International Core Journal of Engineering Volume 8 Issue 2, 2022
ISSN: 2414-1895 DOI: 10.6919/ICJE.202202_8(2).0091

Personalized Intelligent Farming System based on Internet of Things and Mobile Application

Jiale Li

Ningbo ladder Education Technology Co., Ltd, Ningbo 315000, China

Abstract

This paper introduces an agricultural expert system which is relied on cloud computing platform, aiming at realizing low cost, reliability, energy-saving, intelligence and environment-friendly agricultural production management, thus improving agricultural productivity and quality of farm products. This system is a kind of intelligent agricultural monitoring and management platform applied to intelligent greenhouse in combination of the Internet of Things, mobile internet and big data technology.

Keywords

Intelligent Agriculture; Internet of Things; Mobile Internet; Data Analysis.

1. Introduction

Intelligent agriculture proposes to promote “Internet +” modern agriculture, apply modern information technologies of Internet of Things, cloud computing, big data and mobile connectivity to promote the transformation and upgrading of the entire agricultural industry chain. Intelligent meteorology and agricultural remote sensing technology should be developed. The entire agricultural industry chain will be transformed and upgraded.

At present, most of China's agricultural production mainly relies on manual labor with experience, lacks of systematic scientific guidance. This occupies huge labor force with lower efficient. On the call of promoting "Internet plus" modern agriculture by the country, the development of this project has far-reaching influence on the process of agricultural modernization in accordance with the 13th Five-Year Plan.

2. System Overview

The intelligent farming system consists of three parts which are agricultural greenhouses, Web terminal and mobile terminal. The COM line connects the intelligent agricultural greenhouses and the intelligent data gateway, and WIFI or Internet connects the remote database data to the Web end and the mobile end. The on-site monitoring system transmits the data collected by sensors to the web terminal and the mobile terminal through the internet network, and also sends the control instructions sent by the mobile terminal to the equipment needed to be controlled in the farmland. Relevant collected environmental data are stored in the database. In addition, the system also provides a display interface for web users and mobile users, and the web side will process and release the received relevant data and video information to the interface in the form of charts. Users can clearly understand farmland information.

ISSN: 2414-1895 DOI: 10.6919/ICJE.202202_8(2).0091

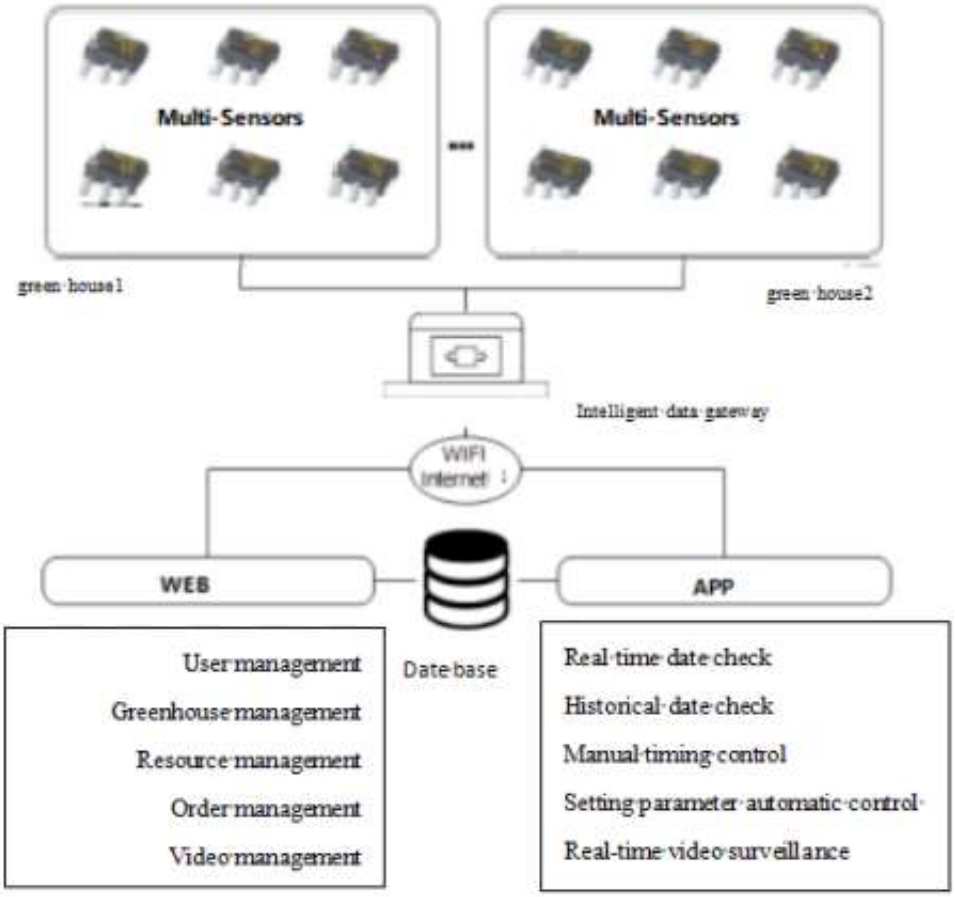

Figure 1. System frame chart

3. System Hardware Design

The hardware environment of system is designed based on the development of wireless sensor platform. The system is divided into three parts: remote client, Internet of Things server and intelligent agricultural sand table. Among them, the client can connect with the server through the internet or wireless network, while the smart agricultural sand table connects with the server through networking. In the sensing layer of the Internet of Things, data collection and feedback control of physical quantities of various sensors are realized through wireless networking or field bus. The data are gathered to the server through the network, and then the server realizes wide-area data distribution through the network and intelligent interaction with various terminals.

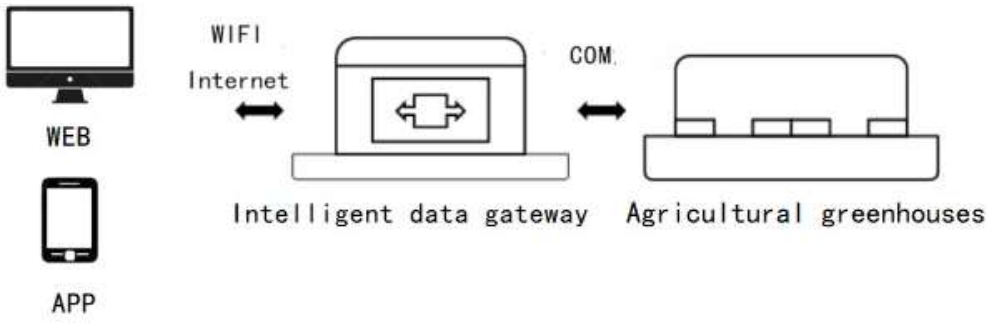

Figure 2. Hardware connection diagram

ISSN: 2414-1895 DOI: 10.6919/ICJE.202202_8(2).0091

4. Network Topology

The intelligent agricultural sand table is a comprehensive monitoring platform integrating analog quantity/ switch signal acquisition, relay control and RS-232 serial port communication, it is accurate and reliable in measurement, simple and convenient in operating and debugging of sensors to collect working environment data, being suitable for the collection of relevant data and equipment control of agricultural greenhouses. The sand table can connect with Wifi and transfer the collected data to an environmental parameter collector with the help of an environmental temperature and humidity sensor, a PM2.5 sensor, an illumination intensity sensor, a soil temperature and humidity sensor, a carbon dioxide sensor equipped in it. The Administrators can use a variety of terminals to carry out system maintenance and daily management, and view data reports and data analysis.

5. System Software Platform Design

5.1 Functional Description

The system is divided into an administrator module and a user module, wherein the administrator module has the functions of user management, greenhouse management, resource management, control command management and the like. The user module can inquire real-time data according to its own authority.

The functions of user module mainly include system registration and login, remote monitoring (which can monitor air temperature and humidity), soil temperature and humidity, light intensity and carbon dioxide concentration; Remote control (turns on and off the fan, LED lamp and water pump on mobile side), system settings (the settings of air temperature, humidity, soil humidity, light intensity, carbon dioxide concentration threshold).

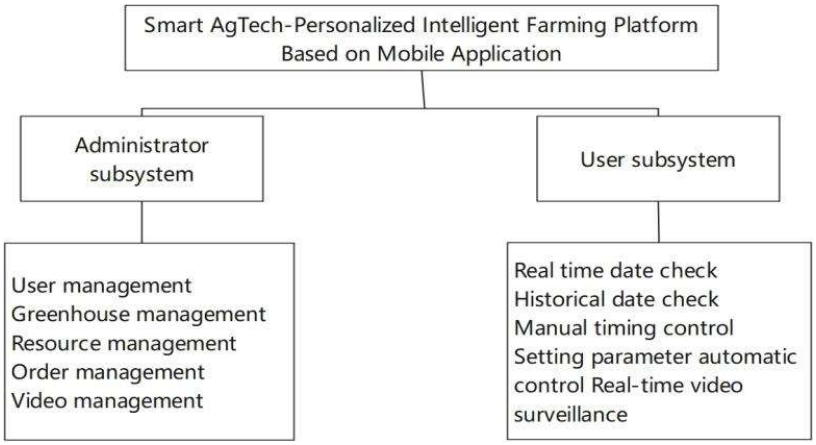

Figure 3. functional Module diagram

5.2 Software Design

5.2.1Mobile Side

The system is mainly based on mobile phone APP for users. As Android system development can freely customize the operating interface, it is easier to use and intelligent. So Android platform is chosen to obtain various data of sensor nodes. In the aspect of data statistics, various data are presented in the form of graphs, which can control the automatic adjustment threshold of sensor nodes, and can manually turn on the adjustment switches of fans, water valves, etc.

The data monitoring function mainly provides five important indexes of agriculture: temperature, humidity, light intensity, carbon dioxide concentration and PH2.5 concentration, and can be displayed to users more intuitively in the form of line charts. Furthermore, the system also provides real-time video monitoring which mainly includes the adjustment of the following four switches: fan, alarm, electric light and sluice. Users can watch the monitoring and make simple operations such as watering

ISSN: 2414-1895 DOI: 10.6919/ICJE.202202_8(2).0091

through mobile phone APP. The user can also set the highest threshold through APP. When the data detected by the sensor exceeds the highest threshold, the alarm will sound automatically and APP will send a notification to the mobile phone user.

Figure 4. user interface diagram

5.2.2Web Side Application

The Web side of the system is designed for administrators, mainly assisting administrators to identify and manage land conveniently and quickly. Administrators can choose to add different kinds of planting areas, and then classify and manage different crops according to different areas. Administrators can monitor in real time on the system page the data of temperature, humidity, light intensity, carbon dioxide concentration and PH2.5 concentration which can be presented in the form of polyline statistical graph on the system page. The commands can be sent to adjust switches such as fans, alarms, lights, etc. In addition, the system can analyze the received data, making more accurate management of crops.

Figure 5. WEB Side User Interface

ISSN: 2414-1895 DOI: 10.6919/ICJE.202202_8(2).0091

6. Conclusion

The system realizes intelligent monitoring and management of agricultural production, enabling the agricultural production links more scientific. The system collects corresponding data through sensors such as temperature, humidity, light intensity, carbon dioxide concentration and PH2.5 concentration, and transmits the data to the gateway through COM line. The system realizes real-time display of environmental parameters of agricultural greenhouses and remote control of simple equipment in greenhouses to ensure data stability.

References

[1] Yuan Xiaoping, Xu Jiang, Hou Pan Feng. Intelligent Agricultural Monitoring System Based on Internet of Things [J]. Jiangsu Agricultural Science2019, 43(3):376-378.

[2] Zhang Shizhen. Intelligent Agricultural Monitoring System Based on Internet [J]. Journal of Hubei University of Technology2020, 31(4):86-87.

[3] Tian Min, Fei Xiaowei, Zhao Dizhi, Xin Guolong. Research on Facility Agriculture Monitoring System Based on Internet of Things [J]. Wireless Interconnection Technology2018, (6):28-30.

[4] Song Yan, Cheng Gailan. Design of Agricultural Planting Environment Monitoring System Based on Internet of Things Technology [J]. Electronic Design Engineering, 2019, 22(8):101-103.

[5] Huang Ying, Zhang Wei. Intelligent Agricultural Monitoring System Based on Internet of Things [J]. Internet of Things Technology 2017, (4):33-34.