Distribution of earthquake activity in mountain area based on embedded system and physical fitness detection of basketball

HaoChen Tang · Qingyuan Xie

Received: 11 June 2021 / Accepted: 31 July 2021 / Published online: 21 August 2021
© Saudi Society for Geosciences 2021

Abstract
With the development of embedded system technology in recent years, it has become increasingly mature. The training model is to train the voice in the embedded system, and match the voice to be tested with the pattern, so as to complete the speech recognition of non-specific people to generate the training model. Therefore, in this paper, the embedded system is used to record the 2018–2020 mountain seismic data of the reservoir at a specific location downstream. For these earthquakes, the displacement, activity, and source parameters are studied, so as to analyze the general characteristics of the distribution of seismic activity in the mountain area, and summarize the double location. At the present stage of Chinese basketball, college basketball is one of the important foundations of its development. Basketball is not only one of the most popular and popular sports in the world, but also one of the most popular sports in China. Since it was introduced into China, it has been highly concerned by the masses and the whole country. Improving the level of college basketball plays an important role in promoting the level of Chinese basketball. Taking a college basketball team as an example, this paper expounds the importance of special basketball training and the role of basketball detection system, and provides effective tips for special physical training. Server data transmission technology and database technology design and implement the team sports physical fitness detection and evaluation system, greatly improve the security of basketball and training. In this paper, the embedded system technology is used to study the distribution of earthquake activity, basketball training, and physical fitness detection. In this paper, the distribution of seismic activity in mountainous areas and basketball physical fitness detection are studied and applied in practice, in order to promote its development and application.

Keywords Embedded system · Distribution of seismicity in mountain area · Basketball · Physical fitness test

Introduction
Embedded system technology aims to convert the analog speech signal of human voice into digital signals recognized by computer, such as binary language and character machine language. The purpose of embedded system is to let the machine understand the common language of human beings. It not only needs to understand the meaning of surface, but also understand the deep meaning behind the text, and respond with coherent actions to realize the actions people want to complete (Qadir et al. 2015). The embedded system technology takes intelligent hardware system as the platform. Besides stable recognition performance, it must be able to keep good recognition status when the environment changes, react quickly and complete command recognition and response actions with “hardware embedded” system. Embedded system must be simpler, more intuitive, compact, more convenient and more integrated, so that human-computer interaction is more smooth, vivid, flexible and frequent. In recent years, the largest cascade hydropower station project in China — downstream cascade hydropower station project has been built in the area, including Xiangjiaba, Xiluodu, Baihetan and Wudongde. In the downstream, there are both structural earthquakes and mountain related earthquakes. This is a natural test field for studying the difference between earthquake and structural earthquake in high intensity area. It is of great significance to study the seismic activity characteristics of the
downstream region for us to understand the Mountain earthquake. The research methods of earthquake in high intensity area should be different from the general study of seismic activity distribution in eastern mountainous areas. Some new research methods can be adopted if necessary (Stephens et al. 2001). At the same time, the embedded technology is used to study the basketball competitive sports. The technical and tactical requirements are high, and there are also certain requirements for the technical and psychological quality of basketball players, which requires the physical quality of basketball players and the extreme requirements for physical strength and endurance. In the current Chinese basketball training, the lack of teaching materials, insufficient attention and lack of comprehensive training methods hinder the development of Chinese basketball. College basketball is one of the important bases of the development of Chinese basketball. It is important to improve the level of college basketball team in promoting Chinese basketball (Yang et al. 2020). This paper takes a university basketball team as an example to discuss the specific physical exercise of basketball and its basketball detection system (Yorek et al. 2016), analyze the existing problems and put forward the importance of practical solutions. At the same time, it also provides effective suggestions for special physical training while successfully building basketball detection system. The demand for sports is increasing; however, special circumstances will inevitably occur in sports. Life safety is one of the most important things. People urgently need a device that can recognize their physical condition in real time. Based on the technology of physical training, the system of physical fitness detection and evaluation that can be used in team sports is developed. Real time detection of each player’s heart rate and other physical conditions, as well as the training status of all players, to display to the administrator in the visual interface. The system also provides the initial warning function, so that administrators can fully understand the operation status of all members to ensure the safety of everyone (Sajjad et al. 2009).

Materials and methods

Research data

Overview of a downstream reservoir network

The downstream tank network consists of 85 stations, including cellular network, earth network and provincial station. There are 33 fixed stations in Sichuan, Yunnan and Guizhou, 26 mobile stations in Institute of Geophysics of China Seismological Bureau, and 25 mobile stations in Institute of earthquake prediction of China Seismological Bureau. They are cmg-3epc, cmg-40t, Trillium 120P, etc. the frequency range of the instrument is 50 hz–60 s or 50 Hz–120 s, and the sampling frequency is 100 Hz. The station network covers the area where the downstream hydropower project is located. Among them, the Xiaojiang station network of Earth Research Institute is mainly located in the south of Baihetan dam, covering both sides of Baihetan reservoir. The cellular network is expected to be mainly in the north, covering the Xiluodu basin and both sides of Zhaotong Ludian fault zone. The distribution of state-run fixed stations is relatively scattered, mainly as supplementary stations.

Data acquisition and processing

The data of a downstream reservoir network has been recorded since January 2018. In this paper, the data from January 2018 to June 2020 are used (1) Because the station network is composed of stations of different units, the instrument model is complex, mainly composed of gulfap, reftek and nano. Among them, the planned cellular network is mainly composed of gulfap and nano. The station network is mainly composed of reftek. The format of the original wave data recorded by different instruments is also different. So, the first step is to use gcf2mmsd, ref2msd, Apollo project and other software to unify all continuous waveform data into a minimum format for the convenience of the next work.

(2) From January 2016 to June 2018, the earthquake catalog was obtained from the national earthquake catalog system, and then combined with the earthquake catalog, the event waveform in EDAs format (EVT) was intercepted from the shape of the earthquake by using the fusion software. A total of 15,786 event waveform data were collected: the event waveform data into a minimum format for the convenience of the next work.

(3) The seismic phase in the event waveform is extracted from (2), and the arrival time of P wave and S wave is obtained. Then, “Sichuan 3D velocity model Yunnan” provided by the software is made by using MSDP software, all earthquakes are relocated, and new earthquake catalog and stage report are received. The follow-up work is based on the catalog and report.

Research methods

Embedded system

Speech recognition is realized in each scene, and the system takes up less memory without the influence of environment, network signal and other factors. Offline speech recognition system is adopted, which is suitable for unspecified personnel. At the same time, the selected integration platform must meet the following conditions, as well as the price, storage and performance requirements.
(1) The chip with integrated voice signal processing function can convert voice signal quickly by D/A;
(2) The system has strong computing power, and can carry out Fourier transform and other complex signal processing;
(3) Rich speech database and keyword recognition list;
(4) It provides a human-computer interaction interface, which can dynamically add recognition instructions for users to check the correctness of recognition results, such as voice broadcast recognition results, or text display recognition results. It provides a human-computer interaction interface, which can dynamically add recognition instructions, so that users can verify the accuracy of recognition results.

Earthquake location method

The phase in place data in the seismic observation report must be used for double seismic difference transmission, and there are obvious errors in some time in place data. The principle of SAC_WFCC software is to take a series of waveforms as reference, and then take turns in the time of other series of waveforms. Move $t$ until the correlation coefficient of the two is the largest, and get the correlation coefficient from the following formula, where $f(\tau)$ and $g(\tau)$ The moving time $t$ is the time difference between the two waves, and the correlation number $C$ is the cross-correlation coefficient of the two waves.

$$C(t) = \frac{\int_{-\infty}^{\infty} f(\tau) g(t + \tau) d\tau}{\sqrt{\int_{-\infty}^{\infty} f^2(\tau) d\tau \int_{-\infty}^{\infty} g^2(\tau) d\tau}}$$

In order to ensure the accuracy of the results, we only keep the results with the number of relationships greater than a certain threshold.

Seismic activity parameters

When Gutenberg and Richter studied global seismic activities in 1944, they collected statistical data of earthquakes of magnitude 6 and above in each seismic zone, and obtained empirical formula:

$$\log N = a - bM$$

Where $N$ is the number of earthquakes with $m \geq M$. The formula shows that there is a linear relationship between the logarithm of cumulative frequency and magnitude of earthquake with different magnitudes, and $b$ value is the slope of the straight line, that is, the proportional relationship between earthquakes.

Using maximum likelihood method to calculate $b$ value has always been the core of seismological research. In the process of historical development, many researchers have proposed different calculation methods, usually based on different assumptions, four methods are considered in this study:

$$\hat{b} = \frac{\log(e)}{M-M_c}$$

$$\hat{b} = \frac{\log(e)}{M-(M_c-\Delta M/2)}$$

$$q - \frac{1}{1-q} \frac{1}{1-q^2} = \frac{1}{N} \sum_{j=1}^{J} \left( j-1 \right) k_j, q = \exp(-\ln(10)\Delta M)$$

$$\hat{b} = \frac{1}{\ln(10)\Delta M} \ln \left( 1 + \frac{\Delta M}{M-M_c} \right)$$

A simple initial half space model is selected as shown in Table 1 to invert the receiver function with Gaussian parameter of 1.0. After five linear iterative inversions, the inversion result with the highest fitting degree is selected.

Inversion first $a \Rightarrow$ Because it represents the low-frequency information of the receiver function and the background profile of the reaction medium structure, we only need to select a simple initial model of 0, as shown in Table 2. The layer thickness of 0 means half space, and the fifth layer inversion iteration is carried on every 4 km. In the results of the five iterations, the waveform matching degree is the highest, the velocity structure is the most appropriate, and the Moho surface is clear.

Data detection settings

**Database design**

Before analyzing user data, the system relies on MySQL database to create a certain type of data, and classifies (see Table 3), integrates, stores and transmits the collected original data, so as to lay the foundation for data analysis. The system adopts B/S architecture and can be used in all web browsers without additional installation. It is compatible with various browser platforms. The relevant information needed by the system, such as user information data, exists in the form of database table and is stored in the system database. The system allows the administrator to edit the data according to the needs, and these data will also be stored in the data table.

**Analysis and statistics**

Based on a series of simple and efficient basic algorithms, the system analyzes the real-time running status of users on the basis of batch data. According to the index classification

| Table 1 | Simple initial model |
|---------|----------------------|
| Speed (km/s) | Depth (km) |
| 3.2 | 40 |
| 4.4 | 0 |
standard (see Table 4), the physical condition of each user is counted in real time, including the user's training distance, training time, maximum oxygen uptake speed, maximum oxygen uptake, average heart rate and aerobic recovery ability. Through the analysis, we can get the conclusion. For example, the system monitors the user's physical condition by monitoring the heart rate and average heart rate in real time over a period of time. If the heart rate is out of control, the system will respond in time to remind administrators and users.

Establishment of physical testing system

In the basketball special physical fitness test system of the basketball team of Henan Normal University, three indexes, including body shape, physical quality and physiological mechanism, can be determined. It includes length, circumference, height, width, fullness, explosive force, flexibility, sensitivity, endurance quality, speed quality, strength quality, sports skills, cardiorespiratory function; 14 three indexes, including arm extension, thigh circumference, height, chest diameter, Clayto index, entry height, shoulder ring, hourglass lane change acceleration stroke, 15×17 return, full bow, push 45s40k/60s80kg squat dumbbell weight, maximum oxygen capacity, etc. The matching weight details are shown in Table 5 below.

According to the indicators at all levels in the table above, the specific data of relevant personnel can be obtained through appropriate tests. According to the weight of the data in the table above, the coefficients of each index can be calculated so as to evaluate the physical quality of basketball players correctly, and then compare the special differences of team members’ physical fitness, so that special and effective guidance can be carried out in the future training to improve the overall competition level.

Results

Distribution results of seismicity in mountainous areas

Based on the phase relation of the original earthquake, the correlated data can be transmitted by double difference, which gives more weight to the correlated data. Double difference positioning requires that the distance between earthquakes is close enough to form “earthquake swarm”. Considering the distribution of earthquakes and stations in this area, we divide the two areas into North and south parts for double differential positioning, as shown in Fig. 1. Although there are many earthquakes in the Northeast Yibin area, it is not surrounded by our stations, so it is not included in the transit area. Our velocity model is divided into eight layers from the surface to 30 km, with top depths of 0.0, 3.0, 6.0, 9.0, 12.0, 15.0, 20.0 and 30.0 km respectively. The corresponding P-wave velocities are 5.50, 5.68, 5.73, 5.77, 5.80, 5.92, 5.95 and 6.21 km/s, and the velocity ratio VP/VS is 1.69.

Table 2

| Initial model m0 | Layer thickness (km) | Speed (km/s) |
|------------------|----------------------|--------------|
| 40               | 3.4                  |
| 20               | 4.2                  |
| 0                | 4.6                  |

Table 3

| Users collect information | Listing | Data structure | Length | Decimal place | Primary key | Non empty | Self-increasing |
|---------------------------|---------|----------------|--------|---------------|-------------|-----------|----------------|
| id                        | int     | 10             | 0      | Yes           | Yes         | Yes       | Yes            |
| name                      | varchar | 20             | 0      | Yes           | Yes         | No        | No             |
| age                       | int     | 3              | 0      | No            | No          | No        | No             |
| gender                    | varchar | 5              | 0      | No            | No          | No        | No             |
| height                    | double  | 5              | 3      | No            | No          | No        | No             |
| weight                    | double  | 6              | 3      | No            | No          | No        | No             |
| username                  | varchar | 32             | 0      | Yes           | Yes         | No        | No             |
| password                  | varchar | 32             | 0      | Yes           | No          | No        | No             |
| ble_mac                   | varchar | 12             | 0      | Yes           | No          | No        | No             |

Table 4

| Sports index classification standard table |
|-------------------------------------------|
| Indicator name                            |
| Index category                            |
| Heart rate control range                  |
|-------------------------------------------|
| Aerobic endurance                         |
| Keep moving                               |
| 59–75%                                    |
| Aerobic power                             |
| Keep moving                               |
| 74–84%                                    |
| Anaerobic threshold                       |
| Keep moving                               |
| 84–88%                                    |
| Anaerobic endurance                       |
| Keep moving                               |
| 88–95%                                    |
| Anaerobic power                           |
| Keep moving                               |
| 95–100%                                   |
| Intermittent threshold                    |
| Intermittent exercise                     |
| >88%                                      |
Table 5  Index and weight table of basketball special physical fitness testing system

| First level indicator           | Secondary indicators           | Weight | Three-level indicators                    | Weight |
|--------------------------------|--------------------------------|--------|-------------------------------------------|--------|
| Body shape                      | Length                         | 0.052  | Arm span                                  | 0.025  |
|                                 | Girth                          | 0.084  | Thigh circumference                       | 0.065  |
|                                 | Height                         | 0.051  | Height                                    | 0.095  |
|                                 | Width                          | 0.052  | Thoracic anteroposterior diameter         | 0.024  |
|                                 | Fullness                       | 0.051  | Clayto Index                              | 0.052  |
| Physical fitness                | Explosive force                | 0.051  | Run-up touch quotient                     | 0.065  |
|                                 | Flexibility                    | 0.052  | Shoulder loop                             | 0.075  |
|                                 | Sensitivity                    | 0.086  | The hourglass route changes to 0 direction and accelerates | 0.047  |
|                                 | Endurance quality              | 0.081  | 15 × 17 turn back run                     | 0.065  |
|                                 | Speed quality                  | 0.054  | Full-court arc run                        | 0.085  |
|                                 | Power quality                  | 0.084  | 45s-40KG bench press/60s±80KG burst weight | 0.044  |
| Physiological mechanism         | Motor function                 | 0.069  | Maximal oxygen uptake                     | 0.058  |
|                                 | Heart and lung function        | 0.054  | Vital capacity                            |        |

The red circle is the earthquake distribution, the green triangle is the station, and the two blue frames are the scope of our study.

Seismicity location results

There are 8230 earthquakes in the southern region, of which 5334 are transmitted earthquakes, 2179 are not located due to the lack of relevant data recorded, 235 are not connected with other earthquakes, and 464 are due to the elimination of excessive residuals in the iterative process, as shown in Fig. 2.

There are 5467 earthquakes in the northern region, of which 3046 earthquakes have been transmitted. In non-local earthquakes, 1559 earthquakes have been recorded due to the small number of phases. 456 earthquakes without connection

Fig. 1  Earthquake distribution in the study area from 2018 to 2020
with other earthquakes are recorded. The remaining 406 earthquakes are eliminated due to errors in the iteration process. As shown in Fig. 3.

The results of the relocation in the south are shown in Fig. 4: (1) the focal depth of the earthquake in the region is mostly within 20 km, mainly concentrated in 10–15 km. (2) There are obvious earthquake groups at Baihetan dam site, and the focal depth is generally shallow. (3) Along Xiaojiang Fault, there are a series of earthquakes distributed in northwest-southeast direction, and the earthquakes are distributed in strip along the fault zone. (4) The aftershock zone is concentrated along the vertical east-west and North-South directions, and the East-West zone extends to the West and gradually expands. (5) Huize basin has concentrated distribution of earthquakes, and it is not obvious strip, and the focal depth is relatively shallow.

The upper left part is the seismic distribution after placement, the color depth represents the focal length, the lower and right parts are the depth profiles along longitude and latitude, and the lower right part is the depth statistics.

The results of relocation in the northern region are shown in Fig. 5: (1) The focal depth of earthquakes in this region is more than 15 km, mainly concentrated in 5–10 km, which is less than that in the southern region. (2) There are a large number of earthquakes in the lower part of Xiluodu basin, which can be divided into two parallel northwest-southeast sequences. (3) A series of northwest-southeast earthquakes occurred along the Yanjin Mabian fault.

The top left is the seismic distribution after placement, the color depth represents the focal length, the bottom and right are the depth profiles along longitude and latitude, and the bottom right is the depth statistics.

The focus is on the two seismic zones in a given region, which are exactly located in the location of the two M5 earthquakes that occurred in 2014 (Fig. 6), indicating that these two seismic zones may be their respective magnitude sequences. The aftershocks of the two M5 earthquakes lasted as long as four years. In addition to the long duration of reservoir earthquake sequence, it should also be related to the local geological environment and deep structure.

**Temporal and spatial distribution characteristics of earthquakes**

At the same time, four methods are used to calculate the overall mean value of area B. As shown in Fig. 7, the results show that the system is too large, which is consistent with our previous discussion. When the correct minimum value is completed, the results obtained by using the size are the same as those obtained by the last three methods.

The spatial distribution results of b-value in the study area is calculated by using the seismic catalog recorded in the downstream reservoir network in 2018–2020. The calculation results are shown in Fig. 8:
Seismic source analysis results

In Fig. 9, the red solid line represents the main event spectrum, and the gray solid line is the reference event spectrum. Figure 10. This is the result of the split. We can see that we get a curve with two turning points. The first turning point of the curve is the turning frequency of the main event, and the second turning point is the turning frequency of the reference event. The reference event is far away from the main event, as can be seen clearly in the figure.

The results show that there is a strong correlation between the calculated torque amplitude and the original local amplitude recorded in the catalog, and there is a stable linear relationship between them in essence (As shown in Fig. 11). Because the moment magnitude is obtained directly from the earthquake time, it also reflects the good correlation between the earthquake moment and the local magnitude, which shows that our calculation results are accurate.

Most of the stress drop results are concentrated in 0.1–10 MPa, which has little relationship with the correlation of the entity (as shown in Fig. 12). It only shows the overall trend of increasing amplitude, which may be due to the large scope of our research or the complex internal stress condition in the region.

The earthquakes in specific mountainous areas do not show the small voltage drop common in general reservoir earthquakes, but are similar to those in Yanjin Mabian fault zone, even higher than those in Xiaojiang Fault Zone. As shown in Fig. 13, the results show that the critical fracture stress of local underground media does not decrease significantly, and the seismic activity is limited by seismic seepage. This is also consistent with the previous results.

Discussion

Analysis of seismic activity distribution in mountainous area

Using the seismic data of the downstream region recorded in the downstream reservoir network from 2018 to 2020, the displacement, activity parameters and source parameters of these earthquakes are studied, and the general characteristics of the reservoir seismic activity are analyzed and summarized.

First, we use the double difference method to relocate the earthquake in the area to obtain accurate information about the seismic location. But the double difference positioning requires that the earthquake should have more accurate time difference than the same earthquake. The earthquake ratio of the seismic phase obtained by manual means must have more error. So, we first use the correlation algorithm to correct some differences in the correct time zone, and then move it to the double difference position. The results show that the earthquake mainly concentrates in the following areas from north to south: (1) Yanjin Mabian fault is distributed in northwest
southeast direction of fault; (2) The Xiluodu basin is distributed along two parallel zones from northwest to Southeast; (3) Baihetan dam site is located in a cluster distribution with a shallow overall depth; (4) The Xiaojiang Fault Zone is distributed from north to west to South East along the fault zone; (5) In the aftershock region of magnitude 6 earthquake, the earthquakes are more concentrated and distributed in two vertical north-south and east-west wave bands; (6) Huize basin, with scattered earthquake distribution, is not striped and the overall depth is shallow.

Then, we use the maximum likelihood method to calculate the spatial distribution of B value in this region. We first find the most suitable method by comparing different methods of calculating b value, and then use it to calculate the b value of the region. Before the calculation, we use the K-K method to eliminate the aftershocks in the catalog to ensure the independence of the event. The results show that: (1) The b value in the aftershock area of the Ms6 earthquake is obviously lower than that in the surrounding area, which corresponds to the variation of B value after the strong earthquake; (2) There is a low b value area at the top of the Baitan dam, which indicates that the stress concentration is very large; (3) There are two obvious high b value areas near Huize basin and Zhaotong Basin, which indicates that the earthquakes in these two areas are more likely to be microseisms; (4) The b value of Xiluodu Reservoir area does not show the high b value of common reservoir earthquakes, but is close to the b value of Yanjin Mabian fault and Xiaojiang Fault.

Finally, we use the spectral ratio method to calculate the source parameters of earthquakes with MS 2.0 and above in this area. In order to calculate the source parameters using the spectral ratio method, we must first select the reference event which is suitable for the main event (Balkhair and Ashraf 2016). The specific method is: the distance between the baseline event and the main event is less than 10 km, the magnitude difference is greater than 1, and the correlation coefficient between the two waveforms is at least 0.5. In this way, we calculate about 200 2.0 or higher level main events and about 500 corresponding reference events. The results show that: (1) there is a strong correlation between seismic moment and magnitude. The pressure drop is mainly concentrated in the range of 0.1–10 MPa, which has no obvious correlation with the magnitude, but increases with the increase of the magnitude; (2) The stress drop in the aftershock area and near the Baihetan dam is relatively high; (3) Compared with the earthquakes near the fault zone, the voltage drop of many
earthquakes in Huize basin is obviously lower; (4) the earthquake in Xiluodu Reservoir area did not appear the small voltage drop which is common in general reservoir earthquakes, but it is similar to the Yanjin Mabian fault earthquake, which is higher than the Xiaojiang Fault earthquake (Cui et al. 2004).

Demand analysis of basketball physical fitness test

From school sports competition to city marathon, from physical fitness test to night running, individual athletes can wear sports armbands and other real-time monitoring devices in all kinds of large, medium and small sports activities, but it is still unable to achieve timely information sharing and consistent monitoring. This problem has not changed. The affected party can view the athletes’ body data (such as heart rate, calorie consumption, etc.). Athletes who do strenuous exercise often cannot objectively evaluate their physical condition. When there are physical discomfort and other abnormal conditions, if the relevant personnel do not find it in time, it will lead to athletes' shock, fainting and other accidents; In order to clarify the facts to the club and support the official investigation, there is an urgent need to record data on the physical condition. In order to protect the life, health and safety of athletes, ensure the smooth development of sports activities, and maintain the core interests of athletes and event organizers, it is urgent to have a real-time display system to display the physical condition of all athletes. Based on the above situation and purpose, we put forward the following requirements for the system: It needs to have a clear structure of the visual interface; It can record the real-time health data of all athletes efficiently, quickly and timely, and save the data on the cloud server; Can rely on scientific algorithms to calculate the health status of athletes in real time, analyze whether the physical condition of athletes support the continuous exercise of the sport; It can display real-time body data of athletes on the visual interface, including heart rate, pulse, calorie consumption, blood oxygen concentration, etc. It can remind athletes to pay attention to their health by analyzing the real-time health data of athletes; Can carry on the safe data transmission, the backup and the storage; Administrators and supervisors can provide better management and data processing capabilities.

The function and significance of basketball physical fitness test

Among the factors affecting basketball players’ competition ability, “special physique” is one of the most important
factors. Its objective evaluation reflects the players’ overall ability, and the specific level of physical fitness directly determines the level of competition. For the specific level of physical fitness of basketball players to accurately improve, we must understand the specific physical fitness, in order to carry out targeted training in the usual training for the defects of basketball players, special sports physical training can improve the technical level of basketball players. Generally speaking, this special test system has theoretical and practical significance for special physical training, and has the function of providing scientific special physical training.

**Improve the overall quality of basketball players**

Special basketball training test system can improve the quality of basketball players. This improvement is not only the improvement of physical quality, but also the improvement of psychological quality. In the process of special physical training, the level of physical fitness of basketball players is gradually improved. At the same time, it has excellent training effect on the promotion of will, which can effectively cultivate the enterprising spirit of basketball players. With the development of basketball competition, the physical quality, sports ability and psychological level of basketball players are put forward more strict requirements, and the comprehensive quality standard of basketball players has been improved.

**Improve the tactical ability of basketball players**

Basketball special physical fitness test training system can improve the tactical ability of basketball players and meet the needs of high-intensity sports venues. If a basketball player does not have a high level of physical fitness, even if his tactical level is high, he is useless. In the fierce competition, if the physical strength of the players is not enough, it will lead to the basketball players’ low shooting percentage, poor offensive consciousness and insufficient confrontation ability, which will lead to failure. On the contrary, if the basketball players have enough physical ability to effectively complete the tactical layout, in the fierce basketball game, they should...
take the initiative to attack, fight hard, defend actively, run continuously and shoot decisively. This will not only improve the antagonism of the team, but also ensure the normal play or even extraordinary play of the players, and finally go to a higher level and match point to win the individual and team.

Prolonging the sport life of basketball players

As we all know, the retirement period of athletes mainly depends on the progress of sports events and the physical condition of athletes. If athletes always maintain a high level of...
physical fitness, and have excellent sports quality, their explosive power, agility, endurance, strength, speed, flexibility and so on will also be eye-catching, to some extent, it can even extend the retirement time of athletes. Therefore, it is very important to train athletes with different qualities.

Current situation of basketball physical fitness test

Single training mode

The unique training method is the main problem of Chinese college basketball training. For example, if “strength training” is carried out in sports, only horizontal bar or barbell will be provided; If “speed” training is carried out, only sprint or acceleration run will be carried out; If “endurance training” is carried out, there is only long-distance running; When we do “weight training”, we only increase the amount of exercise. However, in reality, these training methods are unilateral, which cannot improve the overall physical quality of athletes, and this backward training method cannot effectively stimulate the body of athletes, and cannot achieve the purpose of improving skills.

Lack of theoretical system

In the current training theory and basketball research, it mainly focuses on training, technology and talent selection, while the research on the test, evaluation and selection of basketball players’ physical training system is relatively less. For the chain of traditional theory, coaches in practical training are more technical and theoretical training for basketball players, but less explanation for physical training, especially special physical training and its recognition system (Liu et al. 2005). This means that although some basketball players have gained rich theoretical knowledge and high technical level, their physical fitness does not meet the requirements of theory and tactics, so they cannot effectively improve the level of competition. Different from the general physical training, special basketball training requires coaches to master the physical quality and personal level of athletes within the prescribed time in order to achieve the goal. In order to achieve this goal, it is necessary to carry out an effective and scientific physical fitness test on athletes, to formulate a specific grading and purposeful basketball physical training plan, and to develop a model based on the test system as a reference standard, so as to carry out the next movement. Systematic and effective basketball special physical training. At present, the market is relatively deficient in the above aspects.

Establishment of basketball physical fitness testing system

Special physical training measures

(1) Combining theory with practice. The first step to strengthen the basketball special physical training is the combination of theory and practice. In addition to imparting theoretical knowledge to basketball players, we must also fully understand the training content, and make clear the training objectives of the whole team and individuals.

(2) Increase basketball special physical training methods. In the methods of increasing basketball special physical training, the improvement of “strength” is the basis of the whole basketball special physical training. Only through strong strength training and balanced strength base, can we survive to the end and win the hard game. Therefore, strength training is an indispensable special physical training in basketball. In daily training, coaches can consciously increase the strength training of players, specifically increase the strength of muscle contraction, increase the strength training of basketball players.

Secondly, endurance is also one of the essential qualities of basketball players. Due to the long basketball match time,
players need to maintain a high level of endurance. Through basketball special physical training, coaches can control the endurance training of athletes. In order to improve the team’s attack times, we must keep the fastest pass in the whole process. Therefore, in the basketball special physical training, we can use the method of single fast dribble to improve the attack level of basketball players.

Finally, in the basketball special physical training, we should strengthen the training of sensitivity. In the process of basketball special physical training, coaches can increase the training of body coordination by cultivating the players’ sense of distance, ball and position.

(3) Improve the basketball special sports training system.

In order to ensure the good training effect of basketball special physical training, in addition to the wise training methods, we also need to improve the basketball special training system, including: establishing a perfect training system, carrying out by stages and levels, controlling the training objectives, seriously formulating the training plan, and scientifically monitoring the training process (Naser et al. 2009). According to the different training cycle, it can be divided into early stage, middle stage and late stage, then, according to the training content of each period, formulate a meaningful training plan, adjust training objectives and achieve each small goal to achieve the final goal.

Establishment of physical fitness testing system

According to the set goal and the purpose of reservation, the physical fitness testing system analyzes the different attributes of parity objects layer by layer, and determines the meaning of index group according to the weight of different attributes. When building the three-dimensional performance test system, we need to organize the indicators at all levels and the corresponding weights. Under this, all index levels contain various indicators and concepts that constitute the physical fitness test system, and weight is an important factor to determine the breadth and proportion of connotation. Finally, the weight is used for correlation calculation.

Conclusion

This paper studies a speech recognition system based on embedded microprocessor. The system optimizes the algorithm of extracting speech features and pattern matching, and
transmits the optimized algorithm to the embedded platform. Combined with the characteristics of the actual use scene, the circuit is designed on the hardware of the integrated platform. According to the characteristics of the built-in platform and the actual use scenarios, the CX20921 echo noise suppression circuit is developed, which can reduce the system noise and echo interference, and improve the integrity and stability of the integrated system caused by the system. Generally, they are distributed in clusters along faults and the focal depth is generally shallower than those of natural earthquakes. The seismicity in mountainous areas generally has a high b value, that is, H. earthquakes in this area are more likely to occur in the form of small earthquakes and micro earthquakes; and the pressure drop is small, generally less than the same level of natural earthquakes. Under the action of water seepage, the critical fracture stress decreases, the seismic activity occurs and the stress release decreases. This study shows that the basketball detection system in the basketball team can record the individual physical data and level differences of players, so that basketball fitness players can use the special physical training of basketball in the actual training, and the basketball technical level will be improved. On the basis of relevant research, combined with the relevant expert tips, this paper successfully built a basketball special physical fitness test system, and provided detailed basketball special training measures and appropriate trainers, also can adjust the training methods accordingly. The system uses Java Web technology, Bluetooth 4.0 technology and MySQL database technology, combined with the current situation of team sports, to provide a real-time development and implementation of team basketball physical condition detection and evaluation. It is feasible, practical and available to effectively reduce the possibility of accidents caused by individual health risks in team sports. It is expected to achieve the expected goal of reliability, efficiency and convenience in the system design. However, with the passage of time, the system will face new requirements and challenges: the different needs of different groups for test data types, the development of cross platform mobile application software, the identification and certification of personal motor skills, etc.

**Declarations**

**Conflict of interest**  The authors declare that they have no competing interests.

**Open Access**  This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing,
adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/.

References

Balkhair KS, Ashraf MA (2016) Field accumulation risks of heavy metals in soil and vegetable crop irrigated with sewage water in western region of Saudi Arabia. Saudi J Biol Sci 23:32–44

Cui YG, Zhu YG, Zhai RH et al (2004) Transfer of metals from near a smelter in Nanning, China. Environ Int 30(1):785–791

Liu W, Zhao JZ, Ouyang ZY, Soderlund L, Liu GH (2005) Impacts of sewage irrigation on heavy metal distribution and contamination in Beijing, China. Environ Int 31(1):805–812

Naser HM, Shil NC, Mahmud NU, Rashid MH, Hossain KM (2009) Lead, cadmium and nickel contents of vegetables grown in industrially polluted and non–polluted areas of Bangladesh. Bangladesh J Agric Res 34(4):545–554

Qadir A, Amina Q, Kanwal R, Bano M, Youssaf B (2015) Accessing potential bioaccumulation of heavy metals in selective vegetables from Gujranwala District, Pakistan. J Environ Earth Sci 5(8):58–70

Sajjad K, Farooq R, Shahbaz S, Khan MA, Sadique M (2009) Health risk assessment of heavy metals for population via consumption of vegetables. World Appl Sci J 6:1602–1606

Stephens SR, Alloway BJ, Carter JE, Parker A (2001) Towards the characterization of heavy metals in dredged canal sediments and an appreciation of availability: two examples from the UK. Environ Pollut 113(3):395–401

Yang Y, Khan ZI, Ahmad K, Arshad N, Rehman SU et al (2015) Does the chromium element in forages and fodders grown in contaminated pasture lands cause toxicity to livestock: assessing the potential risk. Rev Chim 71(7):397–405. https://doi.org/10.37358/RC.20.7.8257

Yorek N, Ugulu I, Aydin H (2016) Using self-organizing neural network map combined with ward’s clustering algorithm for visualization of students’ cognitive structural models about aliveness concept. Comput Intell Neurosci Article ID 2476256:1–14. https://doi.org/10.1155/2016/2476256