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Research on Smart Sports Training Platform Based on Data Post-Processing Algorithm of Gasp Frequency Signal Acquisition Instrument

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Abstract:This study proposes a design of a "Microwave Heart Rate (456) and Respiratory Rate (57) Telemetry Monitor" using electromagnetic waves as the sensing medium. An experimental prototype using this scheme has been developed successfully. ; Using the characteristics of wavelet analysis self-adaptation and multi-resolution analysis, the extracted area signal is denoised to eliminate signal burrs (local extreme points). The system uses Kinect to obtain human color video and depth data, respectively. Motion data of users under two Kinects. Since the joint points of the human bones obtained under the two Kinects are relative to the current coordinate system, the least squares method is used for coordinate calibration, and then the Kalman filtering algorithm is used for data fusion.

Keywords: Smart Sports Training, Data Post-Processing, Gasp Frequency, Signal Acquisition Instrument

1. INTRODUCTION

Human heart rhythm 456 (4FI-K 5FIK 6LSKL9) and respiratory rate 57 (5-FIKL 7-FUCF>NS) information is of great significance for clinical medical diagnosis and nursing, in hospital emergency room [1], operating room, intensive care unit, etc. Widely equipped with "patient monitors" for monitoring human information such as heart rhythm, respiration, blood pressure, etc. [2] Breath detection is an important topic in the field of medical research. There are many researches on human breath detection at home and abroad. In 2006, Myoungho Lee of Yonsei University [3], South Korea, etc. used ultrasonic sensors to measure human respiration, and obtained a two-dimensional signal of respiration [4].

This method has high accuracy for the detection of breathing [5], but it adopts a contact method, which has its limitations in the detection of animals and is not suitable for large-scale breeding of pigs. Existing respiratory protection products or oxygen supply Most of the systems are continuous air supply [6], high power consumption and the airflow generated by the continuous direct blowing method can easily cause discomfort to the user. Under normal conditions [7], the lung exercise cycle of the same person tends to be stable, and parameters such as respiratory rate remain basically unchanged under the same state [8]. Based on this, the author proposes a way to record the air supply based on the prior value of the human respiratory rate. As my country's national intangible cultural heritage, Taijiquan has been promoted and developed all over the world [9]. And showing a booming trend. However, the traditional Taijiquan learning adopts the methods of reading books and teaching by teachers, etc., there are problems such as subjective assumptions, difficult to judge whether the movements are standardized, and difficult to display data intuitively [[10]. With the development of current intelligent technology, intelligence has penetrated deeper and deeper into people's lives, which has had a profound impact on people's lives [12].

As a sport to improve people's physical fitness, its importance is self-evident. With the change of people's concept of life [13], people began to strengthen physical exercise. At the same time, with the advancement of intelligent technology and information technology, sports and these technologies have begun to integrate continuously. At the end of the last century [14], the MES production execution system to solve this problem came into being. MES system is a new generation information system for enterprise production management. It aims to improve production efficiency, reduce production costs, shorten delivery time, and improve customer service [15]. It uses computer networks to connect various automation islands, and uses information technology to manage and optimize the overall production process, starting from product orders [16]. From the point of view of information collection, the patient monitor is a signal collection instrument that extracts human life movement information through sensors [17]. The extracted signal is processed by amplification, noise elimination and calculation, etc., and becomes valuable medical information. Provided to doctors as an important basis for diagnosing conditions and determining nursing measures [18].

In 2011, Song Kui from Chongqing Medical University and others used the non-contact method of laser ranging to measure the patient's respiration for sensitive parts of the human body [19]. However, due to the limitation of pig house environment and conditions, it is difficult to apply it to pig breath detection. In this paper, the hot wire flow sensor is used to detect the human breathing signal [20]. The sensor adopts the circuit working principle of constant temperature difference, and the structure mainly includes heating elements, air temperature compensation resistors, operational amplifiers, etc. Most of the research on Kinect sports-assisted training has been developed with a single Kinect [21]. Most of them are based on small-scale studies such as table tennis, badminton, yoga, and pull-ups [22]. For the large-scale movement of Tai Chi, a single Kinect cannot obtain accurate bone point data, and there is a problem of occlusion. With the development of current intelligent technology [23], intelligence has penetrated deeper and deeper into people's lives, which has had a profound impact on people's lives. As a sport to improve people's physical fitness, its importance is

self-evident. With the change of people's concept of life, people began to strengthen physical exercise [24]. At the same time, with the advancement of intelligent technology and information technology, sports and these technologies have begun to integrate continuously. Accurate and complete real-time data is the basis for running this MES-based data mining tool. Some data mining results are premised on the accurate measurement of the required parameters. The correctness of data collection directly affects the results and data of online calculation. The normal operation of the mining system.

2. THE PROPOSED METHODOLOGY

2.1 Gasping Frequency Signal Acquisition Instrument Data

According to the current commercial product advertising materials, the sensors used in the patient monitor are all contact-type, and most of them use ECG probes (A'FNK-, N JFIT) pasted on the human skin to obtain ECG signals, using impedance The sensing band (6FM+, -IK, &> 5IMF) surrounds the body's thoracic cavity to obtain breathing signals, etc. In this paper, a method of area feature operator with greater correlation with respiration and better stability is proposed to detect the respiration of pigs. After obtaining the two-dimensional signal of pig respiration, wavelet analysis was used to optimize the signal, and the peak point detection algorithm was used to obtain the pig's respiratory frequency, which was finally converted into respiratory frequency. This method can replace traditional manual counting.

Linearization is achieved by microprocessor and software in order to produce reproducible flow rate profiles. The heating wire is a section of the bridge. When the flow rate changes, the temperature, impedance and current changes of the heating wire cause the bridge circuit to be unbalanced. The flow rate can be converted according to the output voltage change. Motion capture technology is a technology that can measure the motion of moving objects in three-dimensional space. At present, it has applications in human-computer interaction, medical treatment, animation production, sports training, etc. Motion capture technology is based on the principles of computer graphics, using sensors and motion capture devices. Provide users with functions such as motion posture analysis, so as to realize human motion analysis based on computer vision. Specifically, the input part of the system mainly inputs the body motion image sequence of athletes and coaches into the auxiliary sports training system through Kinect image acquisition; the auxiliary sports training system first detects the input image sequence and constructs a human body contour map. Data mining technology It is the result of people's long-term research and development of database technology.

At first, various commercial data were stored in the computer database, and then developed to query and access the database, and then developed to the instant traversal of the database.

2.2 The Signal Acquisition Instrument Data Post-processing Algorithm

The microcontroller STC12C5A60S2 acts as the core controller to receive the data uploaded by the temperature sensor DS18B20 and the flow sensor AWM720. After analysis and synthesis, it controls the start and stop of the fan, and uploads the sensor data to the host computer for real-time display through serial communication. Provides depth data, color video, audio data. It has functions such as motion capture, image recognition, speech recognition, skeleton tracking, and image recognition.

Using Kinect, the original data stream can be detected, and the user's skeleton data information can be obtained, which can be combined with Taijiquan movement to meet the requirements of motion capture technology in the user's Taijiquan training process. Then, according to the corresponding algorithm, the joint angle trajectory of the athlete and the coach during limb movement is calculated. Finally, the calculation results are compared and the similarity is calculated. The obtained joint angle trajectory and posture similarity results are displayed to the system user through the output module. Provides auxiliary functions such as printing. Human motion capture is an important means to obtain human motion data. In the optical motion capture system, it generally includes a data acquisition part and a data processing part. The data processing part is mainly divided into data noise processing, scattered data matching and missing points. deal with.

At present, domestic and foreign scholars have carried out a lot of research on some problems in motion capture data processing and achieved fruitful results. Association analysis: Association rule mining was first proposed by rakesh apwal et al. There is a certain regularity between the values of two or more variables, which is called an association. Data association is an important class of discoverable knowledge that exists in the database. Associations are divided into simple associations, temporal associations, and causal associations.

2.3 The Research on Smart Sports Training Platform

The STC12C5A60S2A/D is converted on the P1 port. After the power-on reset, the P1 port is a weak pull-up type A/D, and the output of the flow sensor is connected to the P1.0 pin. The chip ADC is a successive comparison ADC, which consists of a comparator and a D/A converter. Through successive comparison logic, starting from the highest bit, the user motion database is established according to the skeleton point fusion data obtained by the two Kinects. Test sequences and standard sequences can be constructed according to the skeletal point coordinates of the Taijiquan movement of the user and the standard instructor. Relevant rules and evaluation scores are specified in advance. The joint data extraction needs to firstly apply the generator UserGenerator, which detects the appearance and departure of characters through callback functions.

The callback function NewUser corresponds to the appearance of the character, and the callback function LostUser corresponds to the departure of the character. Requirement analysis is an important step in system design, and the analysis result directly affects the realization of the project. The requirement analysis of the real-time data preprocessing system is to obtain the needs of the users of the system to solve practical problems. The analysis of system requirements needs to master the basic concepts, methods, means, evaluation standards, risks and other related knowledge of requirements. The marking points are set to be symmetrical from left to right and from front to back to facilitate subsequent data processing. The points enclosed in a closed pentagon in the figure are marked points set on the desktop, and their positions remain unchanged during the motion capture process, which is the reference for the later data processing time base coordinate system setting. (, the marked points are set on both sides of the joint, and the left and right are symmetrical, and the connection between the

marked points reflects the rotary motion of the joint during the movement process; (, the marked points are set on both sides of the joint, and the left and right are symmetrical, and the connection between the marked points is in the The rotational movement of the joint is reflected in the movement process. It can be seen from the above formula.

The electric field at a certain point in the space outside the sphere is a function of the radius 0 of the sphere, the permittivity #, $ and the wave vector &. Assuming that the human heartbeat and breathing motion cause the equivalent radius 0 to change periodically with time.

3. CONCLUSIONS

The feature extraction of the target image constructed in this paper has a certain feasibility, and the key joint information of the moving human body can be extracted, and the difference between the standard action and the sports action can be compared with the aid of the auxiliary system. However, in the realization of the auxiliary training system in this paper, the components of higher harmonics are relatively complex; in addition, the heartbeat and breathing signals are weak, and the noise also increases when the telemetry distance increases. This problem needs to be solved by digital signal processing methods, such as Adaptive correlation processing, wavelet transform methods, etc.

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