

Research Article

Book box design and implementation of intelligent network-based sharing

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ABSTRACT

The original intention of this device is to allow people to use social book resources more effectively. Users can share the books in their hands through this device. Multiple devices connected by cloud servers can form a book storage network to realize the circulation of paper books. The camera is used for the ISBN code identification of books, the WiFi module is used for the wireless network communication between the device and the background server, the bluetooth module is used for the near distance communication between the device and the mobile terminal, and the infrared module is used for detecting the storage state of the device. Equipment ISBN read, storage of equipment state inspection, such as simple data processing done by the device with a built-in MCU, user registration, user reading habits, such as book search more complex data calculated by the background server processing. By borrowing the concept of distributed computing, implements the equipment, and efficient use of server resources, reduce the workload of the entire system at the same time.

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1. Introduction

With the continuous popularization of Internet technology, the exchange and transmission of information is more convenient and fast, and electronic reading develops accordingly. Compared with traditional paper-based reading, e-reading is more convenient, fast, and easy to obtain, and has undoubted advantages in carrying it out. However, the current mainstream e-reading is relatively scattered reading. digital media in order to gain the reader's preferences, with simple, rapid, shallow and other information to be person eyeball, ideological content of the article without giving carefully chosen, causes the reader too pursuit of reading speed and the number, the lack of deep thinking [1], [2]. Compared with e-reading, paper-based reading can give readers more in-depth thinking and gain more from it. At the same time, paper reading has many advantages, such as less harm to

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eyesight, greater appreciation space and lower error rate. So in today's advanced science and technology, we still need to promote the traditional way of reading - paper reading.

However, while promoting paper reading, some problems existing in paper books should not be ignored. These problems mainly include that the price of paper books is relatively higher, which takes up more storage space, and at the same time, it is easier to get bored with the problem of storage after reading. Therefore, this paper designed a kind of Shared bookcase that can be placed in the community, school or shopping mall and other public areas, so that users can not only share books they no longer use but also borrow books for reading. Thanks to the rapidly developing communication technology, multiple Shared bookcases can be connected through the network to form an extensive book network.

2. Embedded hardware system design

The embedded hardware system adopts TM32F767IGT6 single-chip microcomputer produced by stmicroelectronics as the main control chip. In addition, bluetooth communication module, DTU module, photoelectric switch module and beidou positioning module are integrated around the main control chip. Among them, bluetooth module is used for communication between embedded device and mobile phone client, DTU module is used for communication between embedded device and background server, photoelectric switch module is used for detecting the current storage state of storage unit, and beidou positioning module is used for book case positioning.

2.1 main control chip

The core microcontroller of the embedded hardware system is stm32f767igt6 chip shown in Fig.1, 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.1. STM32F767IGT6 chip

2.2 Bluetooth communication module

Bluetooth communication is a short-range wireless communication technology. Its initial goal is to replace cable connections on existing digital devices, such as handheld computers and mobile phones. Bluetooth technology is characterized by small volume of communication module, low energy consumption, especially suitable for remote, high speed transmission of single-chip microcomputer system equipment. Bluetooth communication transmission distance is usually less than 10 meters, the use of bluetooth technology can be realized by short-range wireless link instead of communication cable, not only to avoid the trouble of wiring, but also to facilitate wireless control of equipment, there is a very wide application space. Bluetooth receiver shown in Fig.2 integrated circuit consists of rf, baseband and link management. In the terminal of MCU, there are four terminals, two ports are connected with power supply, RxD in communication port is connected with TxD in MCU, TxD in communication port is connected with RxD in MCU, that is, reading and writing terminals should be cross-connected [3].

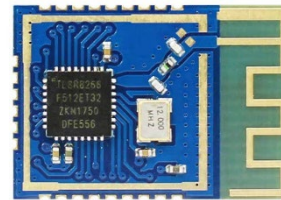


Fig.2. Bluetooth communication module

2.3 DTU module

DTU(Data Transfer unit) Data transmission unit shown in Fig.3 is a wireless terminal device specially used to convert serial port Data into IP Data or IP Data into serial port Data through wireless communication network for transmission [4].



Fig.3. DTU module

2.4 Photoelectric switch

The principle of photoelectric switch shown in Fig.4 is the same as that of infrared detection, which belongs to active infrared detection. The photoelectric switch module emits pulse infrared light at a specific frequency, and the infrared photosensitive receiving tube is used to receive the reflected light ahead, and the distance of the obstacle is judged according to the intensity of the received light. Because of its simple structure and low cost, it is often used for non-contact distance measurement, obstacle detection, obstacle color detection and other devices [5].



Fig.4. Photoelectric switch

2.5 Beidou positioning module

Beidou navigation system is an active bidirectional ranging 2d navigation system. The ground center control system is solved to provide users with 3d positioning data.

Besides the function of GPS satellite positioning, it also adds the communication function, which can play a great role in some fields such as ocean monitoring and military communication. Beidou shown in Fig.5 is the world's first satellite navigation system to provide three-frequency signal services. The three-frequency signal can better eliminate the influence of high-order ionospheric delay and improve the positioning reliability. Besides, beidou also has its own special short message communication Function [6].



Fig.5. Beidou positioning module

3. System software design

The system software layer design is divided into three parts: client end, embedded end and background server end. The communication between the client and the embedded end is conducted through bluetooth, and the communication between the client and the background server and between the embedded end and the background server is conducted through the public mobile communication network.

3.1 Client software design

The mobile client takes APP as the carrier to provide the operation of saving and borrowing books. Its program flow chart is shown below shown in Fig.6.

When using the APP, users must scan the qr code pasted on the box to confirm the current book case number. The content of the qr code is the 48-bit MAC Address (Media Access Control Address) of the bluetooth module of the book case, which is globally unique and can be used as the number of different book cases [7]. After obtaining the case number, the user can store or borrow books according to the instructions of the software interface.

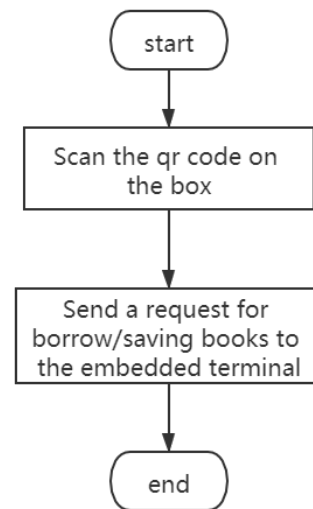


Fig.6. Client program design flow chart

3.2 Embedded end software design

The software design of embedded device includes the communication between the embedded device and the mobile phone client, the control of embedded device on the bookcase storage unit, and the detection of embedded device on the storage unit when storing books. This flowchart is shown in Fig.7

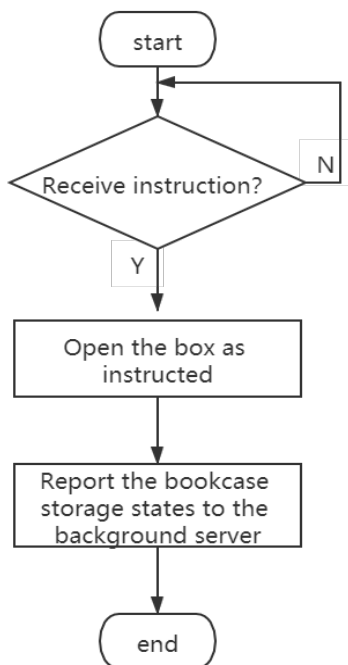


Fig.7. Embedded programming flowchart

3.3 Background server software design

The background server includes two parts, the server and the database, which are respectively used to realize the data interaction with the client and record the information such as the bookcase storage. Its program flow chart is shown in the Fig.8. Whenever the storage status in the bookcase changes, the information in the database can be updated in real time.

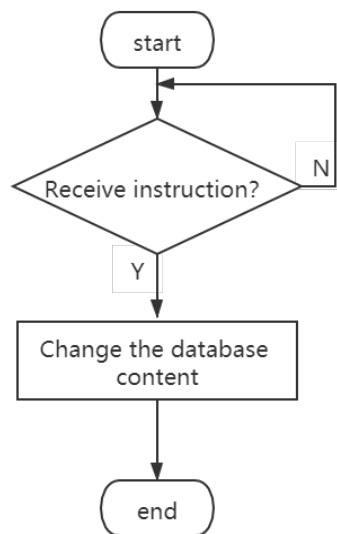


Fig.8. Background server programming flow chart

4. Conclusion

With the development of modern lifestyle, people's pace of life is speeding up, so it is particularly necessary to set aside more space for bookstores in the city's diversified space. What we need to see is that although the flow of people in shopping malls, downtowns, or financial centers is large, noisy environments are not suitable for deep reading. Schools, parks, hotels and other places with leisure functions are very suitable for reading. Break down the mechanism barrier, update the business form, let the books naturally into these places, holding books quiet cultural street scene will be more and more. In the case of Beijing, the Palace Museum has added 6 exquisite bookstores in recent years, with flowers flourishing and a room full of books. Many hotels, service areas and other related industries have also realized the transformation from "walking in" to "living" and "reading" by opening "book corners". Facts show that as long as a lot of support, do the characteristics, reading can completely in the continuous "break the circle" to achieve diverse development [8].

Based on the above reasons, the mobile book network designed in this article. Through the application of the Internet of Things technology and the clever layout in reality, books can be shared many times between readers who do not know each other, so that paper books can give full play to their value and make readers more convenient and faster Read paper books without grace.

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