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Research Article

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Temperature and humidity measurement experiment using Zigbee core board

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Abstract The main purpose is to use Zigbee to practice software operations first, and then understand the principles of Zigbee for more complex applications. The simplest test is to practice measuring temperature and humidity first, so the focus of this experiment is to use the core board produced by An-lan-der and use the CC2530 chip of TI to design. The backplane has a serial port to combine with the core board. This is to use the emulator combined with IAR's IDE (integrated development environment) to compile the programming language. After the compiled code has been completed, the corresponding number of serial port is selected and driver is installed then the machine code will be transferred inside the core board. The measurement results are displayed on the screen, and the experimental results can meet the system requirements and are accurate.

Keywords Zigbee, Temperature control, Humidity

1. Introduction

Zigbee is a low-power, low-cost wireless communication technology that can be used in many different applications, including temperature and humidity measurement. Here are a few possible application scenarios [1]-[5]. Home automation: In home automation solutions, Zigbee temperature and humidity sensors can be used to monitor the environmental conditions of rooms, such as living rooms, bedrooms, kitchens, etc. These sensors can be linked with smart home controllers to automatically adjust indoor temperature and humidity when needed to improve living comfort. Agriculture: In agriculture, Zigbee temperature and humidity sensors can be used to monitor environmental conditions such as greenhouses and plant growth chambers to ensure the stability and optimal conditions of the plant growth environment. Industrial: In industrial applications, Zigbee temperature and humidity sensors can be used to monitor machines and equipment in factories to ensure they are operating within normal operating ranges and to help predict possible failures. Healthcare: In healthcare applications, Zigbee temperature and humidity sensors can be used to monitor the temperature and humidity within medical facilities to ensure that medicines and medical facilities are stored under proper conditions. In summary, Zigbee temperature and humidity sensors can be used in various application scenarios to monitor environmental conditions and improve productivity and comfort.

2. Design process

The first step is to verify the quality of the hardware [6]. Generally, the program has been downloaded before leaving the factory, and you can test it directly. If the power-on indicator light is not on, check the switch or re-download the factory program for testing. Use "SmartRF Flash Programmer" to download the compiled files, and use this tool to download. Download only select "TFT_INIT.hex". After confirming that the hardware is correct, you can start programming. Open the IAR and write the code. The main code is as follows Fig.1:

```
void main(void)
{
    uchar temp[3];
    uchar humidity[3];
    uchar strTemp[13]="Temperature:";
    uchar strHumidity[10]="Humidity:";

    Delay_ms(1000);              //让设备稳定
    InitUart();                  //串口初始化
    while(1)
    {
        memset(temp, 0, 3);
        memset(humidity, 0, 3);

        DHT11();                 //获取温湿度
```

Figure 1: Main program of temperature and humidity measure

```
void DHT11(void)    //温湿传感启动
{
    DATA_PIN=0;
    Delay_ms(19);   //>18MS
    DATA_PIN=1;
    P0DIR &= ~0x80; //重新配置IO口方向
    Delay_10us();
    Delay_10us();
    Delay_10us();
    Delay_10us();
    if(!DATA_PIN)
    {
        ucharFLAG=2;
        while((!DATA_PIN)&&ucharFLAG++);
        ucharFLAG=2;
        while((DATA_PIN)&&ucharFLAG++);
        COM();
        ucharRH_data_H_temp=ucharcomdata;
        COM();
        ucharRH_data_L_temp=ucharcomdata;
        COM();
        ucharT_data_H_temp=ucharcomdata;
        COM();
        ucharT_data_L_temp=ucharcomdata;
```

Figure 2: Program of convert value to display on screen

Next, the layout of the experimental equipment is carried out, as shown in Figure 3. The test results are shown in Figure 4. At the beginning, the temperature was about 37 degrees Celsius and the humidity was 44 degrees. After blowing with a hair dryer, the temperature rose to 44 degrees Celsius and the humidity dropped to 34 degrees.

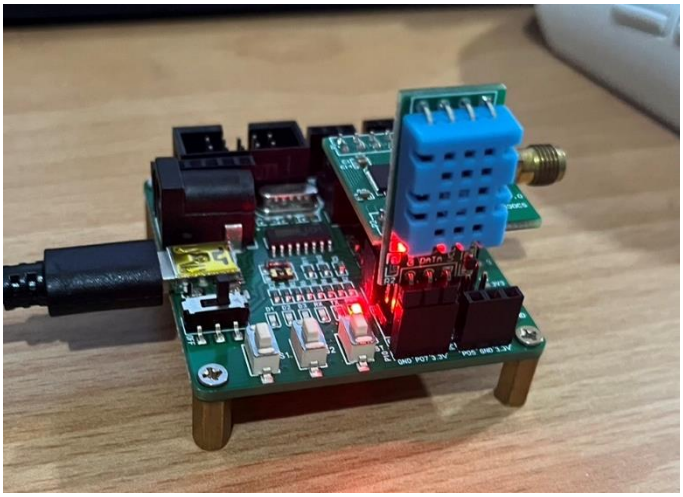

Figure 3: Experimental equipment is carried out

Figure 4-1: Experimental result of low temperature

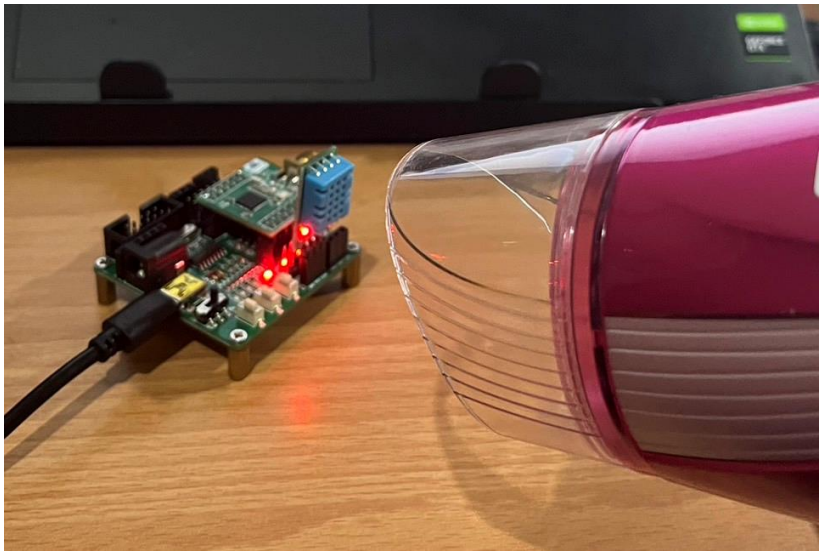

Figure 4-2: Experimental diagram of using hair dryer to rise temperature

Figure 4-3: Experimental result of high temperature

3. Conclusion

Through this experiment, we can see that the experiment can accurately measure temperature and humidity, which is very helpful for future integration experiments. Moreover, the measured data can be seen on the computer screen in time, and can also be used for other monitoring and testing applications. The focus is still on writing and testing in C language. This set of experimental equipment includes an emulator, which can be used for debugging without execution, which is very convenient.

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