Design of Physiological Information and Home Security Information Collection System for the Elderly Based on LabVIEW

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Abstract. Design of physiological information and home security information collection system for the elderly is based on LabVIEW. The main function is to receive data information from the hardware through serial communication, so that the upper computer can realize the conversion of data, and associate the data with the database. In the design of the system, module panels including “user management”, “personal information”, “physiological information”, “living home”, “history information”, “news media” are added. The data of the core module “physiological information” and “living home” is received by the serial port and stored in the database. The Microsoft Office Access database is selected on the database building. The database is accessed, read, written, newly created, deleted, etc. by creating a computer ODBC data source and using a LabSQL toolkit. It uses the VISA control on the serial port to configure the system serial port and other settings, selects the hexadecimal number of the system serial port receiving hardware to convert to a decimal number, and distinguish the delivery display panel.

1. Introduction
Aiming at the objective factors such as physical characteristics, forgetfulness and decreased physical function of the elderly, a physiological information and home security information collection system for the elderly is designed. The system is based on LabVIEW, which can collect the physiological information and home security information tested by the lower computer through the serial port. It can display the real-time information and perform historical data query functions to facilitate the health management and home security management of the elderly.

2. Overall design of the system
Figure 1. Overall block diagram.

The overall block diagram is shown in Figure 1. The “user management” module accesses, adds, and deletes the “users” in the database, and the contents of the database are transferred to the “personal information” and other module panels. As the core function of the “physiological information” and “living home” panel, there is a serial port as a bridge to receive information from the lower computer. The information conveyed by the serial port will be converted and differentiated by a function program, and the information will be interpreted and sent to the two panels, so that the data will be fed back to the user in real time. The information received by the front panel is stored in the database for the reference of the user's health and provides historical data query function.

3. System design

3.1. User management

User management is divided into three major modules: adding users, selecting users, and deleting users.

“Adding users” module is able for users to fill in the personal information in the user adding interface to add a new user in the database, and create a new data list for the user to store data. In the program, the ADO control of the LabSQL toolkit is used to access the database. Three-time operation on ADO controls in this interface is used to respectively implement access, write, and new list functions. “ADO connection create.vi” generates a database access channel. “ADO connection open.vi” opens the database with the command “DSN=test;”, “SQL Execute.vi” will implement different functions by inputting SQL commands, and “ADO connection close.vi” will close the database after operation. On the “adding users” function, “select*from user;” command is used to access the database user list and output to the form. “INSERT INTO user (name, gender, age, contact, emergency contact, emergency contact number) values ('Username', 'female', 12, 123, 123, 123);” instruction is used to add a new user. The first parenthesis is the column option of the user list, and the second parenthesis is the user input data. “Create table username (number counter, body temperature) Varchar (50), high pressure varchar (50), low pressure varchar (50), blood glucose varchar (50), heart rate varchar (50))” command is used to build a new data list with the name of the user name. The contents in parentheses are the column options and attributes of the new list. The specific program is shown in Figure 2 Adding Users Program, and Figure 3 Add User Sub vi.
As for Selecting users module, since there are more than one user, the system needs to access the measurement data for different users, and display the user’s personal information in the system personal information interface, as is shown in Figure 4. By entering the user name of the user through the “select*from” command, the “user” list can be accessed and the user’s personal information can be sent to the “personal information” interface, so as to provide indication for the list name of the subsequent data storage.
The deleting users module is used to delete some users or abnormal users that are no longer used. The SQL command “delete from user where user name;” can delete the unnecessary users in the database “user” list. The program is shown in Figure 5.

3.2. Personal information

Personal information includes name, age, gender, contact information, emergency contact information and so on.

In the personal information program function, the user’s own account is selected through the user management interface. The system accesses the user list of the database, retrieves the key information of the user and sends it to the front panel personal information column for visual display.

![Figure 6. Personal information program.](image)

As is shown in figure 6, the user inputs the user name to perform the database positioning in users selection, and accesses the data in the position. The implementation of this function is based on the third-party library LabSQL, using “ADO connection create.vi”, “ADO connection open.vi”, “SQL Execute.vi”, “ADO connection close.vi” in the LabSQL library as the core of database access. Create a string constant in “ADO connection open.vi” control and enter “DSN=test;” to open the database. Use “SQL Execute.vi” to create two string constants and a string input control, use string concatenation control to connect the three into a long string, and then synthesize a complete SQL instruction “select * from user where name = Username;”. This command means opening the “user” list in the database, accessing all the data named “username” in the “name” column, and outputting to the table or array display control. The data of each part in the array control is output to the display control corresponding to the personal information panel.

3.3. Physiological information and living home data collection and storage

The physiological information is collected from the lower computer through the serial port to obtain key data information, and the data is converted and differentiated by the data operation, so that the data is displayed on the front panel and stored in database, where the values are divided into corresponding table contents. Specific data include key physiological parameters such as blood pressure, blood sugar, body temperature, heart rate and so on. The data received by the serial port is converted by a numerical value-string, and together with the string connection control constitutes a SQL “write” operation in figure 7.
The home security module obtains key information from the lower computer through the serial port, including data such as indoor carbon monoxide concentration, methane concentration, negative oxygen ion concentration, PM2.5 concentration and so on, as is shown in figure 8 and 9. Through the data analysis calculation program, the received data is separated and converted into a number system, and transmitted to the front panel display control for display. By judging the program, it is judged whether the section in which the data is located is dangerous and can be timely fed back to the user.

Figure 7. Physiological information storage.

Figure 8. Living home program diagram.
3.4. Historical information
The history information query program is shown in figure 10. After the user is selected, the selected user name is sent to the SQL command statement of the historical query, and the historical information data of the current user can be directly viewed. In the representation of the information data, the use of the table and the waveform diagram is selected, because the table clearly records the data and the chart conveys the health trend information. Using the slide switch control to control the range of data displayed by the chart, users can view the first seven data or the first thirty times.

3.5. Database building
Building database needs to be prepared in advance, including the download and installation of the LabSQL toolkit and Access, as well as the creation of a connection to the data source ODBC. The
DSN data source is generated by ODBC, which is called in LabSQL and combined with the SQL statement instruction to access the Access database.

3.6. Serial communication
As shown in the serial port program diagram in Figure 11, the system serial port communication uses the VISA serial port tool, and the “VISA Configuration Serial Port” control is used to configure the system and hardware matching settings. To create a COM port number at the “VISA Resource Name” wiring, the baud rate setting depends on the serial port mode of the hardware and here the baud rate is 115200. The “stop bit” wiring port inputs the stop bit of the serial port data transmission, which is determined according to the hardware data transmission mode. The constant 10 is used here to indicate that the stop bit is the line feed “OA”, and the “enable terminator” wiring port defaults to “true” to enable the stop bit judgment mode. The while loop to embed the conditional structure and the “read buffer byte number” control is used to determine whether the data is received. When the number of bytes read is not “0”, it means there is data in the serial port, and the execution condition is within the structure. Read the operation of the serial port data. After the reading is finished, the VISA tool is closed with the “VISA close” control.

![Figure 11. Serial port program diagram.](image)

4. Conclusion

![Figure 12. Physiological information interface.](image)
The system debugging operation is shown in Figure 12-13. It can realize the collection and display of physiological parameters of the user, the collection and display function of home safety information, and also the historical query function for the data of physiological parameters. The database can achieve stand-alone operation, and it will be optimized in the later stage to build an Internet shared database. Through the IP address and the authorization method, the user can leave the system and perform real-time access to the database in multiple locations.

Acknowledgment
This paper is funded by the following projects: Anhui Provincial Automation Comprehensive Experimental Training Center(2015sxzx024).

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