Design of Medical Call System Based on CAN Fieldbus Technology

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Abstract: The system uses industrial fieldbus CAN and single-chip microcomputer to realize the communication between the ward and the nurse station and the medical care room, and can achieve real-time communication for help and response. The paper focuses on the overall plan of the medical call system and the design of hardware and software, and gives the communication protocol. The system realizes the problem of remote button information transmission and low power consumption. The realistic application response, the call system has the advantages of high stability, low power consumption, easy installation, ease of use, strong function, etc., and has strong application value and important social significance.

1. Introduction

Medical call system is one of the indispensable electronic devices in medical institutions in the world. When considering the overall layout and environmental factors of medical institutions, the system not only has good applicability, but also has certain decorative features. The medical call system is a bridge for communication between patients and medical staff, so that patients can receive timely treatment in times of crisis. Compared with other types of buses such as ISA, PCI, SPI, etc., the data transmission technology based on CAN fieldbus has the advantages of high stability, sensitivity, real-time and cost performance. It is suiTable for the establishment of the system and can easily complete the ward. Communication with the nurse station and the medical care room can achieve the dual effects of help and response.

2. System overall design

The system uses the current popular CAN bus and single-chip microcomputer to realize the communication between the patient call controller and the nurse station and the medical care room. The overall framework of the system is shown in Figure 1. The medical call system hardware is mainly composed of two parts: the host and the slave. The two parts are composed of the telephone intercom system and the call sub-system with the MCS-51 single-chip microcomputer as the backbone. The main function of the system software is to collect, organize and analyze the relevant data, and then rely on the CAN field bus to transmit to the host in the nurse station and implement alarm reminders.

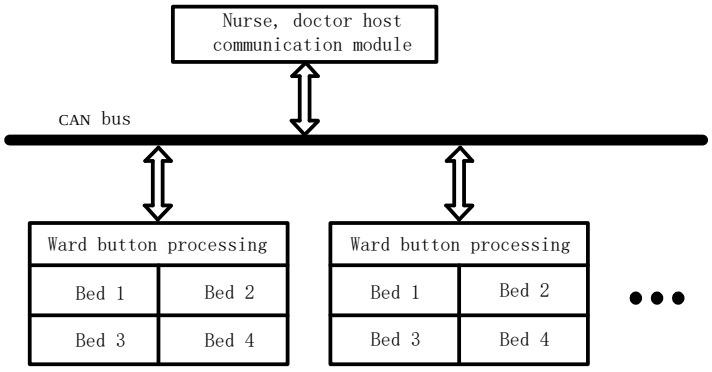

Figure 1 system overall framework

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In the design of the medical call system, communication between the slave unit of the ward and the host unit of the medical room is first realized. The slave unit of the ward analyzes and sorts the button data and transmits it to the host unit via the CAN bus. After receiving the data information, the host unit processes the arithmetic and logic operations and then feeds back to the slave module via the CAN bus. The medical call system must be able to analyze and process the button information, that is, receive the patient's call signal, and transmit the patient's bed number and ward number and other related data to the host unit, waiting for the response and processing of the caregiver, and the alarm unit uses the language mode to remind Medical staff. Therefore, in order to accomplish the above functions, the extension generally consists of the following units: a button processing unit, an LCD display unit, an alarm prompting unit, and a voice prompting unit. The hardware structure of the extension system is shown in Figure 2.

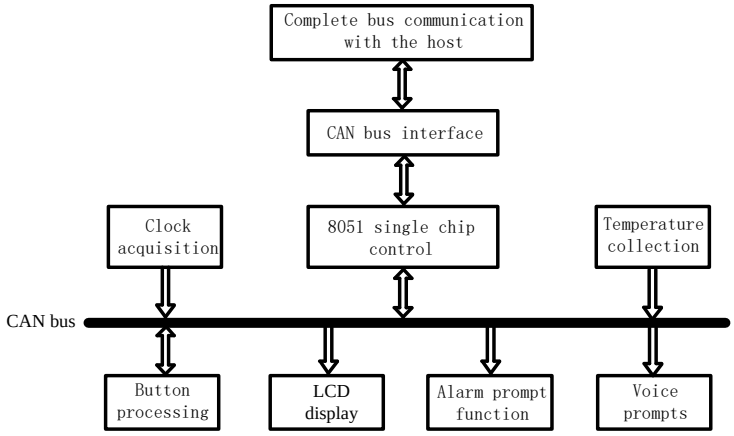

Figure 2 Extension system hardware structure diagram

3. System hardware design

3.1 CAN communication interface circuit

The CAN bus controller selects the bus controller SJA1000 of PHILIPS, runs in BasicCAN form or PeliCAN mode, and can be directly connected with IN-TEL's 80C51 MCU or Motorola's MCU interface. The CAN bus transceiver selects PHILIPS' P82C250, which can operate at transmission speeds as low as 5Kbps, which can meet the low speed conditions of remote transmission information. The CAN bus transceiver can extend the communication spacing, enhance the differential transmission and reception efficiency of the bus, and also protect the bus. The schematic diagram of the CAN controller unit is shown in Figure 3.

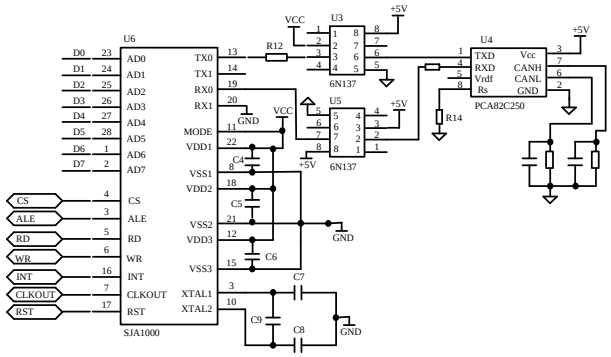

Figure 3 Schematic diagram of the CAN controller unit

3.2 ward temperature detection module

The temperature measurement in the ward selects the DS18 B20 digital intelligent temperature sensor of the Dallas semiconductor company's waterproof package, which can directly convert the temperature signal into a digital signal and send it to the computer for analysis and finishing

through the CAN bus. The DS18 B20 digital temperature sensor measures from -55 ° C to +125 ° C with a measurement accuracy of ± 0.5 ° C in the range of -10 ° C to + 85 ° C.

3.3 voice circuit

The host and the slave of the medical call system are provided with voice circuits, and the host performs corresponding voice broadcast according to the call information of the slave, such as a “135” call, that is, a 5-bed patient call in a 13 ward, and the slave performs voice according to the feedback information of the host. The broadcast, such as the “No. 3” received, is received by the No. 3 medical staff. The voice circuit selects the ISD4004 chip, and the FM signal is modulated and demodulated by the LM386 integrated phase-locked loop decoder.

3.4 display circuit

The host and slave of the medical call system are designed with display circuits, and the display circuit selects a relatively mature LCD display unit to specifically indicate which patient needs help. The unit selects the MZLH04 module. The MzLH04-12864 is an LCD module consisting of 128╳ 64 dot matrix. It has two different font size Chinese character generators and two different font size ASCII west generators; and has simple drawing Features. In addition, the unit's distinctive aspect is that it has a direct digital display.

4. System software design

The system software uses C51 language, and it is written in Keil uVision2 under Windows2000 mode, and the STC89C52 is programmed to complete different functions. System initialization process: Firstly, the initial parameters of each unit are set, mainly including: setting of initial parameters of LCD display, setting of initial parameters of DS1302 clock chip, setting of initial parameters of CAN bus. After all the units have completed the initial parameter setting, the stored program of the DS1302 clock chip is read. When the memory is used for the first time, the value is 0; the value of the last written flag is not read for the first time; then the keyboard subroutine is processed to process the key information to obtain the key value for storage; if there is no key information, After the liquid crystal display, the DS1302 clock chip is judged until the button information is sent, and the CAN bus is sent to send the data subroutine and the voice prompt subroutine, and the button flag is recorded. Then call the LCD liquid crystal display subroutine to display the stored clock data, temperature information and button information in sequence, and finally to the system cycle of the DS1302 clock chip reading. The main program flow chart of the system is shown in Figure 4.

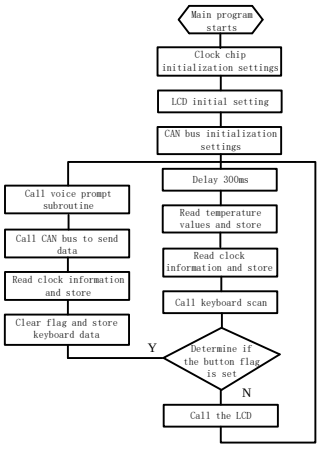

Figure 4 system main program flow chart

5. Conclusion

The paper studies and designs the medical call system based on CAN bus. The master and slave units can complete the related work of their corresponding modules and design the CAN bus

communication. The host can collect the data information of the slave and can be fed back to the slave module via the CAN bus after processing.

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