Research and Technology Development of University Campus Sports Data Platform

Guan Li
Guangdong University Science and Technology
Dongguan, China
675288845@qq.com

Xinxin Huang
Guangdong University Science and Technology
Dongguan, China
hxx2128@163.com

***Abstract*—This article introduces a sports platform APP developed based on Android system. The APP contains multiple sections, users can perform autonomous extracurricular exercises according to the goals specified by professional teachers; users can query the fitness test results through the APP; professional teachers can use the APP to collect users'exercise data and physical fitness data, and develop course goals of different exercise intensity and exercise load, guide users to choose a suitable course and through the data analysis system in the APP, provide hierarchical guidance to user groups. In the Android Studio environment, the team uses Java to write the client APP; In the Net beans IDE environment, the client APP is written by Java to respond to the request; the C / S architecture is implemented, and it cooperates with other tools like the MySql database, Tomcat server, and Python program. Then the basic functions of the software can work well.**

Keywords—campus sports, sports data, functions, platform building, Android app

I. INTRODUCTION

In the Internet era, the publicity of college campus sports activities is still using traditional publicity methods, so that it is difficult to attract wide attention from students [1]. In this era when everyone in colleges and universities have mobile phones, students hope that they can learn about campus sports activities through mobile phones, and that they can participate in sports activities through mobile phone terminals [2-3]. Of course, there are a lot of smart APPs for sports, and the APPs downloaded by students are not uniform, so that the uniformity of sports activity information cannot be determined [4]. The smart APP for college campus sports activities is based on the fundamental needs for students. It publishes campus sports information on the sports activities smart APP, and does a good job of propaganda and management of campus sports activities. More importantly, on the campus sports smart APP, students can not only understand the time and type of campus sports activities in a timely manner, but also can query sports information and exercise skills on the smart APP [5-6]. Of course, the smart application of campus sports activities in colleges and universities is an effective link for the undergraduate physical education curriculum, adhering to the concept of lifelong physical education, innovating physical education classroom assessment standards, strengthening the supervision of students' physical exercise, and promoting the intelligent dissemination of physical education knowledge[7-8]. Therefore, it is very necessary for college campus communication and activities to apply intelligent APP, which is great significance to the intelligent construction of college campus sports [9-10].

II. THE PLATFORM CONSTRUCTION

The concept of sports data: With the development of society, economy and technology, people's exploration of computer technology has reached a new level, and some technical bottlenecks in previous sports science research have been broken. Sports data is to use the computer technology for analyzing the individual physical fitness data, exercise data, and collection, sorting, and analysis of daily exercise data, with a view to solving technical problems that could not be fully implemented because of the technical condition.

Significance of sports data: Sports data is a consideration of physical education and a reflection of the sports skills of individuals. Data is collected and analyzed by data software to refine individual sports characteristics and formulate personalized exercise goals and intensity, so that each athlete can experience the exercise intensity. It can meet needs of different people through digitization, achieve the purpose of improving exercise performance, and develop the habit of lifelong sports.

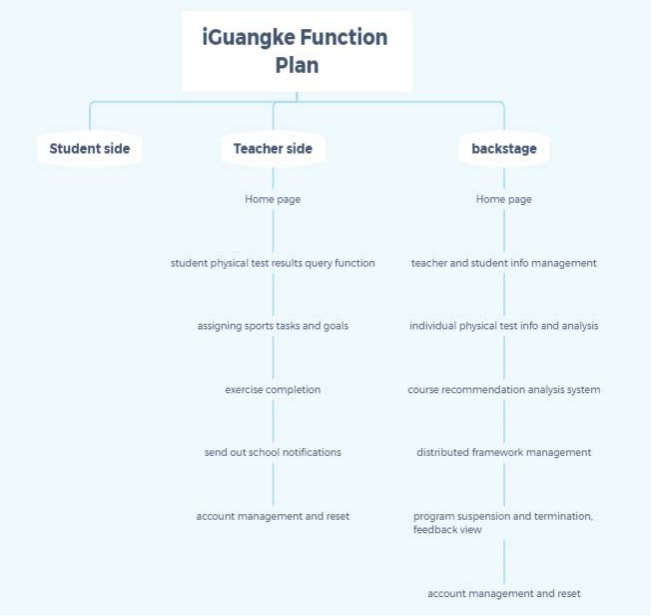

Fig. 1. Guangke Function Plan Map

Campus sports data platform construction function realization: campus sports data system settings include student side, teacher side, and backstage. The overall function design includes the query function of sports records,

lightweight intelligent sports tracking and recording functions, sports tasks and notification functions, sports track speed display function, intelligent sports violation detection function, physical test results query function, account management and feedback function, assigning sports tasks and goals, exercise completion feedback function, course recommendation analysis system, program suspension and termination, query problem feedback function, etc. As shown in Fig. 1.

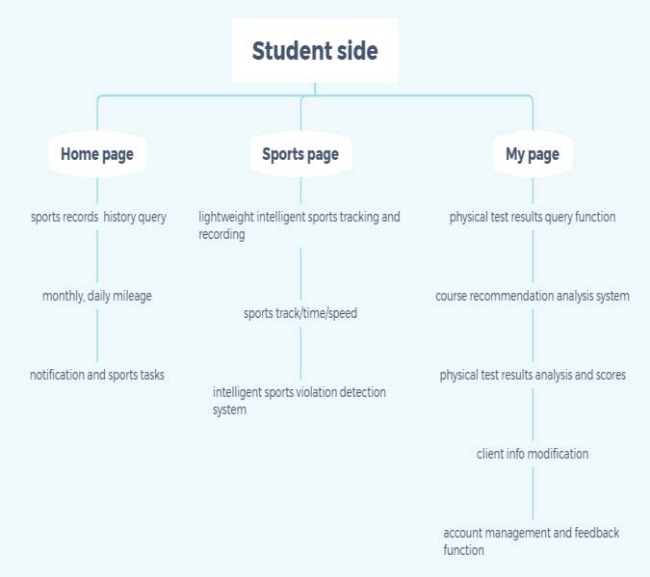

Fig. 2. Student side Function Plan Map

User management function: An interface is established between the user management function of the student sports file information system and the student educational affairs system, which can directly obtain the educational affairs information. The student's ID is the account number, and the user can login the software by real name. The basic interface displays the student name, student number, and other basic information.

Results query function: The sports results query module mainly provides information such as examination results query, fitness test results query, and sports results query. The grade query module can be set by the teacher to add items, such as vital capacity, 50-meter run, 800-meter run, long jump and so on.

Teacher information query function: Users can query the basic information of the teachers of a certain course, or search the teacher's current course, contact information and other information by searching the teacher's name.

Information push function: The service actively pushes messages to users, and class teachers can automatically obtain the basic information of all students who choose courses in the system, and can push the course and exam information through the message push function. Compared with oral notification, mobile phone APP, the message push method can more conveniently transfer messages and ensure that every piece of information can be obtained in a timely manner.

Exercise timing function: After the user logs into the account, the user can use the GPS positioning function and mobile internet technology to record the user's exercise time, route, and distance. Teachers can use this function to grasp the student's exercise situation and use the spare time sports. The amount of exercise cancalculate the usual performance.

III. The Platform Implementation

A. Construction of sports data platform

Based on big data mining and sensor device data collection, analyze and study physical fitness indicators of college students. The system is divided into three major modules: information collection and processing, App information call and algorithm processing, and web interaction system. As shown in TABLE I

TABLE I. Module function implementation

Module division	***Functions***
Information collection and processing Bluetooth low energy (BLE)	connection with the terminal
App information call and algorithm processing	APP sensor device connection to interact and process algorithm
web interaction system	server-side interface synchronized to the cloud for data analysis

- Information collection and processing:

Collect raw data (such as raw data obtained through gravity acceleration sensors, piezoelectric thin film sensors, etc.) through sensing devices (such as wristbands), connect and interact with smart phone terminals through Bluetooth Low Energy (BLE), and upload data to the server through the smart phone terminals, to obtain corresponding distance, heat, pace, speed and other data by deploying more accurate algorithms that have been obtained through reasonable data model analysis on the server.

- APP information call and algorithm processing:

(1) The smart phone terminal APP is connected to the wearable motion sensing device for data interaction.

(2) APP sports data processing algorithm and basic function implementation.

- web interaction system:

After the APP reads the data from the sensing device, it will be synchronized with the cloud for data analysis through the server-side interface. The user can view the map of each body index during the exercise and learn the detailed data; the user can formulate exercise plan; and get exercise-related guidance (such as warming up with the app guidelines).

Research needs to be completed to address the following key issues: study the accuracy of electronic pedometer data for smart phones and smart wearable sports devices; Selecting appropriate exercise types and data for the user's physical fitness as research indicators; Developing reasonable algorithms of distance, heat, step frequency, speed, etc. in the case of relatively accurate steps, and establishing a suitable mathematical model; Program the system according to the mathematical model; Initially apply the system to the exercise process of trial volunteers, use a large amount of actual data to test the accuracy of the system's physical fitness indicators.

B. Technology realization

The project uses the sensing subsystem and interactive subsystem of the wearable motion detection device as the raw data collection and calculation, and uses Bluetooth Low

Energy (BLE) as the communication method to realize the connection and data interaction between the smart phone terminal and sensing device. According to a large number of experiments and data analysis, thoroughly study the algorithms, research methods, software and hardware design, and related algorithms involved in the implementation of sports detection,

It mainly includes the following aspects:

- Selection of research index items

Taking the college student group as the research object, standard methods are used to measure height, weight, waist circumference, hip circumference, lower limb length, upper hips, skin fold thickness, scapular area, etc. to calculate the BM I index, WHR index, and body fat rate. Based on reasonable and targeted application, the work of recording, sorting, statistics, and analysis of various sports data is conducted.

- Research on Human Motion Model

The study uses a simplified human motion model for analysis, and establishes a motion coordinate system whih is consis of the sagittal axis (front-back direction of the human body), coronal axis (lateral side of the human body), and vertical axis (vertical to the ground). As the coordinate of the sensing device is closely related to the wearing position and continuously changes with the movement of the human body, the research of this project is based on the data collection of the sensing device in the smart phone terminal worn on the wrist or held in the hand.

- Improve step counting algorithm and verify accuracy

On the application layer of the Bluetooth Low Energy (BLE) protocol stack, combining the operating mechanism of the operating system abstraction layer (O SAL), the method of step-by-step execution and state transfer is used to improve the step counting algorithm of sensor in existing wearable motion detection devices and smart phone terminals, and Matlab simulation program is written for verification.

- Design and study of statistical calculation algorithms for application health data

In the motion detection, five health data are mainly calculated, which mianly contain total steps, total distance exercised, calories burned, step frequency and speed. The total number of steps is obtained by the acceleration sensor and is a known quantity. On the premise that the number of motion steps transmitted from the sensor to the smart phone terminal is accurate, a reasonable mathematical model is established for problems such as motion distance, heat, step frequency, and speed. Based on a large amount of actual motion data, equations, drawings, and theorems for proving, logic operations, numerical operations, and other traditional and modern mathematical methods, as well as computer technology, are used to study and solve mathematical models, error analysis and data stability analysis.

- Application Programming

The connection and communication between Bluetooth Low Energy (BLE) and smart phone terminals, using a large amount of data read by the terminal, and programming through distance, heat, cadence, speed and other algorithms, as well as actual application tests to verify the algorithms' accuracy.

IV. Conclusion

A society, especially today's contemporary society, needs all-round talents. The ever-increasing social rhythm and increasing social pressure have brought severe challenge to college students who are about to enter the society. Students should adapt to the development and progress of today's society, which be well-educated in humanities and social sciences, and have an excellent and healthy physique. The purpose of this study is to improve the physical fitness of college students. By designing and implementing a Hadoop-based motion information analysis service platform and combining motion analysis methods, a large number of motion data are analyzed and distributed from two perspectives, namely, individuals and groups. The big data-based motion information analysis method is applied to the information analysis service platform. The collected data can be used as a supplement to the national fitness testing platform to better understand the true physique of college students and provide more objective and effective data for the selection of all-round development talents.

Acknowledgment

This work was supported by the Guangdong University of science and technology research project under Grant No. GKY-2019KYYB. Guangdong Province Higher Education Education Reform Project in 2018.

References

[1] Dai Min. Analysis of athletes' physical fitness test data based on data mining [J]. Computer Engineering and Applications, 2015 (9).

[2] Yang Shuangyan, Zhao Shuining. Application Research of Data Mining Technology in Sports Data [J]. Zhejiang Sports Science, 2016 (30).

[3] Sun Yindong. The impact of classroom use of mobile phones on college students and reflections on the use of auxiliary teaching [J]. Journal of Higher Education, 2017 (7): 41-44.

[4] Zhu Weidong. Application of data mining technology in contemporary sports research [J]. Journal of Nanjing Institute of Physical Education (Natural Science Edition), 2010, 9 (1): 132-134.

[5] Yang Wenxue, Shao Yan, Xie Huisong. Effects of different sports on physical fitness of non-sports students [J]. Journal of Beijing Sport University, 2012 (8): 95-97.

[6] Wang Zhen, Hu Guopeng, Meng Qingguang. Development and Application of Comprehensive Management System for College Students' Physical Fitness Test under B / S C / S Mixed Mode [J]. Journal of Shanghai Institute of Physical Education, 2013, 37 (4): 61-64.

[7] Noribusziren. Design of APP software for university sports information [J]. Automation and Instrumentation. 2017 (9): 227-228.

[8] Jiao Chengsheng. Functional Design and Application of Intelligent APP for Campus Sports Activities [J]. Sports Science Research. 2017, 21 (2): 88-92.

[9] Liu Chengcheng. Research on Mobile Phone APP Product Service Design under Mobile Internet [D]. On Jiangnan Master's DegreeText, 2012, 6.

[10] Wu Yan, Rao Jingyang, Wei Xiaorong, etc. Evaluation and Analysis of Ten Issues in American Higher Education Informatization from 2000 to 2014 [J]. Electrification Education Research, 2014, 11: 109-117.

[11] Sharma Kartik; Aggarwal Ashutosh; Singhania Tanay; Gupta Deepak; Khanna Ashish (2019). Hiding Data in Images Using Cryptography and Deep Neural Network. Journal of Artificial Intelligence and Systems, 1, 143–162.