Design of Monitoring System in Smart Agriculture Environment
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Abstract. With the development of smart agricultural technology, traditional agriculture has also begun to shift to intelligent control. This article integrates wireless sensor network, wireless video monitoring network with Internet. From the collection of farm environmental parameters to real-time video monitoring of crop growth, data is eventually transmitted to the monitoring center. The environmental parameters of farmland and crop growth can be monitored in real time.

Introduction
With the continuous development of information science and technology, agricultural production has been further improved. Traditional agricultural production has restricted the development of agriculture, so the direction of intelligent agricultural control will become a focus of future research. The main research areas include agricultural automation control, intelligent management, and real-time monitoring of crop growth. At present, Smart agriculture mainly uses the Internet of Things technology, control devices, and sensor devices. The control center software system displays data obtained from field sensors such as temperature and humidity, PH value, carbon dioxide content, soil nutrients and other data information. This information provides a strong basis for decision makers to provide real-time monitoring of farmland, thereby ensuring the best environment for crop growth. The use of various sensors to measure the environment in which crops are grown can provide scientific basis for the precise control of greenhouses, the realization of increased yields, and improved quality.

Intelligent Agricultural Monitoring System Design
Overall System Design
The Internet of Things-based Smart Agricultural Monitoring System The overall structure frame is shown in Fig. 1, including the acquisition of information module, real-time monitoring module, and control monitoring center.
Firstly, using n irrigation control valves and E-201-c-9PH monitoring, TDR-3 soil temperature and humidity sensor, SH-300-ND CO2 monitoring to m ZigBee wireless routing to send control commands to m ZigBee wireless routes to obtain the measured soil data. The monitoring data is then sent to the wireless gateway, which sends temperature and humidity control commands to the monitoring center via Wi-Fi wireless communication. Finally, using n high-definition video surveillance nodes to m Wi-Fi wireless routes to send surveillance video, and monitoring data through the wireless communication network to the wireless gateway, wireless gateway will be the final information uploaded to the monitoring center, monitoring.

Hardware Design (Information Acquisition)
Perceived Node Design. The perceptive node is composed of soil temperature and humidity sensor, carbon dioxide concentration sensor, water environment PH sensor, etc. The perceived node hardware design is shown in Fig. 2.
1. Temperature and humidity sensors
   Soil has a very important parameter, that is, the dielectric constant of the soil, and the second is the amount of water reflects the soil dielectric constant important parameters. Using the TDR-3 soil moisture detection sensor, you can get a percentage of the volume of soil moisture in total volume, which is not relevant to the nature of the soil itself, which is currently the most popular method of soil moisture measurement in the world.

2. CARBON dioxide concentration sensor
   Dual-beam infrared CARBON dioxide sensor module SH-300-ND dual-beam CO2 sensor, suitable for small-size products installed CARBON dioxide sensor applications, with high precision, high temperature resistance characteristics.

3. PH value sensor
   E-201-C-9 PH composite electrode detection sensor, the electrode is a combination of PH glass electrode and reference electrode composite electrode, which is a composite electrode to detect the PH value of the liquid.
**Microcontrollers.** The C8051F350 is a highly integrated hybrid signal 8-bit microcontroller (MCU) with a powerful 8051 core and 50MHz performance. This analog-intensive MCU has 24-bit, 8-channel, 1 ksps ADC, 8-bit, 2-channel DAC, 1 comparator, and an on-chip temperature sensor. The C8051F350 also offers 8kb flash memory, 0.75kb RAM, plus additional communication interfaces and 4x 16-bit timers (9x9mm, QFP32). The C8051F350 microcontroller has an on-chip POR, VDD display, watchdog timer, an internal oscillator of 2 and high analog integration, suitable for this test microcontroller.

**Control Center Software Design**

The control center mainly displays the collected data. The monitoring center foreground is developed using the operating system Microsoft win7, the server with the Apache-tomcat-11.0 configuration environment, and the JSP program. The BACKGROUND uses my SQL database, including database table design and establishment. Through the visual interface design, users can easily select the information they need for viewing, video surveillance, data statistical analysis and so on.

![Soil Moisture Display](image1.png)

**Figure 3. Soil Moisture Display.**

![Soil Temperature Display](image2.png)

**Figure 4. Soil Temperature Display.**
System Testing

A test field in the North China Plain was selected, and two test nodes at different positions were selected. Soil moisture monitoring at two nodes is shown in Fig. 3 (above). Soil temperature monitoring is shown in Fig. 4 (above).

Summary

The system is designed to include the acquisition of information module, real-time monitoring module, control monitoring center. The combination of wireless sensor and PC web end realizes the function of real-time collection and web side data display of crop growth environment in farmland. In the case of farmland in an area of the North China Plain, the changes in soil moisture and temperature in the area, the acidity and alkalinity of the soil and the concentration of carbon dioxide were tested. These can clearly provide users with a basis for planting.

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