A Design and Implementation Intelligent flowerpot

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Abstract

The original intention of the device is that people often neglect the care of potted plants at home, resulting in plants unable to grow and survive unattended. This intelligent flowerpot is a device that can make potted plants survive and grow better without supervision. Smart home products based on Internet of things technology. The data of temperature sensor, humidity sensor, soil humidity sensor, harmful gas sensor, photosensitive sensor and other sensors are collected by STM32 single chip microcomputer, and the data are cooperated with intelligent tracking system and automatic irrigation system. To achieve the purpose of potted cultivation, beautify and improve the living environment. In view of the disadvantages of traditional family life of artificial cultivation and potted plants, the maintenance of scientific intelligence is realized, and the intelligent flowerpot system is designed.

Keywords: Internet of things technology, singlechip, Smart home, ecology, WIFI, flowerpot.

1. Introduction

With the accelerating pace of people's life, people usually ignore the care of potted plants, and potted plants can not play their due role. Gradually, people have lost the habit and interest of planting potted plants at home[1]. There are many advantages of planting potted plants at home, such as raising flowers, which can convey feelings and cultivate sentiment; green leaf potted plants can purify the air and make people happy. So potted plants have been loved by many people[2]. However, due to the fast pace of people's life and lack of time management, taking good care of potted plants has gradually become a luxury. Many people want to take some time to take good care of their flowers and plants, but they can't find the right time, so they stay at the stage of "just living". Therefore, this paper designed a kind of intelligent flowerpot which can be placed at home and take care of potted plants independently[3,4]. Users can not only not take care of the potted plants, but also know the situation of potted plants at any time[5]. Due to the rapid development of Internet of things technology, multiple intelligent flowerpots are connected to form a family ecosystem[6].

2. Embedded hardware system design

2.1. Overall structure of flowerpot hardware

When the signal of each sensor changes, the MCU will give instructions to the motion system

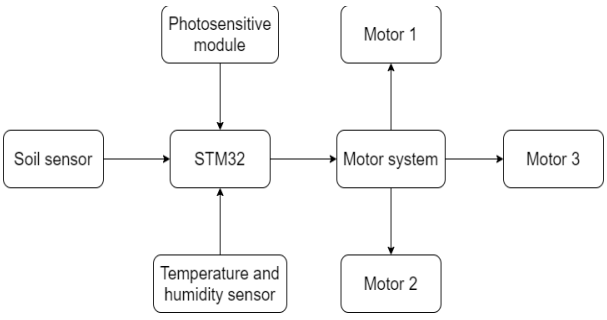

Fig.1. Hardware block diagram

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2.2. Main control chip

The core microcontroller of the embedded hardware system is stm32f767igt6 chip, and the core is arm cortex-m7, which is introduced by STMicroelectronics. The operating frequency is up to 216mhz. On chip, 512KB flash memory and 256Kb SRAM memory are integrated; there are up to 21 communication interfaces, including 4 UARTS, 4 USART interfaces running at 12.5 Mbit / s, 5 SPI interfaces running at 50 Mbit / s, 3 I 2C interfaces, one can, two SDIO and one USB with PHY on chip 2.0 full speed device / host / OTG controller; 1 USB 2.0 High Speed / full speed device / host / OTG controller with built-in dedicated DMA controller, up to 18 synchronous 16 bit timers, and up to 140 I / O ports with interrupt capability. Compared with other MCU, it has high performance, low cost and low power consumption, which can fully meet the system requirements.

Fig.2. STM32F767IGT6 chip

2.3. Main components and sensors

2.3.1 Bluetooth serial communication module

The Bluetooth hc05 is a master-slave Bluetooth serial port module. In short, when the Bluetooth device and Bluetooth device are paired and connected successfully, we can ignore the internal communication protocol of Bluetooth and directly use Bluetooth as a serial port. When a connection is established, two devices share a channel, that is, the same serial port. One device sends data to the channel, and the other device can receive the data in the channel.

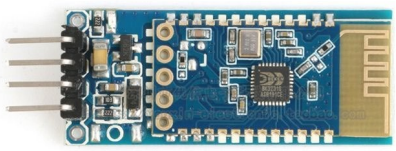

Fig.3. Hc05 Bluetooth serial communication module

2.3.2 Photosensitive module

The photosensitive resistance module is the most sensitive to the ambient light, which is generally used to detect the brightness of the ambient light and trigger the microcontroller or relay module. When the brightness of the ambient light fails to reach the set threshold, the do terminal outputs the high level. When the brightness of the external environment light exceeds the set threshold value, the do terminal outputs the low-level do The output end can be directly connected with the single-chip microcomputer, through which the high and low-level level can be detected, so as to detect the change of the light brightness of the environment; the analog output Ao of the small board can be connected with the ad module, and the more accurate value of the ambient light intensity can be obtained through AD conversion

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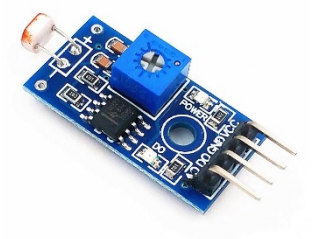

Fig.4.The motor drive module

2.3.3 Soil moisture sensor

The soil moisture sensor consists of two detectors to measure the amount of water in the soil. The two probes allow current to pass through the soil and measure the moisture content of the soil based on its resistance. When there is more water, the soil conducts more current, which means that the resistance will be smaller. So the moisture content will be higher. Dry soil reduces electrical conductivity. Therefore, when there is less water, the soil conducts less electricity, which means that it has a greater resistance. Therefore, the moisture content will decrease.

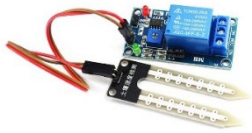

Fig.5. Soil moisture sensor

2.3.4 Integrated temperature and humidity sensor

The integrated temperature and humidity sensor uses digital integrated sensor as probe and digital processing circuit to convert the temperature and relative humidity in the environment into corresponding standard analog signal, 4-20mA, 0-5V or 0-10V. The temperature and humidity integrated analog sensor can transform the change of temperature and humidity value into the change of current / voltage value at the same time, and can be directly connected with various standard analog input secondary instruments.

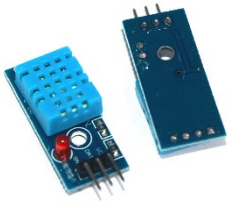

Fig.6. Integrated temperature and humidity sensor

3. Software design

STM32 microcontroller judges the growth environment of potted plants by reading the change of the level value of each sensor connecting pin. Each sensor detects the external environment in real time and transmits the collected signals to the single chip microcomputer. The Bluetooth module is connected with the mobile phone Bluetooth, and receives the information sent by the mobile phone Bluetooth for corresponding operation. The user's operation information can be transmitted to the flowerpot through WiFi.

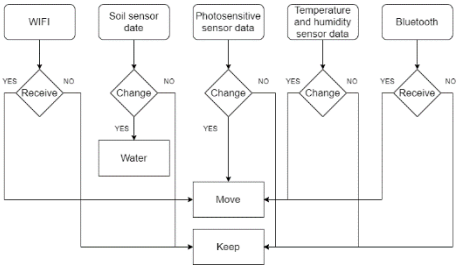

Fig.7. Software design flow chart

4. Testing and conclusion

4.1. Test plan

We put the seeds of Yushu in the flowerpot for cultivation, add a certain amount of water and fertilizer, put them on the windowsill with suitable light intensity, and let the flowerpot carry out self-cultivation for one month

Fig.8. Autonomic growth test

4.2. Test results

A month later, when we observed the flowerpot again, it had already sprouted. We extracted and analyzed the nutrient and water of the pot, and found that it met the normal standard of plant growth

Fig.9. Self growth test results

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