Design of Humidity Control System of Greenhouse Based on MCU

Haifang Cong

Changchun University of Science and Technology, Changchun, 130022, China

593788368@qq.com

Abstract

Agriculture is the foundation of the economic development of our country. It is the foundation of the development of all undertakings. Modern greenhouses control is a kind of feasible and can be a way to effectively solve the above problem. This paper mainly describes a control system for greenhouses humidity based on STC89C52.I use STC89C52 as the processor, display the current greenhouse humidity data by 12864 LCD, cooperate with good keyboard input which makes the whole system works well. System can set humidity demand via keyboard. When the humidity exceed the upper limits, the ventilator will work. When it is below lower limits, the humidity humidifier will work. Which achieved stable humidity control requirements.

Keywords

Humidity sensors;STC89C52 MCU; ventilator; humidifier.

1. Introduction

With the development and progress of computer technology, people need more and more various of vegetables and fruits to eat in different seasons. Therefore, the development of greenhouse is also very fast. Greenhouses is a complex system, it is controlled by multiple factors. Now with the popularity of network technology, people can upload real-time data and information based on LAN to realize information sharing. This can not only greatly improve the labor productivity, but also greatly facilitate the management, and be able to manage different data and comparison of greenhouse. Meanwhile, this technology can also upload the overrun data through GSM to alarm, so let the operator know in time to realize the greenhouse remote transmission and control of greenhouse environment parameters in alarm.

2. General hardware design of greenhouse

There are many factors which can affect crop growth. This paper mainly studies the humidity parameters of the crops, through the sensors to collect and detect humidity environment factors. The system adopts the microprocessor to process the datum. The hardware design of greenhouse is as shown in fig.1.

The main controller of the system is STC89C52. Humidity sensor can collect the scene of the humidity data which will be converted and handled by controller .The final datum will be displayed through the external LCD screen. If indoor humidity changes due to emergency or bad weather, then single chip microcomputer will compare the data for the ventilator and humidifier corresponding control operation. If the humidity exceeds limit, the fan begins to work, otherwise, the humidifier begins to work. To make the whole greenhouses in a benign state of control, the system can control the collected data through humidity sensors in order to keep the entire greenhouses system stable in the humidity requirements range. This makes the greenhouse to realize automatic control of humidity.

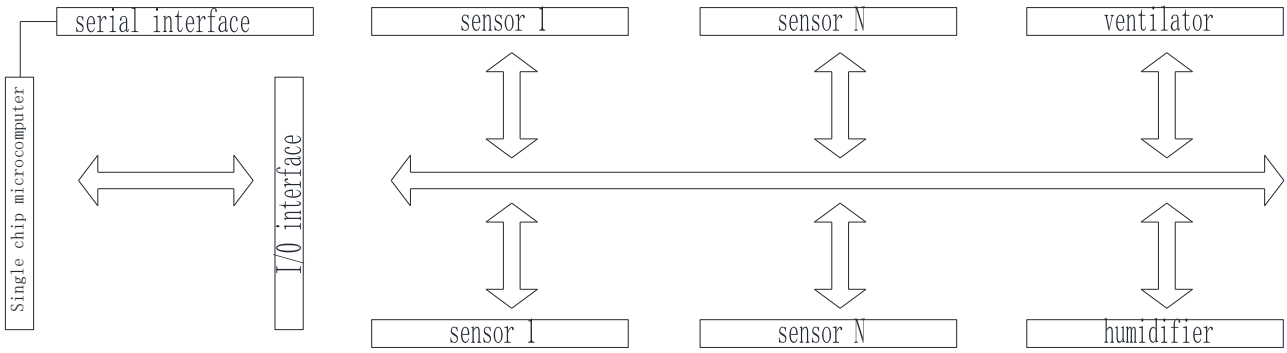

Fig.1 the hardware design of greenhouse

3. The key circuits hardware design

3.1 The design of sensor module

DHT21 digital temperature and humidity sensor is a kind of compound sensor

contains calibration of digital signal output. The sensor includes a capacitive moisture sensor element and a NTC temperature measuring element, and connectes to a high-performance 8-bit microcontroller. The sensor is small in size ,has low power consumption. The signal transmission distance can reach more than 20 meters. After MCU sends a start signal, DHT21 will work from the low power mode to the mode; after waiting for the start of the host signal, DHT21 sends response signal and sends 40 bits of data, then triggers a signal acquisition. The connection of DHT21 with MCU is as shown in fig. 2.

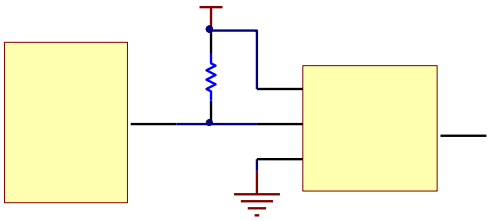

Fig. 2 the connection of DHT21 with MCU

3.2 The design of display circuit

12864 liquid crystal display is refers to the meaning of 128 * 128 pixels. In this paper the system adopts common Demo circuit to dirve 12864 screens. Pin description is as shown in table 3.

Tab.3 pin description

Pin	Name	Direction	Instruction	Pin	Name	Direction	Instruction
1	VSS	—	GND	11	DB4	I	data4
2	VDD	—	+3.3V	12	DB5	I	data5
3	VO	—	Vacant	13	DB6	I	data6
4	CS	O	H:Data L:Instruc-Code	14	DB7	I	data7
5	R/W	O	H:Read L:Write	15	PSB	O	H:Parallel L:Serial
6	SCLK	O	Enable Signal	16	NC	—	Vacant
7	DB0	I	data0	17	/RST	O	Reset Signal Active Low
8	DB1	I	data1	18	NC	—	Vacant
9	DB2	I	data2	19	LEDA	—	BLK 0V
10	DB3	I	data3	20	LEDK	—	BLA 5V

LCD12864 has two kinds of connection mode -- 8-bit parallel and serial connection. Specific LCD12864 driver circuit is as shown in figure 4.

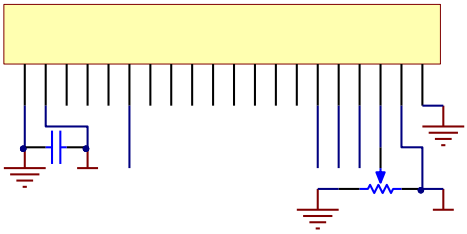

Fig.4 specific LCD12864 driver circuit

3.3 The circuit of humidifier and the ventilator

Because the humidifier and the ventilator relative to the single chip microcomputer system is high voltage system, so the system adopts relay to control the operation. When the average humidity of five sensors is higher than 3% of the limit, single-chip microcomputer control IO2 to give a high level to make K2 relay closed, so the power of the fan switch is on, the ventilator begins to work. Otherwise, the average humidity is less than 3% of the limit , IO1 outputs a high level to control the operation of humidifier. The circuit is as shown in fig.5.

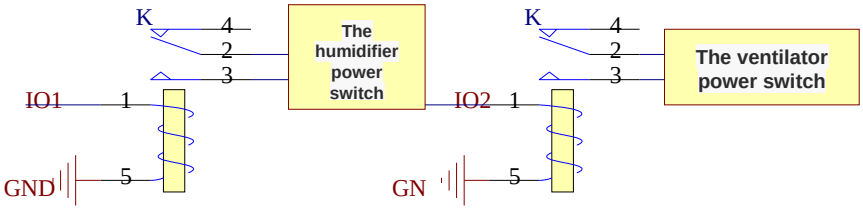

Fig.5 the circuit of humidifier and the ventilator

4. Conclusion

The greenhouse control of this system only selects one humidity environment parameters to study. The system uses MCU to automatic control the greenhouse to achieve the control requirements steadily. In fact, in addition to humidity means, there still are a lot of environmental factors to affect crop growth, such as temperature, co2 concentration, illumination and so on.

References

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