Implementation of Intelligent Embryonic Green House System

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Abstract

In this paper, we try to develop a transparent green house system whose controllable ray, temperature and humidity modulation. This development will offer new step for the agriculture in our country.

Keyword: Green house system, temperature, moisture, embryonic form

1. Introduction

In the 21st century, we started to invent various technologies and even knew how to use existing resources to make our life better. However, with these rapidly changing technologies, we are afraid that it will destroy the peaceful coexistence and balance between human beings and nature. There is a saying that "water can carry a boat, but it can also overturn a boat." If these scientific and technological resources are used in the right place, it is our dedication to traditional agriculture. In recent years, smart greenhouse systems have been actively developed throughout the country, and we have received these research and development of smart greenhouse systems from reference [1-4].

A smart greenhouse is a benign cycle of greenhouse gases that achieves extremely high crop values. Not only will it not affect crops due to climate change, it can also effectively use the renewable energy of nature to achieve a smart agricultural technology. The smart greenhouse can achieve very high efficiency, which can be divided into energy efficiency, climate control, three-dimensional cultivation to increase productivity, and effective use of renewable resources. With these four benefits, we can make the overall cycle better and achieve the highest efficiency of the smart greenhouse system.

We mainly use sensors to detect the brightness and wet soil in the greenhouse. After that, the microcontroller BASIC Stamp is used to control the transmission of messages to the driving circuit. According to the needs to supply water, light, heat dissipation, etc. Because we couldn't really provide a greenhouse for testing, we used a homemade acrylic box as a model instead of a greenhouse to demonstrate this system.

2. System diagram

Modern people are often too busy to take care of some small plants in their homes. The people hope having a device that can provide basic water, brightness, and temperature to the plant to prevent the plant from wilt during the people must be left for a few days or no time to take care of the plants. The system schematic diagram of the smart greenhouse system is shown in Figure 1.

3. Introduction of sensing elements

3.1 Temperature and humidity sensor

Shown as Figure 2, the temperature and humidity sensor SHT11 integrates functions such as temperature sensing, humidity signal conversion temperature sensing, humidity signal conversion A / D conversion, and heater into one chip. The chip includes a capacitive polymer humidity sensor and a temperature sensor made of an energy gap material. These two sensors convert the humidity and temperature into electrical signals, respectively. This electrical signal enters the weak amplifier, 14-bit A / D converter, and serial interface circuit. The output signal is digital signal. Before leaving the factory, SHT11 is calibrated at constant humidity or temperature environment. During the measurement, the calibration coefficients are automatically sensed by the signals. SHT11 integrates a heating element. After the heating element is turned on, the temperature of SHT11 can be increased by about 5 ℃, and the power will also increase. This function is mainly used to compare the temperature and humidity values before and after the heating. It can comprehensively verify the performance of the two sensor elements. In high humidity (> 95% RH) environment, heating the sensor can not only prevent the sensor from dew condensation, but also shortening the response time and improving the accuracy. After heating, the temperature of SHT11 increases and the relative humidity decreases. The measured value will be slightly different than that before heating.

3.2 Moisture sensor

Figure 3 is a soil moisture sensor inserted into the soil in our greenhouse to measure soil moisture. Shown in Figure 3, the soil moisture sensor used is Moisture Sensor v1.4 module.

Soil moisture sensor is mainly used to measure soil moisture content. The soil moisture sensor can simultaneously measure three parameters: soil moisture content, soil temperature, and total salt content in the soil. Based on the status and changes of soil moisture content, the soil moisture sensor can analyze the growth status of plants. This will affect food safety, productivity and the ecological environment.

3.3 Brightness sensor

The brightness sensor is a self-made circuit composed of photo-resistors, resistors and capacitors. The product picture is shown in Figure 4. When the light dims in the room, the pupils of the eyes enlarge. If the screen of an electronic product is too bright, we may feel uncomfortable. This component not only saves energy, but also extends the life of the light.

4. Drive circuit board introduction

We use a microcontroller BASIC Stamp to control the solenoid valve, fan and lamp holder to adjust the greenhouse environment. The drive circuit that drives the solenoid valve, fan, and lamp holder is an integrated drive circuit board. The physical photo is shown in Figure 5. There are B1 to B4 control ports in the driver circuit board. B1 and B2 control the fan, B3 controls the signal output of the solenoid valve, and B4 controls the LED lamp holder. The voltage used by the solenoid valve, fan and lamp holder is DC 12V.

The driving circuit diagram we use is shown in Figure 6. The driver circuit we use as a current switching transistor is MMBT2222A. MMBT2222A is a SMD NPN BJT transistor.

4.1 Solenoid valve

The solenoid valve for the water pipe periphery our greenhouse needs a control voltage of 12V. The physical photo is shown in Figure 7. Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate, the mechanism they use to regulate the fluid and the type and characteristics of fluid they control. The movement of the electromagnet is controlled to control the mechanical movement.

5. Fulfillment results

The functions and photos of our actual fulfillment are shown from Figures 8 to Figures 11. Function test: The fan will turn on the fan to achieve the heat dissipation function when the indoor temperature is 30 ℃. When the temperature decreases, the fan stops. It is tested for normal operation. The sprinkler will open the solenoid valve to sprinkle water when the sensor detects that the soil or air is dry. It is tested for normal operation.

The LED module will turn on automatically when the room is dim. The LED module will turn off the light when the brightness is greater than the setting value. It is tested for normal operation. This system is designed to operate normally with heat dissipation, sprinkling, and lighting functions.

Figures 8, 9, 10, and 11 show the photos of the self-made acrylic box used in our simulated greenhouse. Figure 8 shows the LED module above our simulated greenhouse. Figure 9 shows the fan on the side of our greenhouse. Figure 10 is the circuit board wiring behind the greenhouse. Figure 11 is the side water pipe part of our greenhouse.

6. Conclusion

Figures 8 to 11 are the finished products for this paper. In the future, the agricultural environment will gradually develop towards a "smart greenhouse". The smart greenhouse system we made can provide a reference.

References

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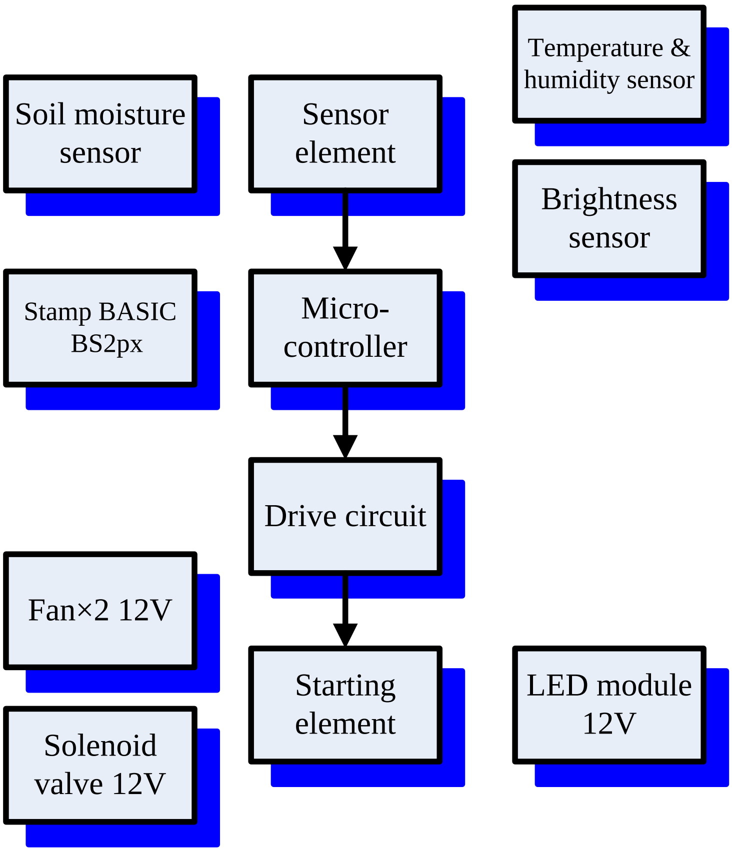

Figure 1 Schematic diagram of smart greenhouse system

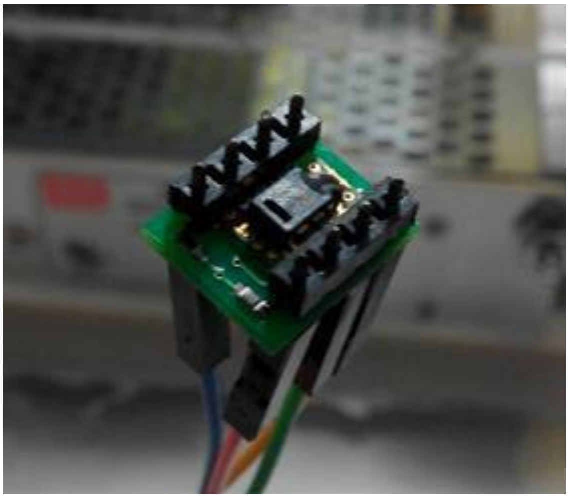

Figure 2 Photo of SHT11 temperature and humidity sensor

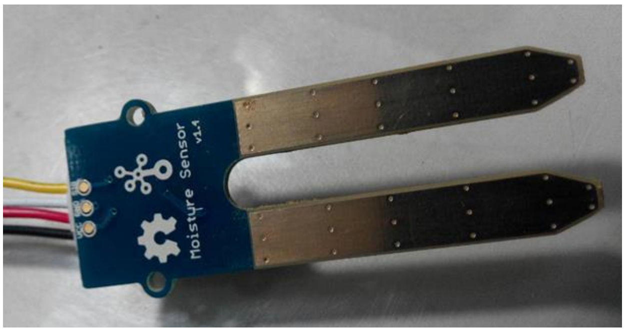

Figure 3 Photo of soil moisture sensor

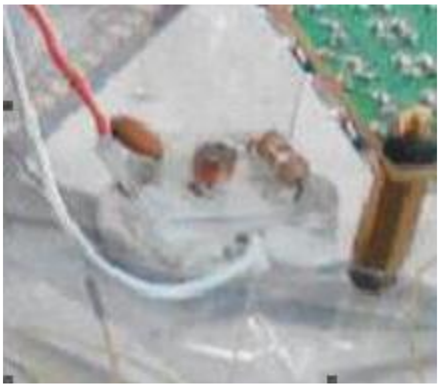
Figure 4 Photo of brightness sensor

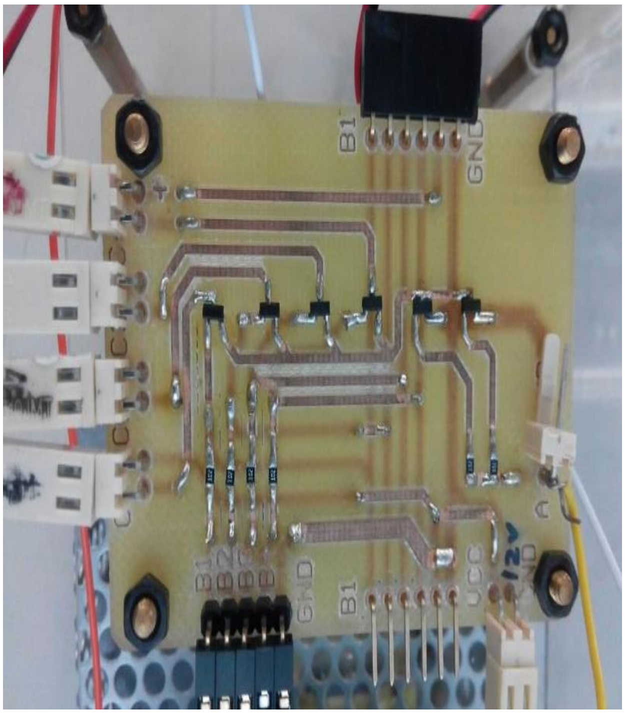

Figure 5 Photo of the drive circuit board

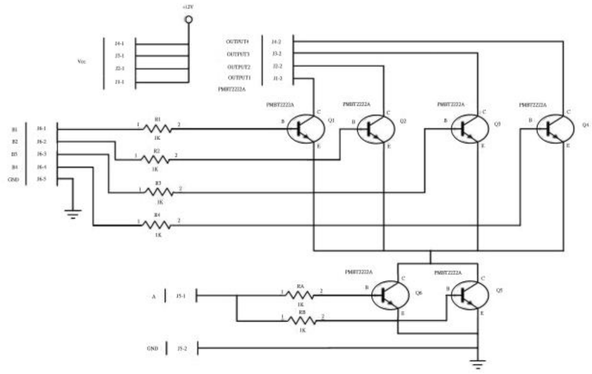

Figure 6 Circuit diagram of the drive circuit board

Figure 7 Photo of solenoid valve

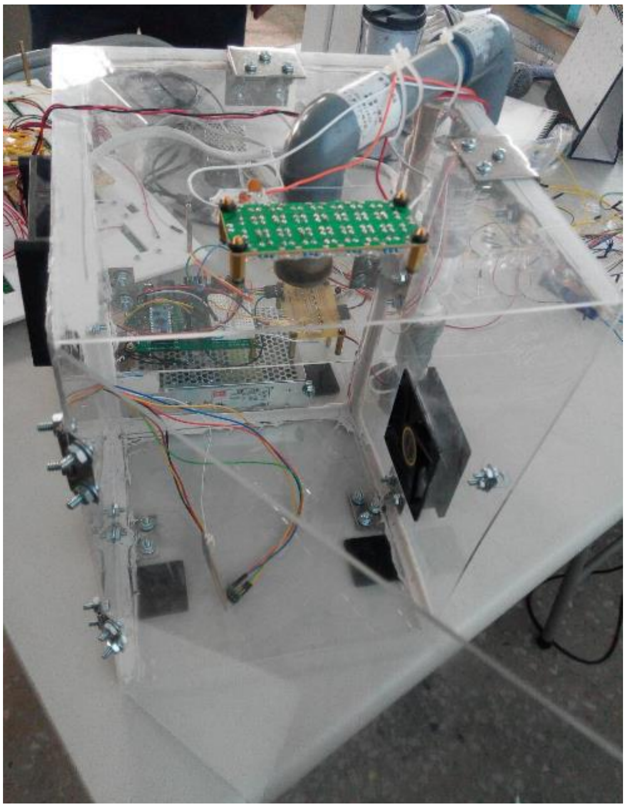

Figure 8 The LED modules above our simulated greenhouse

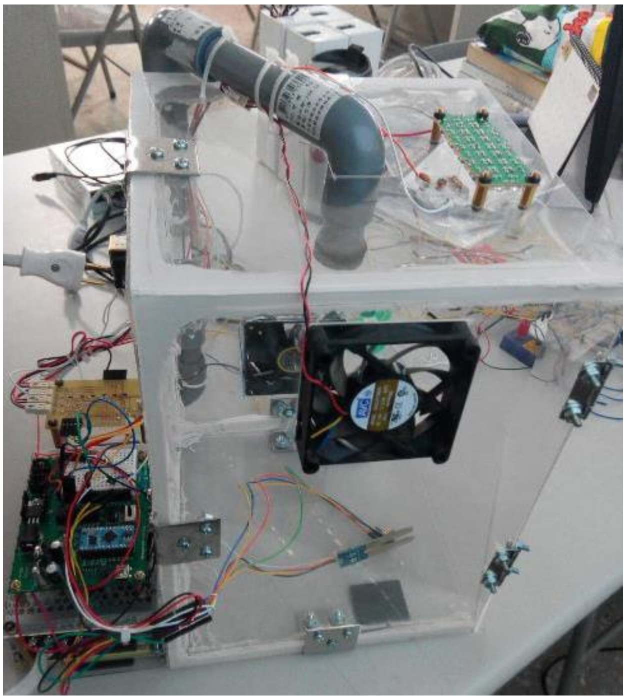

Figure 9 The fan on the side of our greenhouse

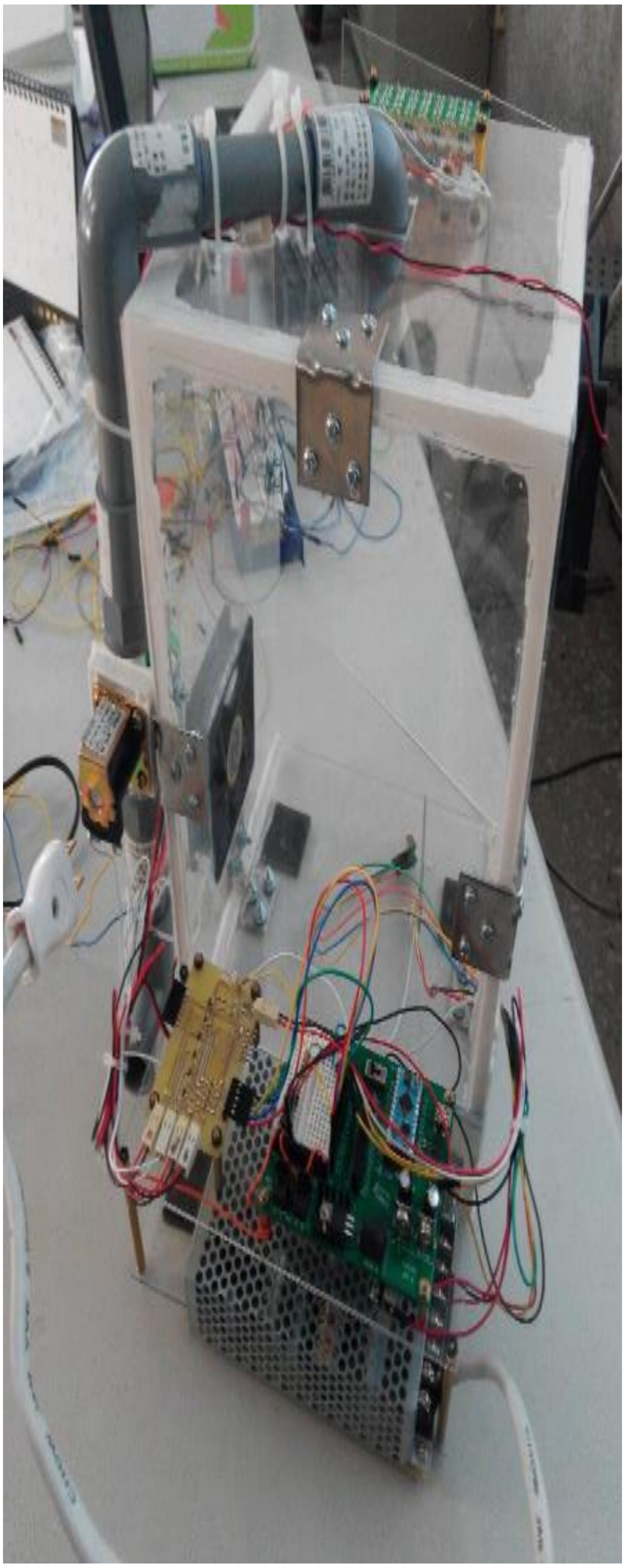

Figure 10 The circuit board wiring behind the greenhouse

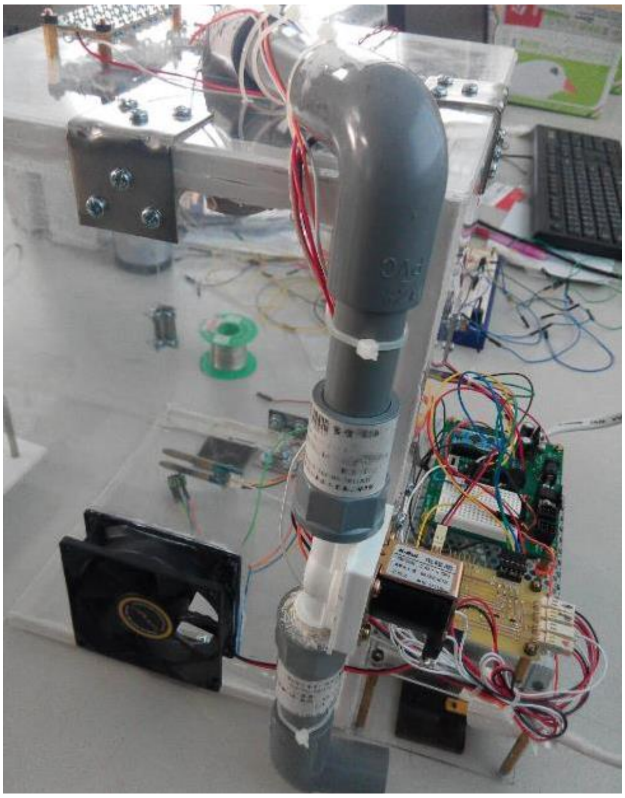

Figure 11 The side water pipe part of our greenhouse