Iot Based Wireless Sensor for Agriculture Monitoring

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***Abstract*--- The recent changes in climate have increased the importance of agriculture monitoring, making it a topical and highly active research area. The aim of this Project is to collect fundamental field information like air moisture, air temperature, soil Temperature, humidity, and salt of agriculture land using wireless sensor network system during the growing season. data is post to the user through IOT. This data is can be update frequently to the cloud and user can monitor the field condition based on sensor values and motor status also. IOT based monitoring system is proposed for continuous monitoring of field by using specified user address. We transmit the information of the field to the user using RF transreceiver with 8 channel, and 2 GHz specification for analyzing the field. Another advantageous module, User can switch ON/OFF the motor from the browser terminal, and motor based on the moisture of the soil .According to the moisture level motor was automatically ON/OFF in the agriculture land and this status was post to monitor section. Thus we propose a technique to send data fast with minimum energy for higher distance**.

Keywords-- DHT11, DS18B20 ,nrf24l01.

I.INTRODUCTION

Agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial, and institutional improvements.The main objective of this project is to reduce unwanted consumption of water in agricultural field. As there is no unexpected usage of water, a lot of water is saved from being wasted. The irrigation system is use only when there is not sufficient moisture in the soil and the microcontroller decides when should the pump be turned ON/OFF, saves a lot time and water for the farmers. As there is no unanticipated usage of water, a lot of water is saved from creature wasted. The constant increasing command of the food provisions requires a rapid improvement in food production technology. This also gives much wanted rest to the farmers, as they don't have to go and revolve the pump ON/OFF. In a lot of countries like India where agriculture and the climatic conditions are isotropic, at a standstill we are not able to make full use of agricultural possessions.In an Automated Irrigation System using, the most significant advantage is that water is supplied only when the moisture in soil goes below a determined threshold value. In current times, the farmers have been using irrigation system through the labor- intensive control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when essential.

II.BASIC ELEMENTS

A.DHT11 **:**

The DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor complex. Its technology ensures the high reliability and excellent long-term stability. This sensor sense wet NTC temperature measuring devices. It has excellent quality, fast response.

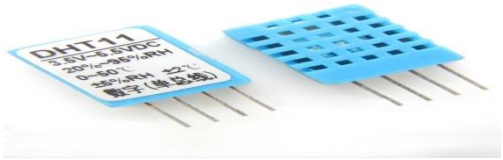

Figure 4.5 Image of DHT11 sensor

DHT11 output calibrated digital signal. It utilizes exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability. Its sensing elements are connected with 8-bit single-chip computer,Small size , low consumption & long transmission distance (20m) . Single-row packaged with four pins, making the connection very convenient.

B. MicroController:

The Atmega328p is a one of the popular microcontroller chip produced by Atmel. It is an 8-bit microcontroller that has 32K of flash memory.The Atmega328 isoneofthe microcontroller chips that are used with the popular Arduino boards.This microcontroller has analog pin and digital pin for easy interface of the sensor and other WSN circuit.Feature of the Microcontroller Operating Voltage: – 1.8 - 5.5V 23 Programmable I/OLinesTwo 8-bit Timer/CountersReal Time Counter with Separate OscillatorSix PWM Channels6-channel 10-bit ADC .

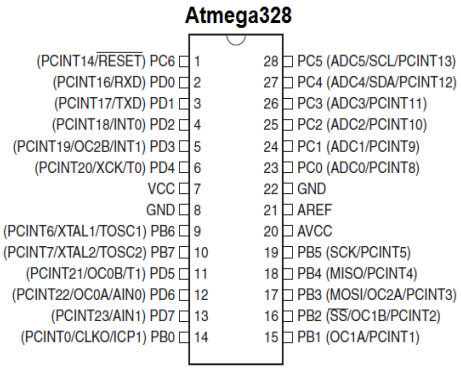

Fig 2.1 pin diagram of microcontroller

C.IOT Module(esp8266):

Wi-Fi Direct (P2P), soft-AP Integrated TCP/IP protocol stack+19.5dBm output power in 802.11b mode Supports antenna diversity,Integrated low power 32-bit CPU could be used as application processor SDIO 2.0, SPI, UART Wake up and transmit packets in < 2ms Standby power consumption.Operating Voltage3.3V

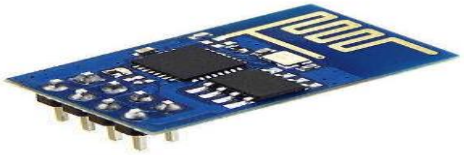

Fig 2.2 esp8266

The esp8266 module it is a 8 pin .vcc power supply.and it is operated by the voltage is 3.3v .This is exceed and it is burn the esp8266 module.GND is connected to the ground terminal.Rx pin is the receiver pin UART serial communication The Tx pin(transmitter).GPIO (general purpose input and output).Reset pin reset the module apply in 3.3v. the CH-PD pin configure channel.

D.nrf24L01

The nrfwireless transreceiver is 8 pin of the operation. GND pin it isalso used to for the ground terminal.Vcc is a power supply operated by the voltage range is 1.9v to the 3.6v and it is mostly apply the 3v .The CE pin is a select the mode of operation either is operated by transmit data or receive a data.CSN it is used to for the enable the SPI chip.SPI provise is high the clock is enable and low the clock is disable.MOSI transmit a data from user module to the external circuit.MISO receive a data from the external circuit or module then finally IRQ interrupt request pin, it does not need to connect

Fig 2.3 nrf 24L01

Connection in Wireless Communication.This communication is called as Serial Peripheral interface (SPI) A standard SPI bus consists of 4 signals, Master Out Slave In(MOSI), Master In Slave Out (MISO) , the clock (SCK), and Slave Select (SS).An SPI bus has one master and one or more slavesThe master can talk to any slave on the bus, but each slave can only talk to the master.Each slave on the bus must have it's own unique slave select signal.

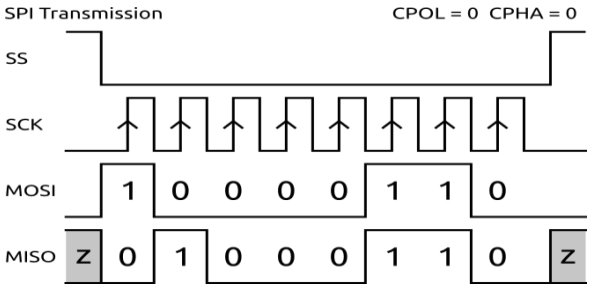

Fig 2.4 SPI method

MISO pins on both the master and slave are ties together. Even though the Signal in MISO is produced by the Slave, the line is controlled by the Master . The Master generates a clock signal at SCLK and is supplied to the clock input of the slave. Chip Select (CS) or Slave Select (SS) is used to select a particular slave by the master.

Master – Out / Slave – In or MOSI, as the name suggests, is the data generated by the Master and received by the Slave. Hence, MOSI pins on both the master and slave are connected together. Master – In / Slave – Out or MISO is the data generated by Slave and must be transmitted to Master.

Configuration of nRF24L01:

RF24 radio (CE, CS) --- mention the pin connection
Mention the pipe address
Uint64_t pipe = 0xE8E8F0F0E1LL
Radio.begin (); Start the process
Radio.openWritingPipe (pipe)
Radio.write(msg,1);
Radio.startlistening();
Radio.available() – to check any incoming message

III. SELECTED SENSORS

A. MOISTURE SENSOR:

This Moisture 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. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.The probe is normally given a frequency excitation to permit measurement of the dielectric constant.

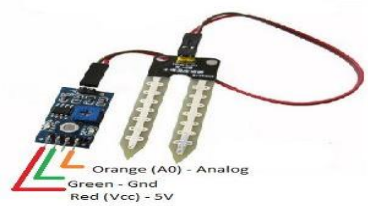

Fig 3.1 Moisture sensor

Specifications:-
1.Operating voltage: 3.3V~5V
2.Dual output mode, analog output more accurate
3.A fixed bolt hole for easy installation
4.With power indicator (red) and digital switching output indicator (green)

B.pH SENSOR:

pH levels are important in soils, irrigation water and spray tank solutions. Soil and water pH is the single most important aspect in determining nutrient availability to crops. pH levels in spray tanks determine the effectiveness of pesticides. This multi-purpose meter to help provide a healthy growing environment for all plants. It tests for soil alkalinity / acidity, soil moisture, and sunlight

Fig 3.2 pH sensor

C.Ds18B06:

The DS18B20 Digital Thermometer provides 9 to 12-bit (configurable) temperature readings which indicate the temperature of the device. The DS18B20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor. In addition, the DS18B20 can derive power directly from the data line ("parasite power"), eliminating the need for an external power supply. This sensor has been included in many applications such as Thermostatic Controls, Industrial Systems etc.

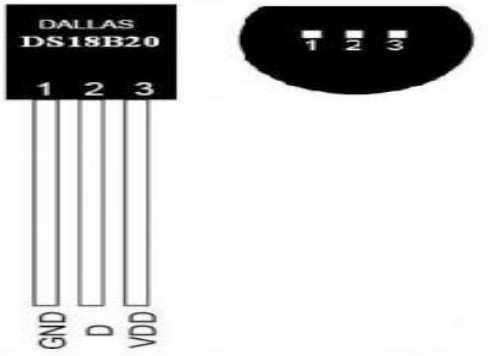

Fig 3.3 Ds18B06

IV.CIRCUIT DIAGRAM

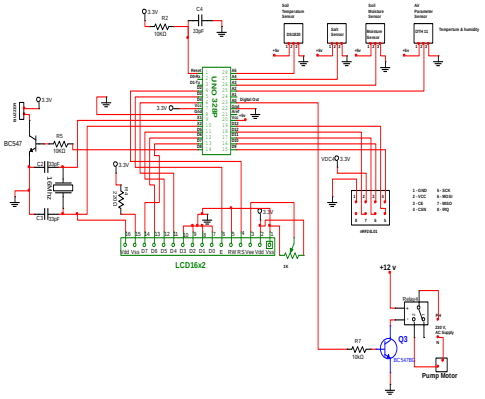

Fig 4.1Circuit Diagram –area section

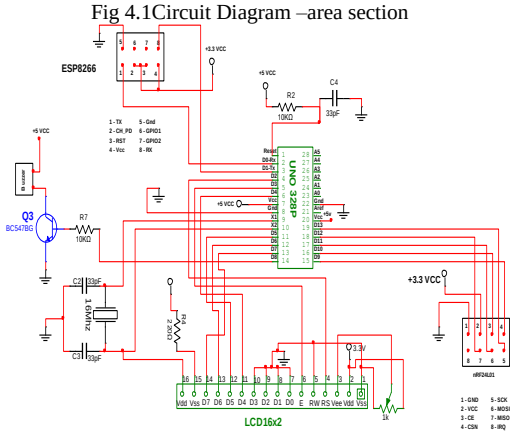

Fig 4.2 Monitor Section

The chip needs power so 2 of the pins, Vcc and GND, provide it power so that it can operate. The Atmega328 is a low-power chip, so it only needs between 1.8-5.5V of power to operate.The Atmega328 chip has an analog-to-digital converter (ADC) inside of it. This must be or else thAtmega328 wouldn't be capable of interpreting analog signals. Because there is an ADC, the chip can interpret analog input, which is why the chip has 6 pins for analog input. The ADC has 3 pins set aside for it to function- AVCC, AREF, and GND. AVCC is the power supply, positive voltage, that for the ADC. The ADC needs its own power supply in order to work. GND is the power supply ground. AREF is the reference voltage that the ADC uses to convert an analog signal to its corresponding digital value. Analog voltages higher than the reference voltage will be assigned to a digital value of 1, while analog voltages below the reference This circuit consists of ATMEGA 328 p which is used to collect the data from the sensor and post to main unit through wireless transceiver. It has 14 digital I/O pins, of which 6 can be used as PWM outputs and 6 analog input pins. These I/O pins account for 20 of the pins. 2 of the pins are for the crystal oscillator. This is to provide a clock pulse for the Atmega chip. A clock pulse is needed for synchronization so that communication can occur in synchrony between the Atmega chip and a device that it is connected to it.

voltage will be assigned the digital value of 0. Since the ADC for the Atmega328 is a 10-bit ADC, meaning it produces a 10-bit digital value, it converts an analog signal to its digital value, with the AREF value being a reference for which digital values are high or low. Thus, a portrait of an analog signal is shown by this digital value; thus, it is its digital correspondent value.

The sensor output will be analog voltage range from 0- 5v depend on the physical parameter the output voltage will be varied. These sensor output is connected to the analog port of the microcontroller. Which converts into digital data. The following formula is used to get analog with help of program.

Output voltage in analog = (Input voltage * reference voltage) / adc resolution (1023) bits

These values are used to for conditional operation. The microcontroller is used to collect data, processes data and output the data.The moisture sensor is used to sense the soil moisture content in terms of the analog voltage ranges from 0v to 5v. This moisture sensor is used to motor ON / OFF in an agriculture land. The motor ON / OFF depend the threshold value given below.

S.no	Name of the Crop	Required Moisture level
1	Paddy	45% to 65%
2.	Wheat	35% to 50%
3	Cotton	20% to 35%
4	Sugarcane	50 % to 75%
5	Green Grass	30% to 40%

Table 4.1 Moisture level for crops

These are the moisture level for some crops. From this if the moisture level is lesser than the required level, motor automatically on, after reaching threshold level motor automatically off.

V. BLOCK DIAGRAM:

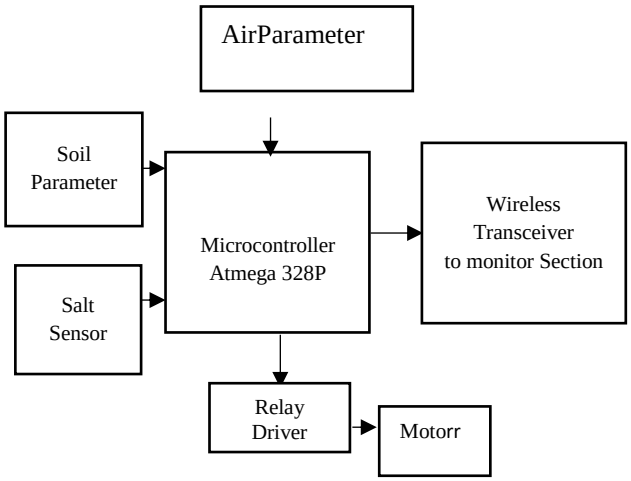

Fig 5.1 block diagram form area 1&2 section

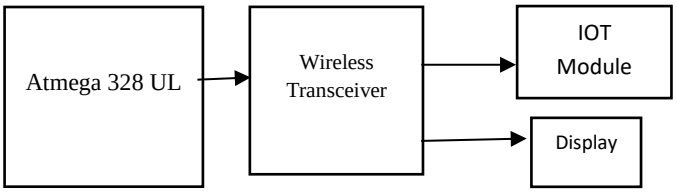

Fig 5.2 block diagram for monitor section

In the project we design to monitor agriculture land using sensors. The sensors, gives the information like air temperature, humidity, soil temperature, soil moisture and pH value of the agriculture land during the growing section. The values of sensors are fed into the microcontroller Atmega328p, simultaneously according to the moisture value relay operate motor (ON/OFF).

The values from microcontroller are transferred to the monitoring section through radio communication (Wireless transreceiver). Then the microcontroller which is in the monitor section receives the data from the transreceiver and post to the IOT with the preformatted HTML code. And the display unit displays the parameters of Agriculture land and the motor condition

VI.CONCLUSION

Automated irrigation in agriculture land proposed a novel system for efficient irrigation using WSNs. The proposed system is based on a model which performs efficient irrigation management by finding the appropriate schemes for the rational utilization of water for irrigation. The development of WSN and IOT systems, which combines efficient irrigation models along with energy efficient utilization of WSNs shows to be a very promising and effective application of automation in agriculture. The proposed model can be further extended to consider the effect of the field characteristics on the quantity of water required for irrigation. ‘Internet of Things’ is far and wide castoff in relating devices and gathering statistics.This agriculture monitoring system serves as a reliable and efficient system and corrective action can be taken. It gives the information about the temperature, humidity of the air in agricultural field through IOT to the farmer. It is cheaper in cost and consumes less power. The developed system is more efficient and beneficial for farmers. The system can be used in green house and temperature dependant plants. In future this system can be improved by adding several modern techniques like irrigation method, solar power source usage.

REFERENCES

[1] George Mois, Silviu Folea ,and Teodora Sanislav "Analysis of Three IoT-Based Wireless Sensors for Environmental Monitoring", 0018-9456 © 2017 IEEE.

[2] Dr. D.K. Sreekantha, Kavya.A.M, "Agricultural Crop Monitoring using IOT- A Study" in 2017 11th International Conference on Intelligent Systems and Control .

[3] Awati J.S,Patil V.S, And Awati S.B. "Application of wireless sensor networks for agriculture parameters" International Journal of Agriculture Sciences ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 4, Issue 3, 2012.

[4] Sonam Tenzi, Satetha Siyang, Theerapat Pobkrut, Teerakiat Kerdcharoen "Low Cost Weather Station for Climate-SmartAgriculture" 978-1-4673 90774/17/$31.00 ©2017 IEEE.

[5] Prof. K. A. Patil, Prof. N. R. Kale "A Model for Smart Agriculture Using IoT" 2016 International Conference on Global Trends in Signal Processing, Information Computing and Communication.

[6] Imtinungla, Samar Jyoti Saikia and Hemashree Bordoloi," Embedded System based Agricultural Field Monitoring System", International Journal of Electronics Engineering Research. ISSN 0975-6450 Volume 9, Number 7 (2017) pp. 977-984.

[7] Ye Na,Liu Junfeng", Smart Orchard Soil Moisture Monitoring System Based on Wireless Communication Technology" Agricultural University of Hebei M&E c 978-1-4244-6055-7/10/$26.00 ©2010 IEEE.

[8] Manijeh Keshtgary1, Amene Deljoo, "An Efficient Wireless Sensor Network for Precision Agriculture", Canadian Journal on Multimedia and Wireless Networks, Vol. 3, No. 1, January 2012.

[9] Muhamad Azman Miskam, Azwan bin Nasirudin, Inzarulfaisham Abd. Rahim "Preliminary Design on the Development of Wireless SensorNetwork for Paddy Rice Cropping Monitoring Application in Malaysia", European Journal of Scientific Research, ISSN 1450-216X Vol.37 No.4 (2009), pp.649-657© Euro Journals Publishing, Inc. 2009.

[10] Prof. Pramod T. Shitole, "Auto monitoring energy-efficient wireless sensor network system for a grape farmland" *ISSN: 2277 – 9043*,International Journal of Advanced Research in Computer Science and Electronics Engineering Volume 1, Issue 3, May 2012.