

A Review on Smart IOT Gateway for Agricultural Greenhouse

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Abstract

In the world of automation, traditional forms of agriculture can't satisfy people's needs, so the way of agriculture must be change to satisfy people's needs. That's why the remote monitoring and control of greenhouse is essential. And the greenhouse monitoring system satisfy the real time control of the greenhouse and increase production .So ,In this project the design of the gateway will be introduced and the gateway is the core of the system. The IOT gateway is a join point of public network and wireless sensor network in greenhouse monitoring and control system .And the function of the gateway is realized data gathering,upload and processing remote user control information .The IOT gateway is used as part of the greenhouse monitoring system. This design is compatible with LAN, Wi-fi, GPRS, EDGE, 3G and so on, also the data can store locally. The IOT gateway uses ESP8266 and Arduino as the embedded processor. The application demonstrates the gateway is reliable, compatible, and extendible. Because of this gateway the greenhouse monitoring system realized the real-time detection and control of the greenhouse, and improved the ability of the automation and the intelligent of the greenhouse monitoring.

Keywords-IOT Gateway, ESP8266, Arduino Controller-Board.

I. INTRODUCTION

With the development of our society, Old forms of agriculture can't satisfy people's needs, so agriculture must be change to satisfy people's needs. The development of Internet technology has brought light to the of improvement agricultural modernization, agricultural Internet of things has become the certain trend of agricultural information. Through the remote monitoring and control of greenhouse, the greenhouse monitoring system realized the exact measurement and real time control of the greenhouse. Also the greenhouse monitoring system can improved by the scientific management methods, improve crop disaster prevention ability and increase production. The greenhouse monitoring system is designed to satisfy the need of the remote monitoring system and command of greenhouse. In this project the design of the gateway will be introduced and the gateway is the core of the system. The IOT gateway is a main join point of public network and wireless sensor network in greenhouse monitoring and control system. And the function of the gateway is realized data collection, upload and processing remote user control information. The gateway is based on modern method and the using of the method improved the compatibility and better meets the needs of complex agricultural environment.

II. LITERATURE SURVEY

In this paper suggests a way to understand the transmission between wireless sensor network and therefore the Internet. The IOT (Internet of Things) gateway is employed as a part of the greenhouse monitoring system. the planning compatible multiple access method like LAN, Wifi, GPRS, EDGE, 3G then on, also the info can stored locally. The IOT gateway uses STM32 because the MCU, μ C/OS-III because the embedded OS . the appliance demonstrates the gateway is reliable, compatible, and extendible. due to this gateway the greenhouse monitoring system realized the real-time detection and control of the greenhouse, and improved the power of the automation and therefore the intelligent of the greenhouse monitoring. The IOT gateway connect wireless sensor network with the web , make

sure the operation of the greenhouse monitoring system, and make it convenient to remote monitoring large-scale greenhouse, also make it easy to proper planting. the sensible application approved that the gateway run good within the greenhouse monitoring system, the environment data of the greenhouse can transfer reliably, and therefore the control instruction sent timely. This design realizes remote intelligent monitoring and control of greenhouse, and is useful to farms to scientific and rational planting crops. So this design has certain useful to popularize[1].

This paper shows the technology LORA. The technology of LoRa WAN is employed here, because it provides features like low power and wide selection which are desired for this application. The LoRa technology is to supply ranges between 5 and 10 km, and its average battery life is about 5–11 years. this is often highly desirable in farming considering the vast area of implementation of the system. LoRa WAN allows around thousand nodes to be attributed to at least one gateway. The battery life and its low power consumption also make the system implementation more economical. The prototype model system would contain sensors and actuators which might be interfaced using STM Nucleo embed Board. Three sensors, namely the soil moisture sensor, light sensor, and therefore the temperature sensor, are to be used to measure the greenhouse parameters. The corresponding actuators would trigger the irrigation system, lighting system, and therefore the ventilation, respectively. The ventilation consists of fans and roof vents to supply circulation of air inside the green. during this paper suggests a way to understand the transmission between wireless sensor network and therefore the Internet. The IOT (Internet of Things) gateway is employed as a part of the greenhouse monitoring system. The planning compatible multiple access method like LAN, Wifi, GPRS, EDGE, 3G then on, also the info can stored locally. The IOT gateway uses STM32 because the MCU, μ C/OS-III because the embedded OS. the appliance demonstrates the gateway is reliable, compatible, and extendible. due to this gateway the greenhouse monitoring system realized the real-time detection and control of the greenhouse, and improved the power of the automation and therefore the intelligent of the greenhouse monitoring. The IOT gateway connect wireless sensor network with the web, make sure the operation of the greenhouse monitoring system, and make it convenient to remote monitoring large-scale greenhouse, also make it easy to proper planting. the sensible application approved that the gateway run good within the greenhouse monitoring system, the environment data of the greenhouse can transfer reliably, and therefore the control instruction sent timely. This design realizes remote intelligent monitoring and control of greenhouse, and is useful to farms to scientific and rational planting crops. So this design has certain useful to popularize[2].

The study was conducted during a greenhouse with a floor area of 150 m² where side walls were covered with double layer polyethylene (PE) with a niche of 5 cm and roof was covered with single layer PE building material. the most station was positioned outside the greenhouse. Sensor nodes were positioned 20 meters faraway from the most station within the greenhouse. The research lasted for 20 days between March 20 and April 10. Temperature, ratio and signal strength values were transferred to the most station every five minutes because of the micro-processor software. The obtained data were used to statistically assess the signal strength performance of sensor nodes. The findings demonstrated that prime ratio influenced signal strength positively while heat influenced signal strength negatively. In the field of agriculture, WSN may help

1. Collect weather, plant and soil data
2. Monitoring of distributed land
3. Grow various plants during a single land
4. Offer proactive solutions rather than reactive solutions (Abbasi et al., 2014)[3].

This paper will give us knowledge about system using MySQL database and monitoring. And one among the new technique is “pocket greenhouse” is introduced. This system consists of local monitoring module, server and Android client. The local monitoring module accomplishes data acquisition and device control through CAN bus, and interacts with Android client via the MySQL database. Media streaming server is developed using Real Time Streaming Protocol (RTSP) to realize the greenhouse remote video monitoring. Android client with user-friendly interfaces can realize real-time data display, historical data query, parameter setting, device control, video monitoring etc. Using this technique, people can realize real-time and long-distance scientific management of greenhouse. and therefore the labour intensity are often reduced, what's more, the extent of greenhouse automation monitoring are often improved. In this work, an Android-based modern greenhouse remote monitoring system was developed, which mixes RTSP, JSON format data parsing and other techniques together

and is capable of achieving safe and reliable real-time monitoring on greenhouse. However, there are some problems with this work needing further study like improving the intelligent control algorithm and smoother video playing. On the entire , the scientific and intelligent management on "pocket greenhouse" has basically come true[4].

III. SYSTEM BLOCK DIAGRAM

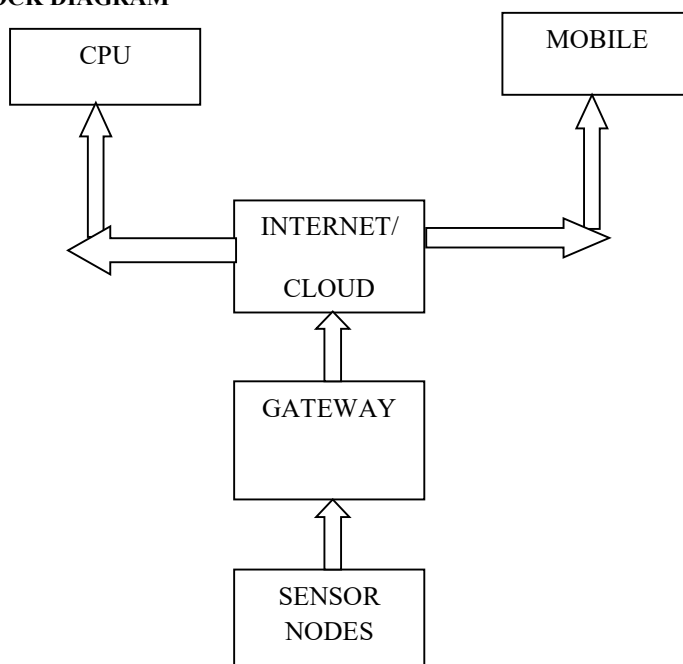


Fig1:Block Diagram of System

This greenhouse monitoring and system is meant to unravel the matter when there are dozens of greenhouses in agricultural production base. If each greenhouse communicates with the remote server independently, the development is big and therefore the cost is high. So we'd like gateway to gathering data and send to the remote server unified. The greenhouse monitoring and system is formed from the acquisition and system within the greenhouses, the gateway and therefore the upper computer. In terms of function, the greenhouse monitoring and system includes acquisition and control two parts. The function of acquisition is transfer data from Wi-Fi to controller, and then the controller encapsulate data into the appropriate format and transfer to the upper computer. The function of controller is transfer data from upper computer to controller, and then the controller encapsulate data into the appropriate format and transfer to the acquisition and control system to the nodes.

IV. FLOWCHART

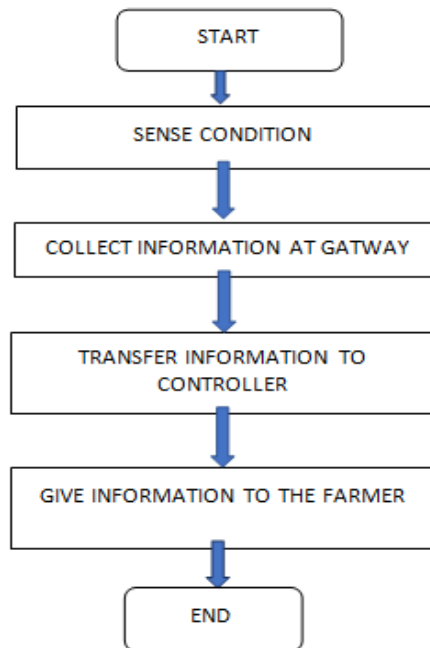


Fig. 2: System flowchart

V. HARDWARE DESCRIPTION

1. GATEWAY:

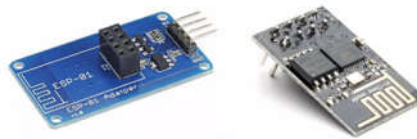


Fig 2: ESP8266

The ESP 8266 wi-fi module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your wi-fi network. The ESP8266 is capable of either hosting an application or offloading all wi-fi networking function from another processor.



2. ARDUINO:

Fig. 3 : Arduino Board

The Uno allows for faster transfer rates, no drivers needed for Linux or Mac (inf file for Windows is needed), and the ability to have the Uno show up as a keyboard, mouse, joystick, etc. UNO development board is 100% compatible with original Arduino DIY, now it has perfect quality and performance.

Arduino is an open-source physical computing platform based on a simple i/o board and a

development environment that implements the processing / wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer (e.g. Flash, Processing, MaxMSP).

3. SENSORS:

Fig. 4. DHT11 Sensor



a) DHT11 Sensor:

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old.

b) Soil Moisture sensor(LM393):



Fig. 5: Soil Moisture

The two probes on the sensor act as variable resistors. Water is conductive, so the more water in the soil, the better the conductivity and the lower the resistance with a higher SIG out. Use it in a home automated watering system, hook it up to IoT.

Interface Description (4-wire)

1. VCC: 3 V-5V
2. GND: GND
3. DO: digital output interface (0 and 1)
4. AO: Analog Output Interface

c) Water Level Sensor:



Fig 6: Water Level Sensor

Water Sensor water level sensor is an easy-to-use, cost-effective high level/drop recognition sensor, which is obtained by having a series of parallel wires exposed traces measured droplets/water volume

in order to determine the water level. Easy to complete water to analog signal conversion and output analog values can be directly read Arduino development board to achieve the level alarm effect.

VI. SOFTWARE DISCRPTION

1)Arduino IDE:

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.



Fig 7: Arduino IDE

VII. CONCLUSION

The IOT gateway connect wireless sensor network with the Internet, ensure the operation of the greenhouse monitoring system, and make it convenient to remote monitoring large-scale greenhouse, also make it easy for planting. The practical application approved that the gateway run easily in the greenhouse monitoring system, the environment data of the greenhouse can transfer reliably, and the control instruction sent timely. This design realizes remote intelligent monitoring and control of greenhouse, and is helpful to farms to scientific and rational planting crops. So this design has certain of value to popularize.

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