
5. The PIR sensor is connected to the A3 pin of the arduino.
6. The LCD is connected to the pins 8,9,10,11,12,13 pins of the arduino.
7. When the temperature increase the alert is given through buzzer, which is connected to the 6th pin of the arduino.
8. When the moisture level decreases the motor will get ON, which is connected to the 7th pin of the arduino.
9. The IoT module is connected to the arduino through TX (1st pin) and RX (2nd pin) of the arduino.
10. The values are displayed in the LCD and also monitored in the IoT.

g) Pump Motor

A pump motor is a DC motor device that moves fluids. A DC motor converts direct current electrical power into mechanical power. DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action. Therefore this project deals with the automatic maintenance of agricultural fields with proper irrigation. The system consists of Humidity sensor, Soil moisture sensor, Temperature sensor, relays, signal conditioner, micro controller, IOT modem and a pump motor.

The controller receives the signal from the various sensors and controls the irrigation accordingly. Through the relay, the pump motor is ON and OFF.

ALGORITHM

STEP 1: Start

STEP 2: Initialise the parts and connect sensors

STEP 3: Read the value from the sensors

STEP 4: If value is greater than thresh hold,then relay will be on and automatically motor will turn on

STEP 5: If value is less than thresh hold ,it send the values to iot

STEP 6: Stop

OUTPUT

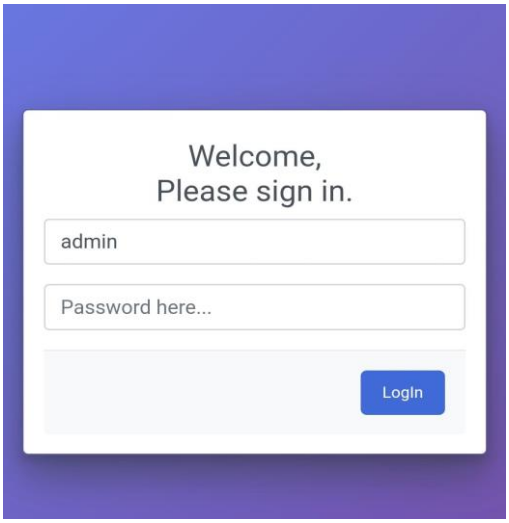

Fig.2 Home page

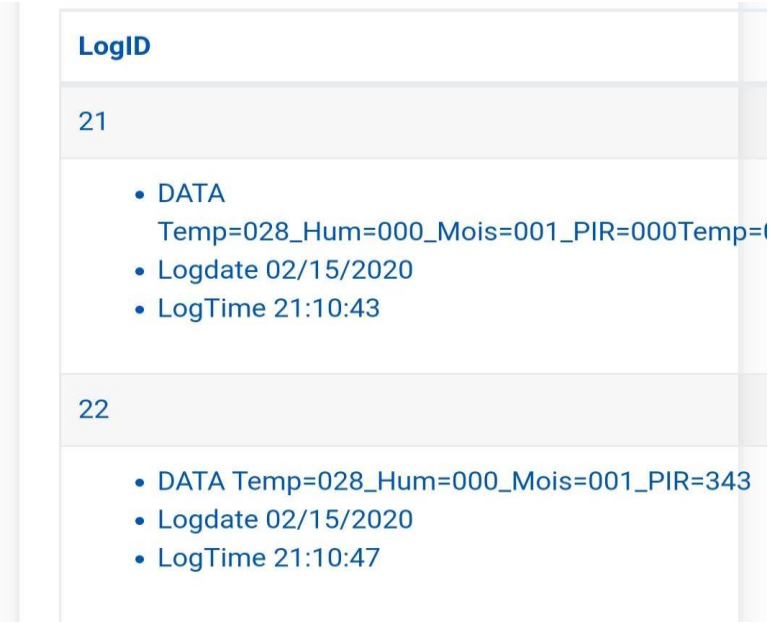

Fig. 3 logID Screen

VI. CONCLUSIONS

The study and analysis related to the interconnected field studies of Internet of Things, Machine-to-Machine and Wireless Sensor and Actuator Networks, it was possible to identify that there are various developments in the last couple of years, there is still problem to address regarding the generated and collected data. Being cloud computing a recent resource providing approach, the main work developed within the context of the paradigms presented above was not properly integrated with the possibilities that a cloud computing platform could offer. The system proposed in this paper, aims to lead to the combination of such systems with the attractive features offered by cloud computing. This integration could be applied to the agricultural applications. The automated irrigation system presented in this work was found more viable, and can manage irrigation water supply more effectively. It helps to optimize the use of water for irrigation purpose. It shows that water consumption is reduced with the implementation of soil-moisture based automated irrigation system.

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