Design and Implementation of Mobile APP for Athletes' Physical Fitness Monitoring During Training

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Abstract—To improve the monitoring efficiency of athletes' physical fitness characteristics in training state, a scientific and reasonable health assistant APP is designed based on Android and combined with JAVA development language, Litepal database, SQLite and OKHttp technology, to help individual users achieve scientific health status. In the hardware module design, the signal conditioning circuit is designed to amplify and filter the pulse test signal, and output the athlete's training pulse in real time. At the same time, it also designs the data analysis and prediction function, which can help athletes better perform health management. Each part also has more detailed sub function modules. Then the collected data are processed with the help of Andriod mobile phone terminal. The test results show that the APP has good test performance, which can realize abnormal physical fitness alarm, and better maintain the athletes' physical function and health level during the process of training.

Keywords-movile APP; physical fitness monitoring; Android; JAVA

I. INTRODUCTION

In the exercise process, pulse change can affect the physical performance and health level of athletes. According to the physical test of athletes' goodness in the state of training, we can scientifically receive the state of training of athletes and analyze the physical characteristics of individual athletes, to guide the training of athletes and to continue to develop energy equipment, collecting and watching data through The smart way has become the current trend of information development. Training athletes is a daily task that directly defines the level of training and the level of athletes. Therefore, smart devices are used in sports training to understand sports information. For example, through the use of large-scale smart devices, the use of motion capture systems to analyze sports data and movements. But the application of these methods on the one hand is more complex, on the other hand, costs are very high. Therefore, this paper is a monitoring system Suggests low cost for athletes' physical fitness, and analyzes the performance process in detail.

To investigate the physical effectiveness of athletes in training, a pulse test method based on sensor technology is proposed, and a portable pulse tester system is designed based on the Android system. It processes the S3C6410 sensor as the main processor of the system. In the Harvard module design, the signal company signal is designed to amplify and refine the pulse test signal and take the pulse test pulse out of real training mode. General problems to consider. In some key modules, it describes the

communication process or the key. The test results show that the test system is good and of high application value.

II. OVERALL ANALYSIS OF SYSTEM

A. Requirement Analysis

According to the athletes' daily training tasks, the product is basically regarded as a training element. Coaches usually improve athletes' natural and physical endurance by running away. Therefore, the physical identification recommended in this article based on the mobile terminal is used as the driver. The practical object uses Android mobile tracking device development system.

Through the development of Android based system, users can build their own according to the intensity training database and new sports training program. Through the above analysis, in order to understand the physical control of sports, on the one hand, we need to feel the user's movement, collect and connect the movement process through the Hargim device. On the other hand, with the help of Android, it is necessary to understand the physical examination of sports. The mobile terminal processes the collected information. However, the traditional information collection is carried out from a device. If it allows athletes to be in the training device, it will bring great burden to the athletes. In this case, use a device that can be used for data capture. According to the current technical conditions, this is understandable. In addition, the target is the inactive display of data, and Android screens are used for interaction. The connection between smart phone and data access must be realized through a specific communication mechanism. Therefore, we must start from any hardware and software to understand the performance and requirements of the system.

B. Technical Principle and Main Function Modules

The control application uses android as the development platform. Using Android Studio development tools, JavaScript development language, Litapal data, SQLite and OKhttp, a more scientific and logical auxiliary application is designed and developed. The health management system and data are stored on the server, as well as equipment and software updates on the server. Using personalized software development tools, gradient support, fast and convenient Android version and a series of simultaneous access problems, combined with java development language, the full use of Java language has two simple functions and functions. User center and user center downlink theory are designed to better perform complex activities.

According to the analysis of the previous request, the specific functions of the system are as follows: input activity,

the user must register, log in, visit the configuration page after successful registration, improve the user's personal data, and improve the user's personal data. The user can download directly to the numbering module. The step number module includes the purpose of the user's exercise, the number of steps in the dynamic state, and the weather; the history module displays the movement data of different dates. The motion category recording module displays the user's motion category in real time; the user information module displays the user's personal information, such as image, name and gender. Its functional structure and corresponding modules are depicted as follows：
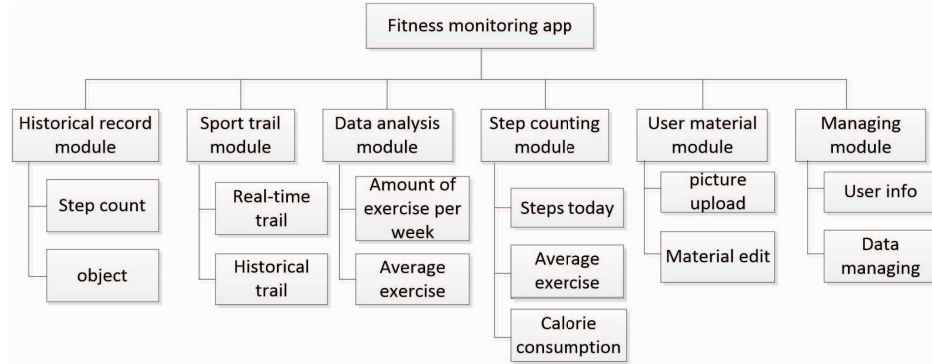

Figure 1. Functional structure and modules of sport monitoring APP

III. DETAILED DESIGN OF SYSTEM

A. Hardware Design

1) Hardware layer deployment

The hardware layer supports the hardware operation and circuit work of the whole system, including sensor signal conditioning, anti aliasing filtering, core processor and corresponding peripheral matching circuit. Floating point DSP can store pulse data through HP e1562d/E data hard disk, and VXI is used for pulse test data The system bus sends the conditioning signal of pulse test to the core controller to analyze the state characteristics of sports training. Using Motorola 56002 fixed-point DSP to complete the middle layer design of pulse test system. According to the programmable 12 dB high pass filter provided by DSP layer, the data information filtering and signal conditioning are carried out, and the real-time digital filtering of pulse test signal is completed.

2) Data acquisition

The receiving of data depends on the wired equipment. As an athlete, wearing large items is very uncomfortable. Therefore, we must choose a sport that does not affect the normal movement of athletes, such as smart bracelets. In essence, this article suggests inserting intelligent data collection into cliffon to understand data collection. Female athletes The portable device of the system uses the ma4755 generator with the function of tracking the speed direction. The speed is a little bit variable, but the exact speed is very high. The concrete corresponding relationship is depicted as equation (1):

$$a = f(x) = \begin{cases} x*2g/128, & x < 0 \\ x*2g/127, & x \geq 0 \end{cases} \quad (1)$$

where x is the integer value obtained after conversion by the complement rule.

3) Peripheral devices

Athletes' training state pulse test is based on embedded Android system technology. Peripheral devices include ADSP21160 processor system, pulse sampling vibration sensor and memory hardware system. The core of hardware system is digital processing board. In order to meet the demand of reliability, 16 bit industrial DSP and 600 MHz Blackfin DSP are selected as peripheral devices The chip as the core processor, using IC3 CD40110 as the main processing chip, IC3 CD40110 has a 16 bit fixed-point DSP core, which can effectively meet the low-power high-frequency transmission performance of pulse test system. The filter unit is added to the embedded processor, and the core control unit of embedded processing is constructed. The operating system and user application program are solidified in ROM An embedded core control module is formed in the system. The peripheral device distribution structure of pulse tester is shown in figure 2.
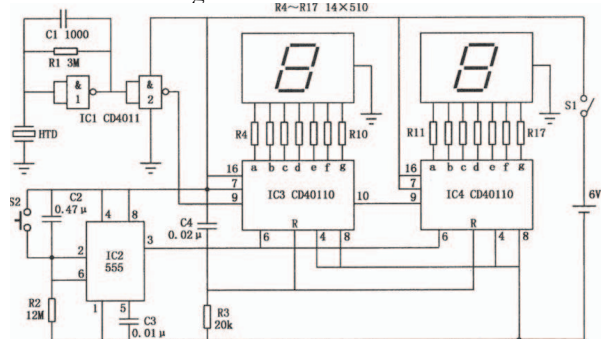

Figure 2. Pulse test control circuit

B. Software Design

1) Overall structure

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Athlete health management system is designed and implemented by MVC mode. The system is divided into three levels: vision, model and monitoring. The display layer is designated to combine the content displayed by the user through the background interface with the control program required by the user when using the key to input data. As shown in figure 3, customers in fury buildings include mobile phones, tablets, and other platforms. Import from customers. The fury architecture also includes a background server, which includes a part of fury system user interface and a specific low-level interface such as NetWeaver gateway. The components of the user interface include a SAPO 5 control library and a key store such as a launch ramp. NW is used to establish communication with the support server and add gateway services created by the supporter. The support server includes a specific recovery area and a search model for executing type programs tab Security, the fury architecture also includes a data layer.
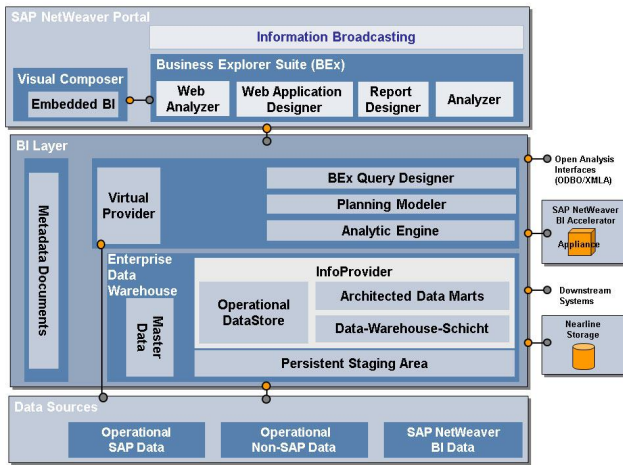

Figure 3.   System architecture graph

2)   Bluetooth communication module

Through fixed operation to receive data in local Bluetooth list, we turn on and off Bluetooth, power information of device and other operations. Due to the connection between smart phone and blood glucose and surface counter without instrument, the data transmission of smart phone is different from that of Bluetooth device. The invention focuses on Bluetooth communication and data transmission through capture. If the data block is still placed in the input mode of the mobile phone, the data is still placed in the input mode of the mobile phone. This makes the user experience very bad. Therefore, the system does not block a new type of opening method for reading input data, and the input stream does not block the main spiral, and the user experience will be improved.

The process of establishing connection between Bluetooth connection request and server: through bluetoothDevice.createRfcommSocketToServiceRecord (MY_ The UUID) method is used to create a Bluetooth socket instance socket.connect () open the connection. If the connection fails, call the destory() method to end the connection. If the connection is successful, the socket.getInputStream The () method gets the input stream of the input stream in the connection. After that, the input stream data on the socket is read and parsed.

3)   Physical examination management module

The management module of athletes' physical fitness test will be carried out around the evaluation of athletes' physical fitness, including the setting of athletes' skill categories, the setting of rating parameter table, the physical fitness test and physical fitness analysis view. Skill category setting   is used to classify athletes' skill types, and rating parameter table is used to set rating scheme. Users can map the built-in rating quantitative table into a new one. For example, two grades of the old scale can be assigned to one of the new scales. At the same time, you can choose a variety of rating indicators, such as rating, star playing, express report, etc. The form design of physical fitness test requires users to input title, location, team, relevant records, start and end time of limited positions, and physical parameters The specific data relationship is shown in figure 4 of E-R: after the form is filled in, the back-end parses the JSON data from the front-end through the performancecontroller class, and the data is processed by the performanceservice class. Finally, the performancewe Dao class is responsible for adding, deleting, modifying and querying the database. The performancetest; class corresponds to the role of the test manager, and is equipped with methods for setting the testset performanceq, etc.
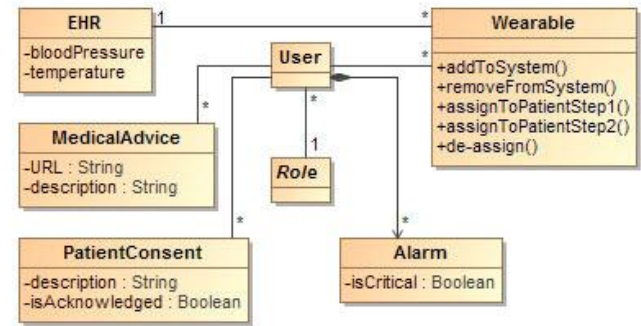

Figure 4.   Class diagram design of physical test management

4)   Client display module

The design and implementation of the module uses *viewpager* to set the top three navigation pictures of the home page, binds data with adapter *adapter*, designs welcome message with view component, and displays daily data with *LinearLayout* view component at the bottom, which is convenient for users to view daily exercise data and help users measure their own health status. The main function of the module is to jump to the page after successful login, welcome the user back and display the current time, and jump to other active pages.

IV.   SYSTEM RUNNING TESTS

To verify the performance of the system, special sports students in a university are regarded as a test object. In this experiment, the athletes conducted an advanced sports training test designed for exercise, swimming and basketball.

Pulse information enables athletes to have real-time, accurate and real-time performance, and can include practical value of abnormal pulse alarm.

Figure 5. Pulse test results of athletes in training state

When the user selects a date, different historical data is displayed. The goal of this module is to execute the planning file by displaying the calendar in the planning file. The data module includes the total number of steps and the average number of steps moved by users in a week. The module defines histogram view category to understand histogram display view, as shown in figure 6 by detail. Add and drag animation records in *MapView* by using *OnDraw* overlay provided by API Android. When the user presses the start move button, a marker appears on the card. As the user moves, the GPS coordinates change.
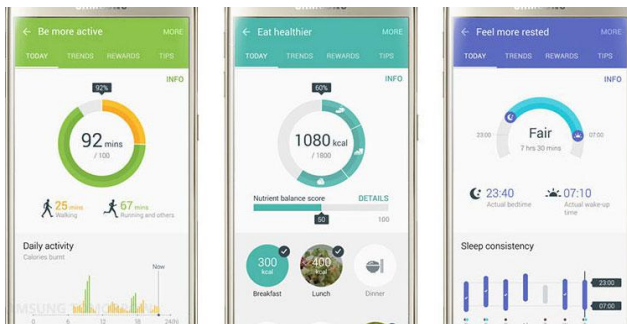

Figure 6. System running results

From the above analysis, the system can not only monitor and remind physical fitness, but also provide more humanized functions, rich content and stronger practicability. In the system performance comparison, the health assistant designed in this paper has many advantages in running fluency, installation and startup time, and is more competitive.

V. CONCLUSIONS

The invention designs and operates a practical assistant application program based on Android system based on in-depth analysis of technical requirements covered by athletes. It can include the bidding or collection function of physical articles, appropriate newspapers and training newspapers. According to the needs of users, the correct principles for the interests of users and users can be applied to the personal training management of athletes, rather than the individual training forms of athletes. People's health management is more comprehensive, and personal physical quality is constantly improved. In developing health assistance, we focus on functionality and performance, and take into account the user interface habits of users. The purpose is to simply weigh and simplify work efficiency. After testing, all the performance of the application is usually executed and meets the design requirements.

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