

The research of android intelligent fan system

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Abstract. This system controls the speed of the fan by the temperature collected by the Single chip microcomputer ,the terminal of android can remotely control the fan by the communication protocol of Bluetooth 2.0.This system can display teal-time temperature. There are three kind of wind speed can be adjusted. The System uses the digital temperature sensor DS18B20 as temperature detection, DS18B20 outputs digital signal to SMT32 microcontroller.STM32 microcontroller collects the change of the temperature signal in the form of digital output. By controlling the three relay to implementation, high and low three different wind speed of fun.

1. Introduction

The industry of fan is mature, electric fan from the beginning of exploration and development to late of destruction as well as the rise in recent years, experienced ups and downs. Under the impact of the air conditioning, electric fan was once thought to air conditioning out products, but according to recent market reaction, that is not the case, some low-end products and don't have much pure market, only those differentiation, personalized products to attract the eye of consumers. So said fan industry takes technological innovation course may have a good development. The android intelligent fan system for Bluetooth 2.0 wireless remote control of intelligent adjustable wind speed fan, fan's wind speed is controlled by temperature, when the temperature is 20 °C and 25 °C to minimum, 25 °C and 30 °C for mid-range, above 30 °C for high-end. At the same time, also has manual mode, as well as the timing and function of the traditional fan. This system is safety and reliable, on the basis of traditional fan innovation, and has the very good application prospect.

2. Organization of the Text

2.1 hardware of the system

The central processor of this system is the single chip microcomputer of STM32F103C8T6.This kind of single chip microcomputer uses the kernel of CM3 ,contains rich peripherals ,such as 37 input/output port, the internal program memory has a capacity of 64 KB, FLASH RAM capacity of 20 k x 8,and has a high working frequency of 72MHz.So STM32F103C8T6 can easily build system need no the other memory chips and timing devices .The price of STM32F103C8T6 is low, working steadily ,so widely used in the field of industrial and consumer electronics.

The communication with the terminal of android is HC - 06, HC - 06 is a module of serial to bluetooth 2. 0. Before using the module you need to set it to a suitable situation, such as setting the baud rate of serial communication, name of bluetooth, bluetooth pairing code. You can set those parameter by the Instruction setting of AT through a serial port assistant. The module of HC - 06 contains just 4 ports:1.GND 2.VCC 3.TXD 4.RXD.After a right a port connected ,the terminal of android can search and connect the module of HC-06,then the STM32F103C8T6 can connect with the terminal of android, The schematic of this system is shown in figure 1.

The temperature sensor of this system is DS18B20.This is the digital temperature sensor. Don't need to design amplifier circuit, filter circuit and AD conversion circuit, and the most important is the data reliable.

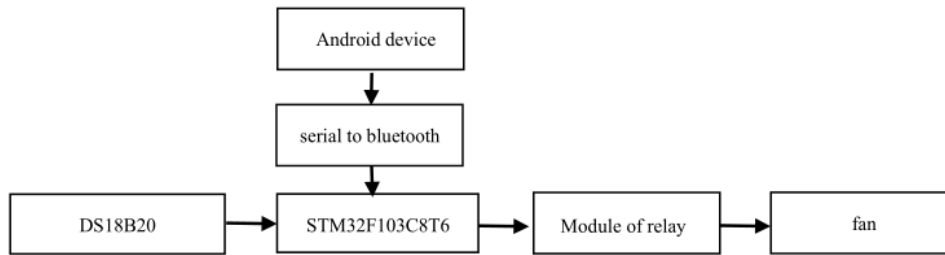


Figure 1.The schematic of this system

Minimum system circuit of STM32F103C8T6. The Minimum system circuit of STM32F103C8T6 is the basic circuit that to ensure the normal operation of STM32F103C8T6, it contains power supply circuit, oscillating circuit and reset circuit

The module of bluetooth communication. HC - 06 is a commonly used bluetooth module, this module used the mainstream CSR bluetooth chip. The bluetooth communication protocol of HC-06 is bluetooth v2.0, Working voltage is 3.3v and reliable communication distance is 8m. After successful matches between android, HC-06 can communicate with android devices. STM32F103C8T6 can use just like Ordinary serial port to send and receive data.

The temperature sensor

DS18B20 is a single bus digital temperature sensor. The sensor is just need one port to connect to STM32F103C8T6, no need in external complex signal conditioning circuit. Temperature range is - 55 ~ + 125 °C. The resolution of the sensor is 9 ~ 12 bit, can completely satisfy the commonly use.

Drive circuit of fan. The output voltage of STM32F103C8T6 is 3.3, which cannot drive the fan that need 220 to run. So using STM32F103C8T6 to control Relay module that can drive the fan. The Relay module contains opt coupler to filter the outside jamming signal. The output current of STM32F103C8T6 is just about 10 -25ma, which can not to drive Relay. So using the NPN to Amplify current of the output of STM32F103C8T6, the two driver Relay.

Other part of hardware. The key circuit is used to start and stop the fan, and also can change the fan to work in different status. STM32F103C8T6 receive external interruption from those key. The LED circuit is used to indicate the fun which kind of running state.

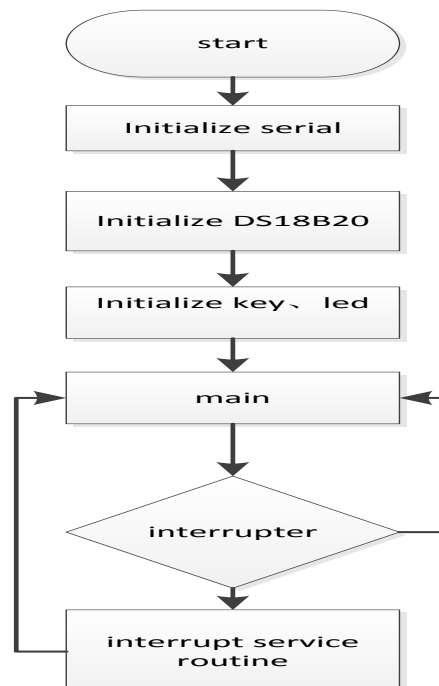


Figure 2.software of STM32F103C8T6

2.2 software of the system

The software part divided into two parts

The software of STM32F103C8T6 is shown in Figure 2

Firstly, the system to finish initialization of serial, DS18B20, Key and LED. Then setting UART interrupt and external interruption. Written UART and external interrupt service routine to handle uart interrupt and external interruption. DS18B20, in the function of main, sends data continuously to STM32F103C8T6 and STM32F103C8T6, at the same time, send the data from 18B20 converted to HC-06. HC-06 can send data to android device.

The UI of android APP is shown in Figure 3. The layout of the UI is used a Relative Layout, and the Relative Layout contains three Linear Layout. Both of widgets are in those Linear Layout. When click the button of connect ,the APP will search Bluetooth devices Within the scope of the 8m. The APP can connect to HC-06 ,when searched HC-06 and Passwords matched, then android device can communicate with STM32F103C8T6. The android device and STM32F103C8T6 disconnected when the button of disconnect is clicked.

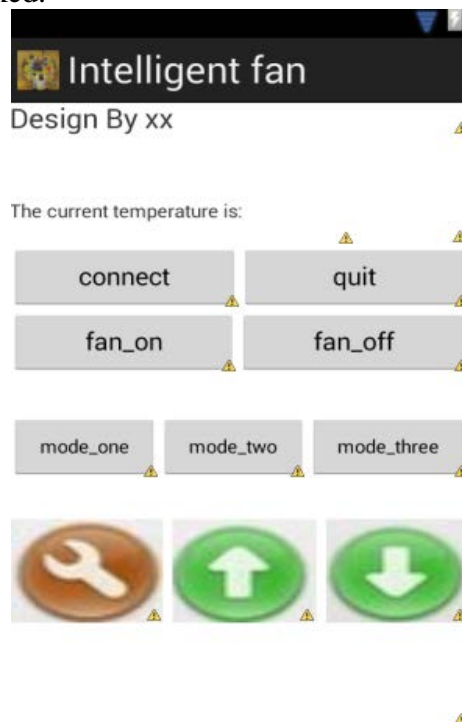


Figure 3

2.3 Communication protocol

The communication protocol between android device and STM32F103C8T6 is defined like this:

Ax_fan_on_one: fun is running at high-end mode.

Ax_fan_on_two: fun is running at mid-range mode.

Ax_fan_on_three: fun is running at minimum mode.

Ax_fan_off: Shut down the fun.

STM32F103C8T6 can, constantly, send the data of temperature that DS18B20 converted to the module of HC-06. HC-06 can send those data to android device after the right connect between STM32F103C8T6 and android device. Then android device, in real time, can display the information of temperature in the widget of the text box. When user clicked the mode one button, the android device can send "Ax_fan_on_one" to STM32F103C8T6. STM32F103C8T6, when receive string, will handle the UART interrupt event. The function of the UART interrupt, firstly, will judge if the string is start with "ax". If it start with "ax", the function will continue to compare next character and the two judge. For example if the String is "Ax_fan_on_one", the function can compare the "one" is different from others. And then corresponding port of STM32F103C8T6 will output high level to achieve the purpose of control fun is running at high-end mode. The other kind of button, similarly, like the button of mode one.

3. Conclusion

The intelligent of this fan system can display temperature in real-time, switch speed mode by collected temperature and also do some remote control. Obviously, this system is a kind of Smart home. As people pursue the quality of life, similarly smart electric appliance will be more and more popular.

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