IOT BASED MONITORING SYSTEM IN HOME AGRICULTURE

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Abstract IoT based Home Agriculture System is built for monitoring the plants with the help of sensors (humidity, temperature, moisture, etc…). These sensors sense and check the changes in the temperature and moisture level and automate the drip watering into the garden if needed. Today people are suffering from scarcity of water. This process optimizes the water usage and also increases the yield to provide organic farming. This automation technology minimizes the human intervention and also keeps the plants green. All this functioning can be monitored by the user in their mobile through IoT technology.

Keyword: Humidity, temperature, moisture sensors, drip watering, organic farming, IoT Technology.

I. INTRODUCTION

The global population is set to touch 9.6 billion by 2050. So, to feed the exploding population, the field of food production must embrace IoT. All fertile lands are now changed into houses because of the increased population. To cater the needs of the vegetables for the increased population, it is encouraged to have a terrace garden in each home. Indoor plants clean the air and reduce the depression to the human.

Against the challenges such as extreme weather conditions and rising climate change, and environmental impact resulting from intensive farming practices, the demand for more food has to be met.

Smart terrace gardening based on IoT technologies will enable growers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the number of Journeys the farm vehicles have made. It is the application of modern ICT (Information and Communication Technologies) into agriculture.

In IoT-based smart gardening, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. The user can monitor the field conditions from anywhere. IoT-based smart gardening is highly efficient when compared with the conventional approach.

II LITERATURE SURVEY

The research in IoT in agriculture area enhanced various aspects to improve the quality and quantity of productivity of agriculture. Researchers have been worked on many different projects on soil attributes, different weather conditions as well as scouting crops. Researchers of MIMOS, Ministry of Science, Technology and Innovation, Kuala Lumpur, MALAYSIA worked on wireless moisture sensor network on agriculture [1]. The Research for smart agriculture is done over IoT[2] by Prof . K. Patil and Prof. N. R. Kale Maharashtra, India. Wireless Sensor Network based poly house monitoring system is in practice which make use of environment temperature, humidity, CO_2 level and sufficient light detection modules [3]. A Case study was carried over by researchers of University of Donja Gorica on IoT-enabled platform for precision agriculture and ecological monitoring [4]. The usage of IoT in Form Management System, Production supply chain development and information service system is explained [5-7]. Remote plant monitoring can be done using ZigBee protocol and GPS [8]. Soil monitoring, nutrients like nitrogen (N),Phosphorous(P), and Potassium(K) are monitored and the results are updated through email [9].Using fuzzy logic different vegetables are being cultivated in terrace garden [10].

III ARCHITECTURE OF ARDUINO

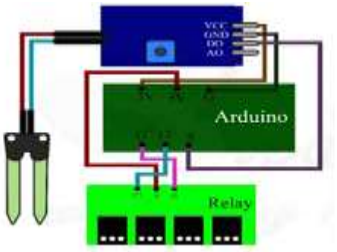

Figure1 – Arduino architecture

3.1 Water moisture Sensor

An Arduino and a Soil moisture sensor are interfaced to determine the need of water to moisturize the soil to the sufficient level. Soil moisture sensor interface with an Arduino and measures the volumetric content of water in soil and gives the moisture level. The sensor gives us both analog and digital output.

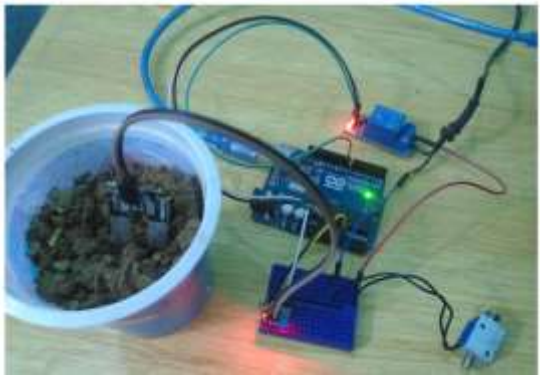

Figure 2 –Water Moisture Sensor

The soil moisture sensor consists of two probes that are used to measure the volumetric content of water. The two probes allow the current to pass through the soil, which gives the resistance value to measure the moisture value. When there is water, the soil will conduct more electricity, which means that there will be less resistance. Dry soil conducts electricity poorly, so when there is less water, then the soil will conduct less electricity, which means that there will be more resistance.

IV PROPOSED PROBLEM STATEMENT

This paper presents proposed model for smart gardening to develop real time monitoring system for soil properties like temperature, atmospheric humidity, soil moisture and to supply the water and fertilizers as needed .It will also be possible to control and monitor various operations of the field remotely from anywhere, anytime by mobile as well as web application.

4.1 Proposed Architecture

Proposed system has three modules – Farm side, Server side and Client side. Farm side deployment is as shown in figure 3. It consists of three methods as follows.

1. Sensing local agricultural parameters by various sensors like temperature sensor, humidity sensor, soil moisture sensor.
2. checking the parameters value with the threshold levels.
   a. If the values are lower than the threshold levels, solenoid valve automatically opens and starts watering the garden through drip irrigation.
   b. The above process continues until it reaches the threshold levels.
3. The above process can be monitored in mobile through IoT .
4. All fertilizers and pesticides details for the different plant will be displayed in the web server

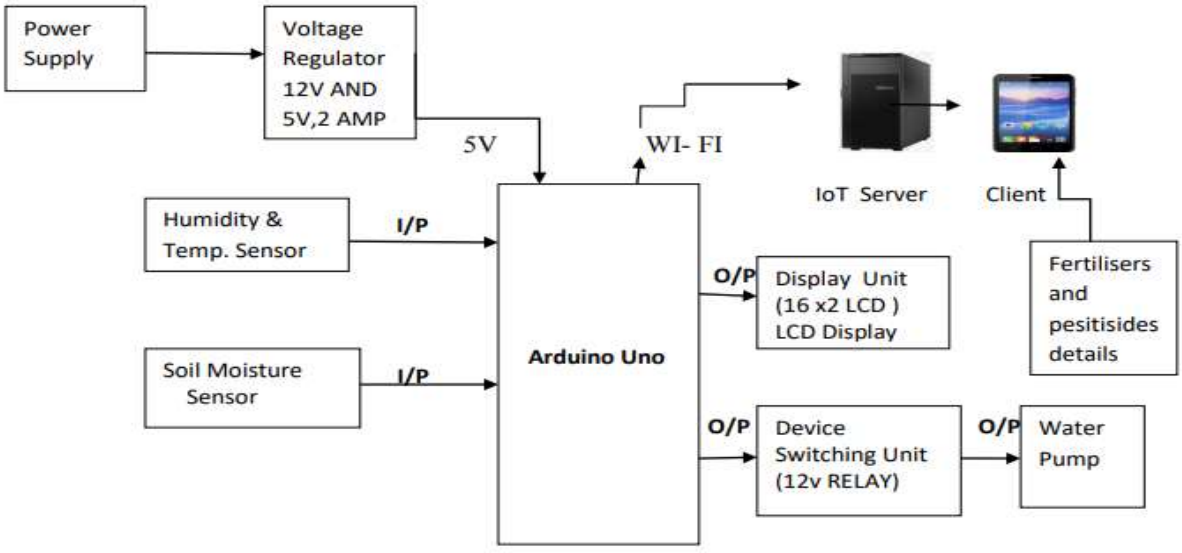

Figure 3 IoT Based Monitoring System

V EXPERIMENTS AND RESULTS

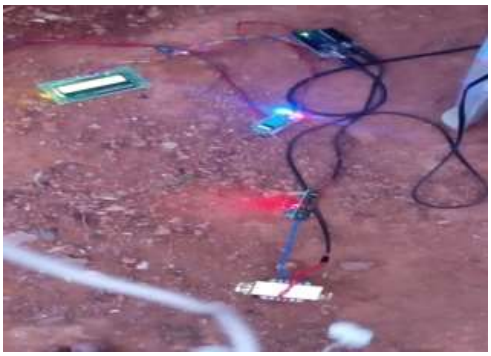

Figure 4 : a)Circuits

Figure 4:b)Drip irrigation

Figure 4: c)LED Display

VI SAMPLE CODING

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(13,12,11,10,9,8);
const int sensor_pin = A1;  /* Soil moisture sensor O/P pin */
const int RELAY_ENABLE=2;
void setup() {
  pinMode(RELAY_ENABLE,OUTPUT);
  Serial.begin(9600); /* Define baud rate for serial communication */
  lcd.begin(16,2);
  lcd.clear();
  lcd.print("Welcome");
  delay(1000);

}

void loop() {

  float moisture_percentage;
  int sensor_analog;
  sensor_analog = analogRead(sensor_pin);
  moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
  Serial.print("Moisture Percentage = ");
  Serial.print(moisture_percentage);
  Serial.print("%\n\n");
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Moisture Percentage");
  lcd.setCursor(0,1);
```

```
 lcd.print(moisture_percentage);

  if(moisture_percentage < 50)
    {
     Serial.println("relay on");
     digitalWrite(RELAY_ENABLE,LOW);
     delay(1000);
    }
    else
    {
    Serial.println("relay off");
     digitalWrite(RELAY_ENABLE,HIGH);
     delay(1000);
    }
delay(500);
}
```

In the Experiments, it checks the soil moisture, temperature and based on the moisture level, water is controlled by the solenoid valve and sprayed to different plants in the garden through drip irrigation method. The Fertilizer and insecticides details can be obtained in the mobile from an IoT Server.

VII CONCLUSION:

The paper proposes a wise smart gardening model in integration with ICT. ICT have always mattered in Agriculture domain. By using the proposed approach, terrace garden can be watered through drip irrigation whenever it is needed and the updated information can be monitored in the mobile even at their work places. This method saves time and water and gives good air and green environment to living places. Fertilizers and pesticides details can increase landscape health, promote deeper root growth, and make the plants more disease resistant.

VIII ACKNOWLEDGMENT

1.St.John's College,Tirunelveli,Tamil Nadu, India.
2. Tamil Nadu Agricultural University portal for fertilizer and pesticides details for different plants

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