

IOT BASED AGRICULTURAL CROP MONITORING WITH SOLAR POWER

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Abstract: In the real world, Agriculture is one of the important things to be controlled, many farmers face problem in monitoring their farms. The farmers have more difficulties to monitor all the farms at the same time. Hence this paper is developed to monitor the farms in the field using the concept of IOT (Internet of things). Depends upon the temperature level, soil moisture and water level are monitored using various sensor, according to the readings of these sensors the pump is automatically switched on to provide adequate water to the fields. Here all the data are parsed into the server and are able to monitor the plants continuously and easily able to monitor the health of farms by using the IOT. Also need not to worry about the health of crops and the readings are displayed in the server automatically through the wireless network. Internet of things involves a three tier system. Solar power can also be used as an alternate source for power control.

Keywords— IOT, PIC microcontroller, Sensors, GSM module

I. INTRODUCTION

Agriculture is play important role in Indian Economy Development. Indian agriculture sector provides the 18 percent of India's gross domestic product (GDP) and provides service to 50% of the countries workforce. Among from various countries, India is the one of country which produces the pulses, rice, wheat and spice products. Due to population increases in day by day, there is essential to produce the lot of agriculture products. In past decade, it is observed that there is not much crop development in agriculture sector. Because loss of fertility in soil by cultivating same type of crop, not follow the proper water management like irrigation systems. So it is necessary to change these activities by means of introducing new technology like internet of things (IOT), which are includes the various sensors to collect the real time information.

The internet of things almost applied in all areas of industry, including smart agriculture, smart parking, smart building environmental monitoring and healthcare transportation and etc. Among them, agriculture is one of the important areas which targets millions of people. Fertilizers play a very significant role in field of agriculture. It helps to increase productivity of plants. The proposed system is to design with sensors which are used to measure the need for fertilization of the soil and water level of soil if there is a need to do so. The farmer's changes their crop based on market value and climate available. Different crops have different irrigational needs.

II. OBJECTIVE

The major objective from this paper is agriculture is to save the water, fertilizer and energy by implementing the new technologies like internet of things (IOT). Agriculture is a water intensive activity. Agricultures are mainly depending on rainfall for all their irrigational needs and maintain the fertilizer level in the soil.

The proposed system uses to predict the soil fertilizer level by using the sensors and find the temperature of the soil to maintain the water in the soil. The motor pump is system used to provide the adequate water level in the soil. All these data can be monitored from various places via Internet of things IOT. The solar panel is the additional device to may provide the alternative power source for the overall circuits.

III. LITERATURE SURVEY

The Lot of research is going to develop the agriculture area to improve the quality and quantity of the production. Monitoring of soil moisture and groundwater levels using ultrasonic waves to predict slope failures, [1] used an ultrasonic waves to predict the slope failures when there is a heavy rainfall, and they have used a method of monitoring of soil moisture. The realization of precision agriculture monitoring system based on wireless sensor network, [2] has used wireless sensor networks to design the monitoring of agriculture, at the same time the system is based on the real time monitoring of agriculture environmental information such as temperature, humidity and the intensity.

In some projects such as [3] authors have designed and implemented an approach in development of crops monitoring system in real time to increase the productions of various plants. The authors proposed a [4] Plantation Monitoring System Based on Internet of Things. An information management system was designed to provide the data for research in agriculture. The authors have presented a newly software which is mainly used to monitor the data for both data acquisition and data processing module. The developed application provides accurate control for the monitoring of the green house. A real time feedback control system which monitors and controls the irrigation system activities efficiently, [5] used to display the results on the both LCD panel and user mobile, for testing the output instantly. GSM is responsible for controlling the irrigation on field and sends them to the receiver.

The information is send to the user on request in the form of SMS. Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBee and GPS, [6] used to realize the GPRS technology, wireless technology the temperature and humidity monitoring system is possible and to maintain low cost investment and low power consumption. Solar E-Bot for Agriculture, [7] in authors have concentrated to provide the power supply through the solar panel for the purpose of alternative source and performance of the robot in an efficient manner with green energy.

IV. PROPOSED SYSTEM MODEL

Generally a sensor is a device that output is analogy form, this sensor output is not directly accept by microcontroller so the ADC pins are available in the controller to convert analogy into digital form and it can read by microcontroller and process the sensed data. In this method four types of sensors are used like Ultrasonic sensor, and water level sensor, Humidity sensor and temperature sensor. The ultrasonic sensor is used to provide the information about any animal movement like rat, goat etc and give the buzzer alarm to protect the crop from them.

The water level sensor is basically installed in the agricultural land and measure the water level and if the water level is reduced below the threshold level then the motor will switch on automatically and provide the adequate level water to avoid crop from dryness. The temperature sensor is providing the atmosphere temperature level, finally the humidity sensor senses the moisture of particular crop land area. The overall sensors data are displayed in LCD display which is available in the module and the same information is sent to the IOT to monitor from worldwide through web link

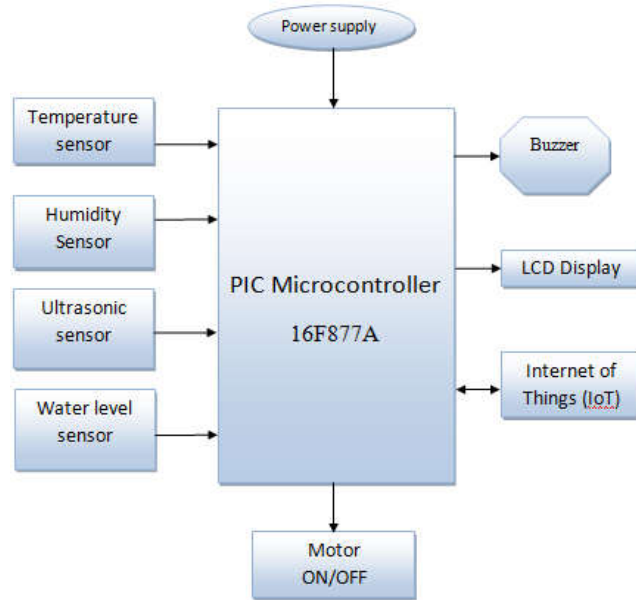


Figure 1: Block diagram of proposed system

4.1 Process flow of the proposed system model

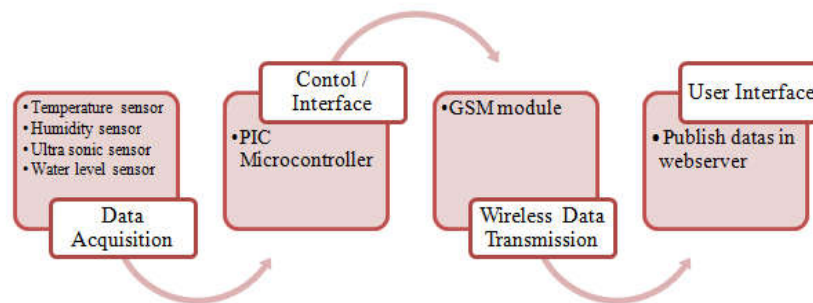


Figure 2: Process flow diagram

4.2 Data Acquisition

In this work low cost temperature sensor, humidity sensor, ultra sonic sensor and water level sensor are utilized for continuously monitor the field. In this experimentation LM35 temperature sensor is connected in the 3rd pin RA1/AN1 of PIC 16F877A microcontroller. The Ultrasonic sensor HCSR04 is connected in the 35th & 36th (RB2, RB3) pin of microcontroller. The Humidity sensor DHT 11 is connected in the pin 4 RA2/AN2. Finally the level sensor is manually designed based on our requirement and it is connected with 37th pin RB4.

4.3 Control and interface

Most advanced microcontroller PIC 16F887A microcontroller is used to get the data from four different sensors. It is also used to control the speed of the motor and alarm. PIC16F877A have 40 pins by 33 path of I/O. It has lot of I/O pins and it is very convenient to interface various peripheral devices

4.4 Wireless Data Transmission

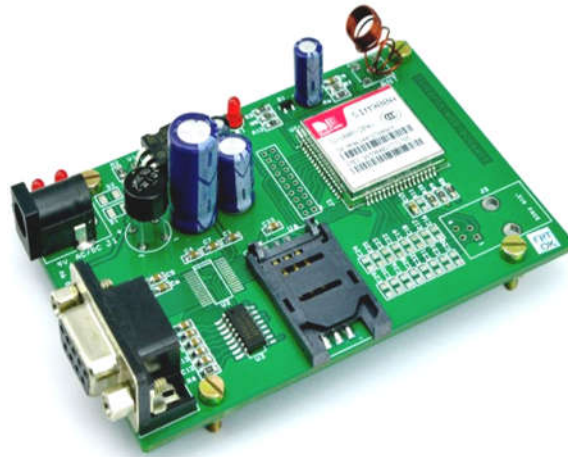


Figure 3: GSM Module (SIM900A)

GSM/GPRS module is mainly used to establish connection between a computer and a GSM-GPRS system. GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/1800 MHz the Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232). This modem baud rate is generally configurable from 9600-115200 through AT command. This GSM/GPRS Modem is having internal transmission control protocol (TCP)/ Internet protocol (IP) stack to enable you to connect with internet via GPRS. It is mainly suitable for sending and receiving SMS, Voice as well as DATA transfer application in M2M interface. By using this modem, we can make audio calls, Messages, Read SMS, receive the incoming calls and internet etc through the normal AT commands.

4.5 User Interface

The web application is designed to monitor the field and crops from anywhere using internet connection. The web application is designed using HTML and PHP script. PHP is server side scripting language for the web development. PHP can be used with HTML code and with various web engine frameworks. PHP is an efficient alternative to Microsoft's Active Server pages. The PHP script will parse the data and display it on android device. The webpage developed insert the sensor data in mysql database when it receives request from the GPRS/GSM modem.

4.5.1 Pseudo code for data updation

```
$conn = new mysqli('localhost:3306','root','','iot_main');
if ($conn->connect_error)
{
    die("Connection failed: " . $conn->connect_error);
}
$value2=$_GET['value2']; // get Temp sensor data
$value3=$_GET['value3']; // get Temp sensor data
$value4=$_GET['value4']; // get Temp sensor data
$value5=$_GET['value5']; // get Temp sensor data
$sql = "insert into iot_demo(data1,data2,data3,time) values('$value2','$value3','$value4','$value5')";
$result = $conn->query($sql);
```

4.5.2 Pseudo code for data publish

```
$sql1 = "select * from iot_demo";
$r1=mysqli_query($conn, $sql1);
while($row = mysqli_fetch_array($r1))
{
    <td class="tr"><?php echo row['id']?></td>
```

```

<td class="tr"><?php echo row['data1']?></td>
<td class="tr"><?php echo $row['data2']?></td>
<td class="tr"><?php echo $row['data3']?></td>
<td class="tr"><?php echo $row['data4']?></td>
}

```

V. RESULTS AND DISCUSSIONS

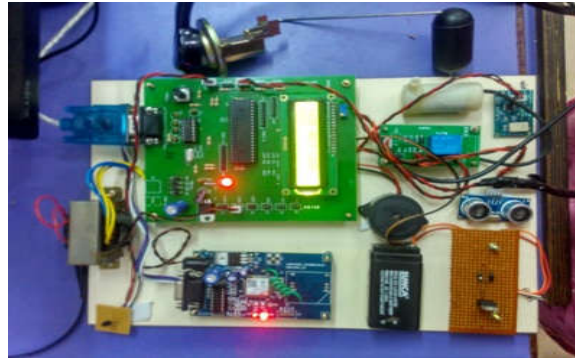


Figure 4: IOT KIT Module

LogID	Temperature	Humidity	Level	Ultrasonic	Logdate	LogTime
1	030	030	001	1471	04/16/2018	14:21:41
2	031	035	002	1481	04/16/2018	14:25:48
3	035	030	004	1480	04/16/2018	14:29:26
4	032	031	005	1595	04/17/2018	08:23:06

Figure 5: Resultant data in Web Application

The working of this paper is based on the functionalities of PIC microcontroller and GSM module also its functions are based on the usage of sensors for the effective crop monitoring. By using various sensors in this module it can reduce the man power in the agriculture field and provide the automation.

The discussions of this paper is related with the components and devices used for the good working of this project. It includes the requirement and need for the selection of the particular components. Every component is selected based on proper standards and needs. The use of every component provides different functions. The microcontroller PIC 16F877A control the overall circuit with input and output devices. Sensors like Ultrasonic, temperature, humidity and water level sensors are the input devices to detect various parameters from real time process and microcontroller analyze parameter from various send and it passed through web link for user via GSM module. GSM and IOT module helps to send the current location details to the particular person.

VI. CONCLUSION & FUTURE WORK

It is the major important to face the crop production in our country, the various advanced technology needed to improve the crop production to earn the high profit. Here we are proposed the advanced technology, which is used to obtain the data from cloud of Internet of Thing (IOT) by means of collecting the data like temperature, Humidity etc. by various sensors. By using the proposed approach, received updated information allows the farmers to handle with and benefit from these changes. It is really challenging tasks that need to provide such knowledge because of highly localized nature of agriculture information specifically distinct conditions. IOT based system offers real time understanding

and analysis of data which can be used across the world wide in combination with the other parameters and also detect the abnormal conditions of the crop.

Fertilizers play a very important role in field of agriculture. They help to increase productivity of plants. So in future the same work will be extended to conserve water, fertilizer and energy in agriculture by incorporating with the help of image processing techniques.

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