

Review on Energy Efficient Wireless Monitoring System for Agriculture

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ABSTRACT: India is an agricultural country. The Indian economy is basically agrarian. In spite of economic development and industrialization, agriculture is the backbone of the Indian economy. Agriculture uses most of available fresh water resources and this use of fresh water resources will continue to increase because of population growth and increased food demand. Increased labor costs, stricter environmental regulations and increased competition for water resources from urban areas provide strong motivation for efficient irrigation systems. In this proposed system, the implementation of an agricultural automation system using a Wireless Sensor Unit (WSU) and a Wireless Information Unit (WIU) connected with a Wi-Fi transceiver. This project will be used to optimize water use for agricultural crops.

KEYWORDS: WSU (Wireless Sensor Unit), WIU (Wireless Information Unit), Wi-Fi transceiver

I. INTRODUCTION

The age of the Internet of things comes; wireless sensor networks become the core of networking. In order to achieve greater things on the technical requirements of the Internet of things, we adopt the technology of wireless sensor network based on WIFI, PC technology designing a set of low cost, low power. The system consists of wireless sensor network nodes and network management platform. Wi-Fi node respectively transmits acquisition of the temperature and humidity data to the PC stations of gateways node. The automatic networking realizes through the many jump routing consumption, flexible automatic networking temperature humidity monitoring system of soil. And the system is a complete set of wireless sensor network induction, acquisition, storage, application, reporting, solution, has a good man computer exchange interface. Users need not go into farmland, in a corner anywhere in the world, could promptly understand the changing condition of farmland soil temperature and humidity, and scientifically guide agricultural production. The automated irrigation system will develop proves that the use of water can be diminished for a given amount of fresh biomass production. The use of solar power in this irrigation system is pertinent and significantly important for organic crops and other agricultural products that are geographically isolated; where the investment in electric power supply would be expensive the irrigation system can be adjusted to a variety of specific crop needs and requires minimum maintenance. The modular configuration of the automated irrigation system allows it to be scaled up for larger greenhouses or open fields. In addition, other applications such as temperature monitoring in compost production can be easily implemented.

1.1 MOTIVATION

Water is an insufficient natural resource, which is very essential thing to life, livelihood, food security and sustainable enlargement. Water requirement is increasing rapidly due to population growth, urbanization and lifestyle. Owing to increasing the requirement of water for domestic, industrial and energy uses, there are severe limitations in the accessibility of water for agriculture. Due to the dissimilar climatic condition, it makes difficult for further existing sequential and spatial difference in availability of water. The tremendous action like floods and drought are happened

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more frequently and affects livelihood and food security. Agriculture recognition plays an important role in improving agricultural production, productivity and mitigating the distress of farmers.

The Indian government has taken several actions for improving agricultural credit flow for farmers. But some of the farmers committed suicide by consuming pesticides, crop failure and inability to repay the debt. Essential motives behind all these suicides were lack of enough water and inadequate rainfall. Farmer's suicide mainly happens in the area of Maharashtra, delta regions of Tamilnadu, Punjab, Andhra Pradesh, Karnataka and Kerala. So, the research is conducted on field survey in Tamilnadu particularly in the districts of Namakkal, Salem and Tiruchy. The field survey is taken from the planted crops like turmeric, onion, banana, tomato, com and tapioca. After that some data are gathered and sorted out some requirements of these crops as per the information given by the farmers around. [4]Based on these information, three sensors are selected namely, temperature, soil moisture and rain sensor. The data collected from the sensors are given to the remote base station through wireless sensor networking that has been confirmed with well distinct architecture.

1.2 OBJECTIVES

- The automated irrigation system consists of two units, Wireless Sensor Unit (WSU) and Wireless Information Unit (WIU) connected with Wi-Fi transceiver.
- It permits the transfer of soil moisture, temperature and solar charging data that implemented in wireless sensor unit. If the data's are reached above the threshold value, it activates the automated irrigation system. WIU also has Wi-Fi module to transmit the data's to the monitor unit through local access and the information were monitored offline by using graphical application on mobile or PC.
- A wireless sensor unit consists of Wi-Fi transceiver, sensor, a microcontroller and power source. Number of wireless sensor units can be arranged in field at different places to construct a distributed sensor network for automated irrigation system.

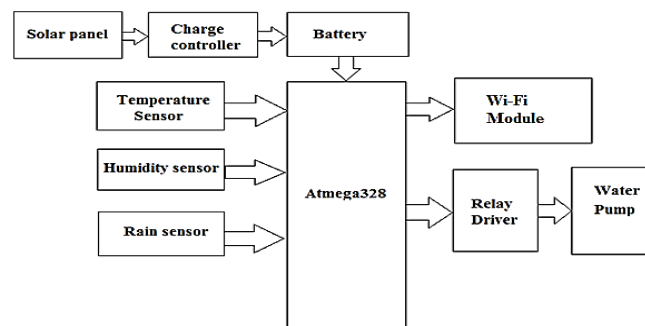


Fig .1.1 Block Diagram of Wireless sensor unite (WSU)

• Wireless Field Sensor Unit

This section describes about wireless field sensor unit. The fig 1.1 shows the block diagram of a field sensor unit. A field sensor unit contains, AVR micro-controller, WIFI module, different sensors, motor and power supply circuit. Several field sensor units are placed in-field to configure sensor network for the automated irrigation system.

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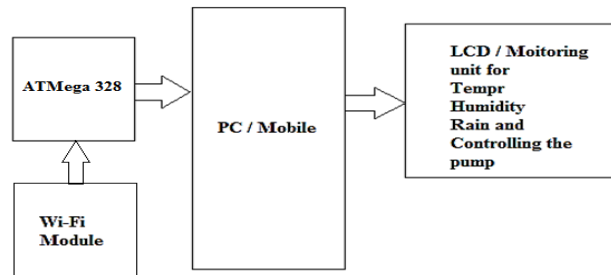


Fig .1.2 Block Diagram of Wireless Information Unit (WIU)

- **Wireless Field Information Unit**

The fig.1.2 shows the block diagram of a wireless field information unit. The soil moisture sensor, temperature sensor and water level sensor values from each field sensor unit information are send through WIFI module, identified, recorded, and analyzed in the field information unit. The field information unit consists of AVR micro- controller, WIFI module. This processed information i.e., status of all these sensors is send to PC by using WIFI technology

II. RELATED WORK

The automated irrigation system [1] developed proves that the use of water can be diminished for a given amount of fresh biomass production. The use of solar power in this irrigation system is pertinent and significantly important for organic crops and other agricultural products that are geographically isolated; where the investment in electric power supply would be expensive the irrigation system can be adjusted to a variety of specific crop needs and requires minimum maintenance. The modular configuration of the automated irrigation system allows it to be scaled up for larger greenhouses or open fields. In addition, other applications such as temperature monitoring in compost production can be easily implemented. The Internet controlled duplex communication system provides a powerful decision making device concept for adaptation to several cultivation scenarios.

Furthermore, the Internet link allows the supervision through mobile telecommunication devices, such as a Smartphone. The automatic irrigation and fertilisation system [2] that has been implemented at relatively low cost which is user friendly with the help of ZIGBEE network. The simulation is done with the help of Keil C software. In this system ZIGBEE protocols replaces the wired irrigation system provides operating range much higher as compared to other wireless. With the use of ZIGBEE based automation circuit considerable amount of power saving is possible and it is flexible and compatible with future technologies so it can be easily customized for individual requirements. This system proves to be a real time feedback control system which monitors and controls all the activities of irrigation system efficiently. Our research idea provides irrigation to larger areas of plants with less water consumption. Using this system, one can save manpower, and water to improve production and ultimately profit. Embedded System Design for Irrigating Field with Different Crops Using Soil Moisture Sensor [3] be used to implement efficient irrigation scheme for the field having different crops. The system can be further enhanced by using fuzzy logic controller. The fuzzy logic scheme is used to increase the accuracy of the measured value and assists in decision making. Programmable Irrigation Control System Using Li-Fi [4] developed proves that the use of water can be diminished for a given amount of fresh biomass production. The irrigation system can be adjusted to a variety of specific crop needs and requires minimum maintenance. The modular configuration of the automated irrigation system allows it to be scaled up for larger greenhouses or open fields. In addition, other applications such as temperature monitoring in compost production can be easily implemented. The LI-FI communication and Internet connection allows the data inspection in real time on a website. Irrigation System Using a Wireless Sensor Network and GPRS [5] can be adjusted to a variety of specific crop needs and requires minimum maintenance. Using this system we can monitor the status of all the sensors (Soil moisture, Temperature, Water level) and also the ON/OFF status of the motor and Fan The some

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system highlights the development of temperature and soil moisture sensor that can be placed on suitable locations on field for monitoring of temperature and moisture of soil, the two parameters to which the crops are susceptible.

2.2 SUMMARY

The sensing system is based on a feedback control mechanism with a centralized control unit which regulates the flow of water on to the field in the real time based on the instantaneous temperature and moisture values. Automation of Irrigation System Using ANN based Controller described a simple approach to Irrigation control problem using Artificial Neural Network Controller. The proposed system is compared with ON/OFF controller and it is shown that ON/OFF Controller based System fails miserably because of its limitations. On the other hand ANN based approach has resulted in possible implementation of better and more efficient control. These controllers do not require a prior knowledge of system and have inherent ability to adapt to the changing conditions unlike conventional methods.

III. EXPERIMENTAL RESULTS

3.1 SIMULATION AND RESULT

AVR (ATMEGA 328)

The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes.

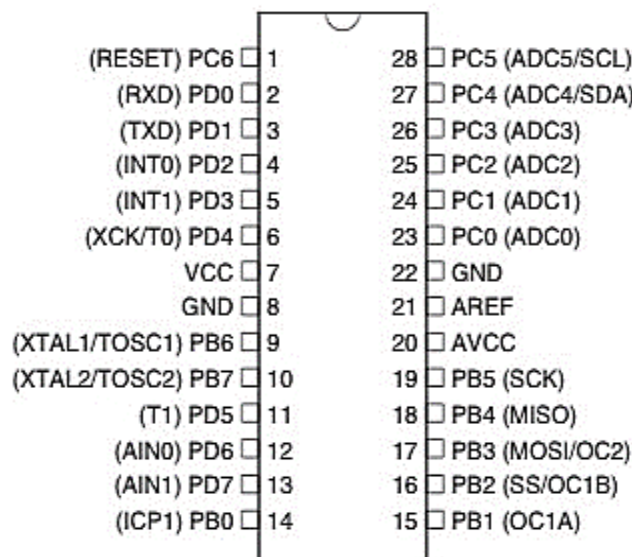


Fig.3.1 Pin Diagram of ATMEGA328

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This controller operates between 1.8-5.5 volts as 28 pin IC is used shown in fig. 3.3. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz,

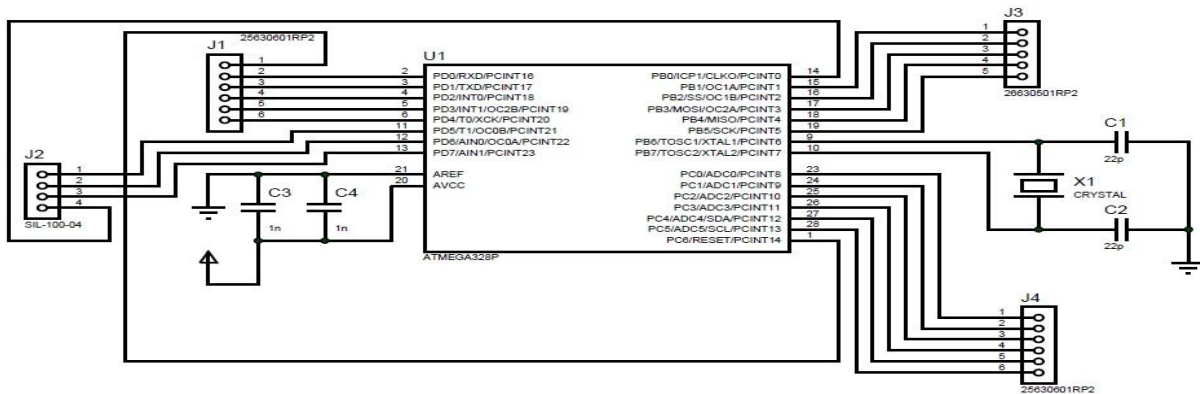


Fig. 3.2 Circuit diagram of Atmega 328 microcontroller circuit connection

Parameter	Value
Flash (Kbytes):	32 Kbytes
Pin Count:	28
Max. Operating Freq. (MHz):	20 MHz
CPU:	8-bit AVR
No. of Touch Channels:	16
Max I/O Pins:	23
Ext Interrupts:	24

Table No. 3.3 Parameters of ATMEGA328

Program code

```
#include <dht.h>
dht DHT;
#define DHT11_PIN 13
const int soilPin = 6;
const int pumpPin = 14;
int soilState = 0;
void setup()
{
  Serial.begin(9600);
  pinMode(pumpPin, OUTPUT);
  pinMode(soilPin, INPUT);
  {
    soilState = digitalRead(soilPin);
    while(1)
    {
      int chk = DHT.read11(DHT11_PIN);
      Serial.print("Temperature = ");
      Serial.println(DHT.temperature);
      Serial.print("Humidity = ");
      Serial.println(DHT.humidity);
      if(soilState == HIGH)
      {
        Serial.println("soil is dry");
      }
    }
  }
}
```

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else

using arduino.cc program has been feed into atmega328 microcontroller to run the project ideas.

3.2 Simulation Result

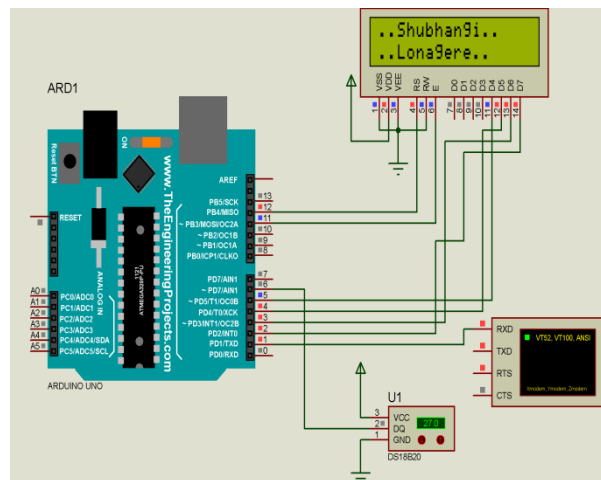


Fig .circuit simulation using proteus software

IV. CONCLUSION

We have implemented an wireless monitoring system for agriculture system using wi-fi module .system thus uses atmega328 microcontroller using wi-fi module and send information by sensors

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