

Design and Implementation of Temperature and Humidity Detection System Based on NB-IoT

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Introduction

The temperature and humidity detection system based on NB-IoT is different from the temperature and humidity detection system of other technologies. First, the network coverage and stability are different. NB-IoT network has wide coverage and good stability. Based on Wi-Fi or Bluetooth network coverage is limited, vulnerable to environmental impact. Second, NB-IoT nodes have ultra-low power consumption characteristics, and the battery can work for 5-10 years; Wi-Fi or Bluetooth nodes have high power consumption, and battery life is usually very short, such as a few months. The third is that the NB-IoT network supports massive connections, and a single base station can reach 100.000 connections: Wi-Fi or Bluetooth network maximum number of connections is low, and hundreds of connections will be congested.

Therefore, this paper studies the design and implementation of temperature and humidity detection system based on NB-IoT, which can avoid the above problems. The design and implementation of this system are pivotal in advancing the integration of the Internet of Things and communication technology, thereby fostering innovation and progress in environmental monitoring technology. Furthermore, it provides solid foundational support for the further exploration and utilization of Internet of Things technology. Concurrently, by enabling remote monitoring and management, it serves to minimize labor costs, significantly elevates the efficiency of environmental monitoring, facilitates industrial modernization and transformation in related sectors, and ultimately enhances product quality and market competitiveness.

Methodologies

The system uses temperature and humidity sensors to collect data, and controls the system through STM32L151C8T6.

It uses NB IoT wireless communication technology to upload the collected data to the cloud platform, and sends instructions to control temperature and humidity through the cloud platform.

Research Questions

The issues studied in this paper include

- 1) Network coverage and stability
- 2) Power consumption
- 3) Number of connections





The hardware structure of the system is composed of main control module, data acquisition module, voice alarm module, wireless communication module, display module and power module.

The STM32L151C8T6 as the primary control unit, is responsible for processing data measured by the sensor and transmitting it to the cloud platform via the wireless communication module. The NB-IoT technology, which boasts a coverage range of approximately 20 kilometers in open areas, is capable of penetrating certain buildings. Furthermore, as NB-IoT is based on cellular networks, it offers superior connectivity range and enhanced signal penetration.

Conclusion

Using NB-IoT technology, the system has the characteristics of low power consumption, wide coverage, mass connection, etc., which can meet the requirements of low power consumption and low cost of the system. Its application range is light, high feasibility, and is currently one of the important choices in the intelligent industry.

As sensor technology continues to advance, there is potential to delve deeper into the realm of higher precision temperature and humidity sensors, thereby enhancing the accuracy of system data acquisition. Concurrently, by optimizing algorithms and hardware design, we aim to bolster the stability and reliability of the system. The incorporation of artificial intelligence and machine learning technologies enables the temperature and humidity detection system to attain a level of intelligence and self-adaptability.