COMPARISON OF HIGH-LEVEL ATHLETE TRAINING BETWEEN CHINESE AND AMERICAN UNIVERSITIES BASED ON THE INTERNET OF THINGS

COMPARAÇÃO DO TREINAMENTO DE ATLETAS DE ALTO NÍVEL ENTRE UNIVERSIDADES CHINESAS E AMERICANAS COM BASEADO NA INTERNET DAS COISAS

COMPARACIÓN DE LA FORMACIÓN DE ATLETAS DE ALTO NIVEL EN COLEGIOS Y UNIVERSIDADES CHINOS Y ESTADOUNIDENSES BASADA EN LA TECNOLOGÍA DE INTERNET DE LAS COSAS

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ABSTRACT

In order to improve the training quality of high-level athletes in Chinese and American universities, an athlete's sports information transmission model is designed based on the Internet of Things (IoT). The communication protocol between Ayla module and the main motion control board, Ayla module and client APP or cloud platform, and APP and cloud platform in the system is designed in detail. For the Ayla module, the most important hardware part of the system, the internal composition and software design are described. In the mobile phone client part that is closely related to the user, the MVC architecture is adopted, the singleton and agent design patterns are utilized, and the functional design of each part is elaborated, including APP interface animation, data transmission format, network communication, and database storage. The research results show that the system of this study can handle most of the athlete training information, and the prediction accuracy exceeds the traditional algorithm. This research study is of great significance for improving the training efficiency of high-level athletes and further expanding the scope of application of the IoT.

Keywords: Internet of Things; Universities; Athlete.

RESUMO

A fim de melhorar a qualidade do treinamento de atletas de alto nível em universidades chinesas e americanas, um modelo de transmissão esportiva de informações esportivas é projetado com base na Internet das Coisas. Projetou-se em detalhes o protocolo de comunicação entre o módulo Ayla e a placa de controle principal de movimento, o módulo Ayla e o aplicativo-cliente ou a plataforma de nuvem, o aplicativo e a plataforma de nuvem no sistema. Para o módulo Ayla, a parte de hardware mais importante do sistema, a composição interna e o projeto de software são descritos. Na parte do cliente de celular intimamente relacionada com o usuário, a arquitetura MVC é adotada, e os padrões de design de singleton e agente são utilizados, e o projeto funcional de cada parte é elaborado, incluindo animação de interface APP, formato de transmissão de dados, comunicação de rede e armazenamento de banco de dados. Os resultados da pesquisa mostram que o sistema deste estudo pode lidar com a maioria das informações de treinamento de atletas, e a precisão da previsão excede o algoritmo tradicional. A pesquisa deste artigo é de grande significância para melhorar a eficiência de treinamento de atletas de alto nível e expandir ainda mais o âmbito de aplicação da Internet das Coisas.

Descritores: *Internet das Coisas; Universidades; Atletas.*

RESUMEN

A fin de mejorar la calidad del entrenamiento de atletas de alto nivel en universidades chinas y americanas, un modelo de transmisión deportiva de informaciones deportivas es proyectado basándose en la Internet de las Cosas. Se proyectó en detalles el protocolo de comunicación entre el módulo Ayla y la placa de control principal de movimiento, el módulo Ayla y el aplicativo-cliente o la plataforma de nube, el aplicativo y la plataforma de nube en el sistema. Para el módulo Ayla, la parte de hardware más importante del sistema, la composición interna y el proyecto de software son descritos. En la parte del cliente de celular íntimamente relacionada con el usuario, la arquitectura MVC es adoptada, y los estándares de diseño de singleton y agente son utilizados, y el proyecto funcional de cada parte es elaborado, incluyendo animación de interface APP, formato de transmisión de datos, comunicación de red y almacenamiento de banco de datos. Los resultados de la investigación muestran que el sistema de este estudio puede lidiar con la mayoría de las informaciones de entrenamiento de atletas, y la precisión de la previsión excede el algoritmo tradicional. La investigación de este artículo es de gran significación para mejorar la eficiencia de entrenamiento de atletas de alto nivel y expandir aún más el ámbito de aplicación de la Internet de las Cosas.

Descriptores: *Internet de las Cosas; Universidades; Atleta*

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INTRODUCTION

With the rapid development of intelligent hardware, the development of the IoT has sprung up at home and abroad, while smartphones have faster processors and larger processing memory, as well as a more user-friendly operating system. We urgently hope that mobile phones can not only be used as a tool to communicate with others, but also to integrate with current traditional hardware, to view hardware in real time and to control the working state of hardware.[1] Based on the Internet platform, smart phone client, and intelligent modules that can be networked, this project proposes a motion remote control system solution that uses the "Ayla Cloud + Traditional Sports" mode to combine sports with the cloud.

For the research method, the overall scheme of the system is designed. The system consists of four parts: Ayla module, motion main control board, mobile client APP and cloud platform. Among them, Ayla module mainly realizes data transmission between sports and cloud platform and APP.[2] The communication protocol between Ayla module and motion main control board, Ayla module and client APP or cloud platform, and APP and cloud platform in the system is designed in detail.[3] For the Ayla module, the most important hardware part of the system, the internal composition and software design are described.

The research in this paper has certain innovation. The paper is designed for the mobile client APP of the remote control system, including iOS platform introduction and programming environment description, client and cloud data transmission format and analysis, APP software design mode, interface animation design, network communication technology and database development.

The research is divided into three parts: The first part is the research review. The second part is the design of high-level athlete training system based on IoT technology in China and the United States, including the design of motion remote control system, Ayla module design, motion and Ayla module communication. The third part tests the system proposed in this paper.

RELATED WORK

Dodd W F proposed that in the field of sports, perceptual technology is applied in some scientific researches on sports human body to monitor the physiological indicators of the human body during exercise.[4] Boonshoft M proposed that in these applications, the relevant equipment generally requires a high experimental environment, and the cost is relatively high. In the field of sports and fitness, the combination of mobile sensing technology and fitness has also begun to take shape.[5] Davis-Hayes C believed that a variety of fitness applications, including smartphones, wearable sensors and devices, are emerging, such as the use of sensors and positioning functions built into smartphones to monitor and guide the movement of ordinary exercisers.[6] Tenforde AS proposed that there are also wearable sensor-based fitness guidance systems, such as Nike+, Adidas miCoach, etc., which provide users with more accurate motion monitoring results through portable and lightweight sensors.[7] De Paiva L C proposed that the current application has a good reference value and reference for the guidance and supervision of adolescent extracurricular sports, especially off-campus self-exercise.[8]

EXPERIMENTAL DESIGN AND ANALYSIS

Experimental Design and Environment

In the above network mode, the APP should make timely network judgments at any time, and at the same time, it must continuously acquire data under two different networks of the local area network and the wide area network. In order not to affect the interface effect and respond to user time interaction, the tasks in the long-time program can be processed in the background. Because it takes a long time for the network to request and load data in the WAN state. Here, it is placed in another thread in a multi-threaded manner. The main thread is responsible for real-time detection of network status and local acquisition of data under the LAN and response to interface events. The sub-thread is responsible for timing network request and APP model data update from the cloud platform under the WAN, and the non-WAN state sub-thread is not enabled. At the same time, the child thread needs to create a large number of temporary objects at work. To prevent memory leaks, the sub-threads are uniformly handed over to the NSAutorelease Pool in iOS for unified management. The object is reclaimed when the thread exits. An NSAutorelease Pool is created and destroyed each iteration of the program run loop NS Runloop.

Analysis of Experimental Results

System testing is a necessary part of the overall system development. This chapter mainly introduces the communication test of each part of the system, including mobile APP, Ayla module, motion and data communication between the cloud in different network states. At the same time, it conducts memory leak test for the APP developed by the author to ensure the system is stable and smooth. The APP memory check is a guarantee for the stable operation of the mobile APP, because in the limited memory space of the mobile terminal, the less memory usage, the smoother the system will run. This sports app uses the memory check tool that comes with Xcode for memory analysis, which is an indispensable part of the enterprise today. Checks are performed mainly for memory increase and memory leaks. Xcode comes with a memory tool that includes two important tools, Leak and Allocations. The Leak tool can be used to check the location of memory leaks. At the same time, the memory leak in that file can be located. The memory leaks where specific code appears can quickly help developers find out. The Allocations tool lists where all of the allocated memory is applied, and the data can quickly find places where memory is allocated and where it is occupied for a long time. In turn, the code of the application can be optimized in time. Below are the test results after a period of testing. In the Leaks-bar, it is a check mark, indicating that the mobile client APP is running normally, there is no memory leak problem, and the memory allocation below is normal without particularly large memory consumption. The entire test result APP memory is used normally, ensuring stable operation of the system. This chapter introduces the testing process of the entire system, including communication between the APP and the cloud platform and the Ayla module under the LAN and WAN. At the same time, the memory usage of the APP, including memory leaks and memory allocations, is checked. The results show that the normal data transmission of each communication in the system meets the accuracy and real-time. The APP running stable interface runs smoothly, and the system meets the expected goals. Based on the algorithm and model proposed above, the aerobic exercise ability of the athletes in the long-distance running is monitored to facilitate an efficient long-distance running plan. The morning pulse is tested first.

As shown in Figure 1 and Figure 2, when the athlete's morning pulse is relatively stable, the scores tend to play better. When the athlete's morning pulse fluctuates greatly, the athlete is more prone to unstable performance and poor performance. In actual long-distance running, if the morning pulse does not change the next day after exercise, it means that the amount of exercise is appropriate. If the morning pulse is increased by 5 times/min or more, it means that the amount of exercise on the previous day is too large, and the amount of exercise should be reduced and the exercise intensity should be reduced.

As shown in Figures 4-6, the systolic and diastolic pressures of athletes are highly correlated with performance to a certain extent. Moreover,

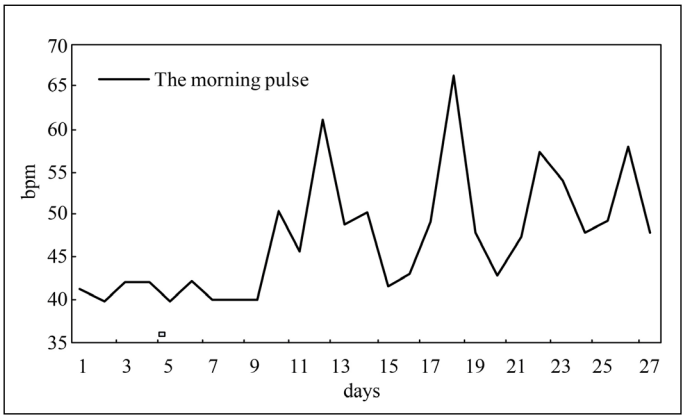

Figure 1. The relationship between the score of 3000 meters obstacle running and the morning pulse.

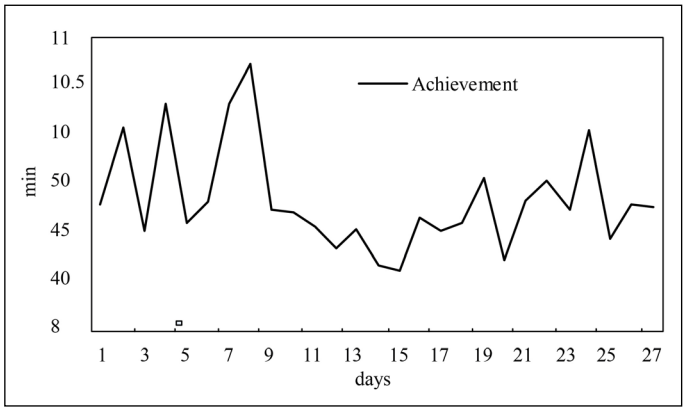

Figure 2. The relationship between the score of 3000 meters obstacle running and the morning pulse.

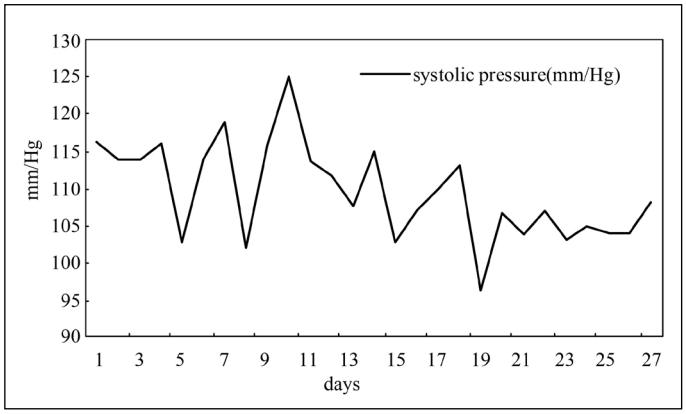

Figure 3. The relationship between the performance of 3000 meters obstacle running and the systolic pressure.

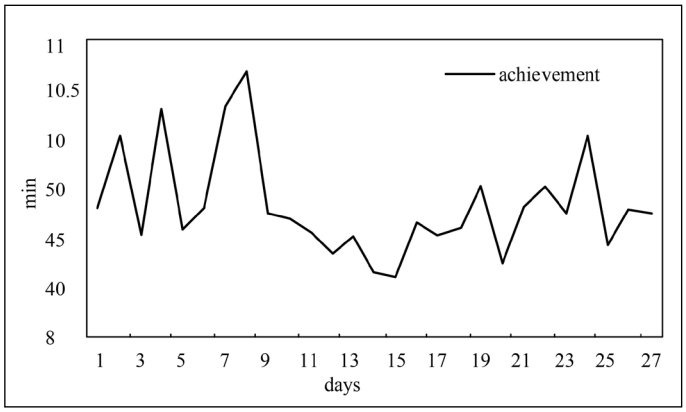

Figure 4. The relationship between the performance of 3000 meters obstacle running and the systolic pressure.

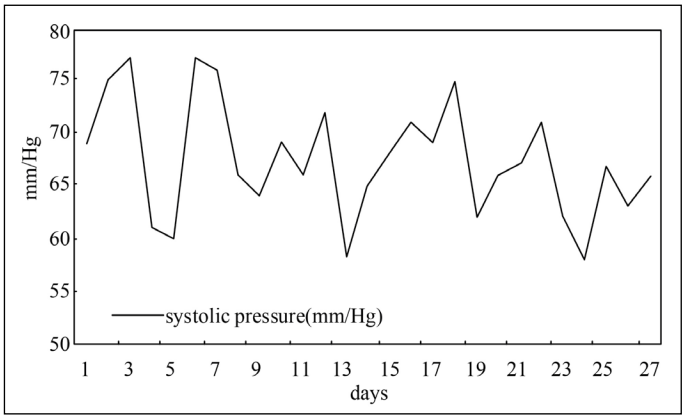

Figure 5. The relationship between the score of 3000 meters obstacle running and the diastolic pressure.

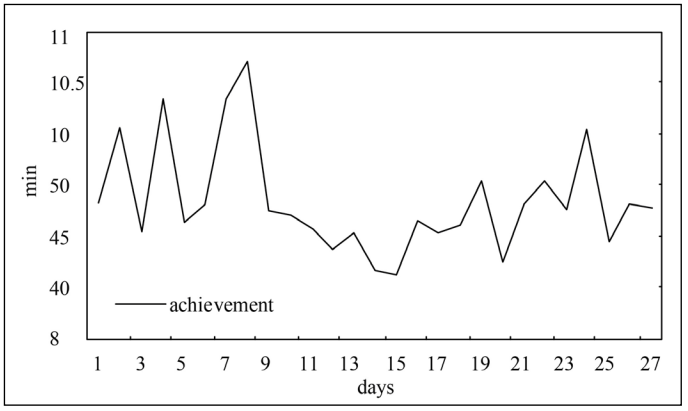

Figure 6. The relationship between the score of 3000 meters obstacle running and the diastolic pressure.

when the athlete's systolic blood pressure is low and the diastolic blood pressure is high, it is relatively easy to achieve better results. If the athletes have irregular heart rate, training out of control and sweating, they need to adjust the training method and increase the rest in time. If they continue to practice, the athletes may have excessive training. At this time, it takes a long time to make adjustments, which affects the normal training of athletes. After adjusting for systolic and diastolic blood pressure, it will return to normal. In the context of the rapid development of the IoT, along with the current boom in the sports market and with the help of the IoT hardware module under the Ayla platform, a customized motion remote control system is designed and proposed for the functional requirements of the motion remote control system. The system has fast development progress, strong portability, low maintenance cost and high practicability. With the rapid development of the current IoT, and at the same time, according to the "Internet +" model proposed by China, the traditional home appliances are transformed, and the Chinese manufacturing drawings proposed by China are initially explored, and the user needs are basically satisfied in functional applications. But there are still functions that can continue to improve.

CONCLUSION

In the context of the rapid development of the IoT, along with the current boom in the sports market and with the help of the IoT hardware module under the Ayla platform, a customized motion remote control system is designed and proposed for the functional requirements of the motion remote control system. At the same time, the design scheme of each module of the system is given. The system has fast development progress, strong portability, low maintenance cost and high practicability. The function requirements of the motion remote control system are

described. The overall design scheme of the motion remote control system is given. The block diagram design of each component of the control system is carried out, and the function is introduced in the important part of the structure. At the same time, the Ayla platform used in this system is described, including the internal structure of the Ayla module, the description of the connection between the Ayla module and the motion main control board circuit, and the role of the Ayla cloud platform. The last part of the article mainly introduces the functional tests of each part of the whole system. The test results verify the practical type of the design system. This system basically meets the needs of users in terms of functional applications, but there are functions that can continue to improve. The system cloud platform is mainly for data communication and storage, and each user's data should be statistically analyzed in the future.

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AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Xidong Zhu: writing and execution.

REFERENCES

1. Sugimoto D, Mattacola CG, Bush HM, Thomas SM, Foss KD, Myer GD, et al. Preventive neuromuscular training for young female athletes: comparison of coach and athlete compliance rates. J Athl Train. 2017;52(1):58-64.
2. Hill E, Cartabuke RH, Mehta N, Colbert C, Nowacki AS, Calabrese C, et al. Resident-Led Handoffs Training for Interns: Online Versus Live Instruction with Subsequent Skills Assessment. Am J Med. 2017;130(10):1225-1230.e6.
3. Weaver ML, Black JH 3rd. Aortobronchial and aortoenteric fistula. Semin Vasc Surg. 2017;30(2-3):85-90.
4. Dodd W F. 1944 Annual Survey of American Law. Edited by Vanderbilt Arthur T. (New York: New York University School of Law. 1946. Pp. lxxxi, 1252. $5.00.). American Political Science Review. 2017;40(5):1001-2.
5. Boonshoft M. The Founders and the Idea of a National University: Constituting the American Mind by George Thomas (review). Journal of the Early Republic. 2017;37(2):370-3.
6. Davis-Hayes C, Gossett JD, Levine WN, Shams T, Harada J, Mitnick J, et al. Sex-specific Outcomes and Predictors of Concussion Recovery. J Am Acad Orthop Surg. 2017;25(12):818-8.
7. Tenforde AS, Carlson JL, Chang A, Sainani KL, Shultz R, Kim JH, et al. Association of the Female Athlete Triad Risk Assessment Stratification to the Development of Bone Stress Injuries in Collegiate Athletes. Am J Sports Med. 2017;45(2):302-10.
8. de Paiva LC, Canário ACG, de Paiva China ELC, Gonçalves AK. Burnout syndrome in health-care professionals in a university hospital. Clinics (Sao Paulo). 2017;72(5):305-9.