

Intelligent Effect Evaluation Platform of Sports Training Based on Extreme Respiratory Rate Detection Equipment

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Abstract: In this paper, a non-contact respiratory rate measurement method based on RGB video information is proposed. The method is divided into four steps: first, perform spatial filtering and noise reduction on each frame image of the input video; then use the grayscale compensation algorithm to perform grayscale compensation on the denoised image. Set the magnitude of learning depth, from quantitative analysis and qualitative analysis. From two perspectives, quantitatively analyze the impact ability of the investment index; establish a judgment matrix, determine the weight coefficient of the grading evaluation index system, set the evaluation result consistency index, and test the evaluation results. A hardware interface circuit is designed by using a thermistor to detect the heat of each exhaled gas through a bridge. And the temperature information is transmitted to the receiving device by wireless transmission, and processed by the single chip microcomputer.

Keywords: Intelligent Effect Evaluation Platform, Sports Training, Extreme Respiratory Rate, Detection Equipment

1. INTRODUCTION

Sports, as an important way for college students to strengthen their bodies, undertakes the important task of enhancing students' physique and shaping their physique. There is a complex and subtle relationship between public sports resources such as venues and equipment and the sports needs of college students [1]. In various scenarios such as search and rescue, monitoring, and elderly care, there is considerable demand for non-contact measurement of human vital signs. Typical human vital sign information includes body temperature, respiratory rate [2], and the like. Among them, body temperature information can be obtained through infrared cameras [3-4]. There are many data and corresponding analysis functions that can truly reflect the physical fitness of middle school students.

Through research, it is found that most middle schools basically use manual methods or Excel tables to complete the statistical data required by physical education and health teaching, which is not conducive to the preservation of data. Learning diversified sports [5], such as aerobics, table tennis, volleyball, taekwondo and yoga, etc. The enthusiasm of sports enriches students' extracurricular activities. At present, this kind of personalized physical training is a research hotspot for optimizing teaching mode [6], and it has more exploratory, experiential, intuitive and interesting features that are worth further study. Commonly used breathing Frequency detection methods are: contact measurement [7], non-contact measurement. Contact measurement methods mainly include: strain gauge type, thermistor type; non-contact measurement methods mainly include: ultrasonic Doppler respiratory rate detection old J [8].

The intelligent management system of sports resources is mainly composed of three parts: sports facility monitoring unit, identity authentication unit and sports information management cloud platform, as shown in Figure 1 [9]. The monitoring unit of sports facilities mainly includes RFID electronic tags, equipment adapters (including RFID card readers, microcontroller systems, ZigBee nodes, power

collection and relay units). The existing respiratory protection products or oxygen supply systems are mostly continuous air supply, with high power consumption. Moreover, the airflow generated by the continuous direct blowing method can easily cause discomfort to the user [10,11]. Under normal conditions, the same heart and lung exercise cycle tends to be stable, allowing students to upload practice images to obtain targeted guidance from teachers, thereby further realizing personalized teaching and enhancing the learning effect of the course [12].

Structure design of the teaching platform System function of the teaching platform the teaching platform serves the two major groups of teachers and learners. However, although it has received a lot of attention, its impact on physical education teaching is not large enough [13]. There are still many schools that remain complacent and unwilling to Changing the traditional teaching mode makes it difficult to achieve the desired effect in physical education. Teachers do not have the enthusiasm for teaching, and students do not get due exercise. This is called "water-pointing" [14]. Breathing is important to the human body. Physiological process, respiratory rate is an important indicator to measure whether the body's cardiopulmonary function and gas exchange are normal, and it can also indirectly reflect work intensity, human fatigue and emotional state.

In the process of physical education, the learning process is often more important than the academic performance. In the teaching practice just started, I consciously emphasize the process evaluation, especially love to use positive evaluation. Those who stand upright praise him as "like a mighty soldier" [15], those who run fast praise him as "can be a champion" and so on. Outsiders compete with students for venues and facilities; the use and distribution of resources are uneven; problems such as damage and aging of facilities need to be solved urgently. Aiming at problems such as automatic management of sports facilities, intelligent use of equipment and college students, identity authentication of athletes, cloud platformization of sports information management, etc. The

respiratory rate is the number of breaths per minute. A rise and fall of the chest is a breath, an inhale and an exhale [16].

Human respiration will cause a certain amount of body micro-motion, and the human respiratory rate can be obtained indirectly through the measurement and analysis of the body's micro-motion [17]. It has been developed into a comprehensive evaluation system for sports and health, which completes the functions of project maintenance, data entry, statistics, report output, and data analysis. Each functional module is relatively independent, which is easy to expand the functions of the system [18]. Provide a superior teaching method for the all-round development of students. In order to study the application effect of the current personalized physical training model, a graded evaluation of the teaching effect is proposed [19]. The traditional graded evaluation method is based on the type of exercise.

2. THE PROPOSED METHODOLOGY

2.1 The Extreme Respiratory Rate Detection Equipments

Respiratory rate is the number of breaths per minute. A rise and fall of the chest is a breath, an inhale and an exhale. Human respiration will cause a certain amount of body micro-motion, and the human respiratory rate can be obtained indirectly through the measurement and analysis of the body's micro-motion. The detection unit adopts a bridge circuit, and a precise constant voltage source composed of TIA31 is used to supply the circuit. The hot wire as a heating element is placed in the air flow channel of the sensor, and the operating temperature is higher than the intake air temperature when the circuit is designed.

In the bridge, only when the temperature of the heating element is higher than the air temperature, the bridge circuit can achieve balance. The teacher guides, corrects and guides the corresponding learning strategies. The training improvement module can provide examples of practice methods for a single technique or multiple combined techniques to improve application ability, meet the needs of students with different levels of learning foundation, and strengthen classroom teaching effects.

In the formula, n is the number of complete breathing cycles collected during the sampling time, and the time interval between any two adjacent peaks in the grayscale curve is regarded as a breathing cycle.

References [10-11] use depth cameras to detect human respiration. The cyclic expansion and contraction of the thoracic cavity is used to calculate the respiratory rate. However, the displacement of the thoracic cavity surface caused by human respiration is relatively small [12]. The outside is first received by the receiving circuit of the corresponding frequency, and the received data is sent to the microcontroller AT90S8535 by means of interruption, and the microcontroller samples the temperature signal according to the data. The temperature is determined by the amplitude, and the processed data is transmitted to the display unit and the alarm unit.

The respiratory rate is obtained by counting the number of peaks and troughs within a certain period of time. The real-time respiratory rate data is transmitted to the firefighter body area network aggregation node through Bluetooth, and then transmitted to the firefighter training evaluation cloud platform through the network. When there are periodically

moving objects in the video, the gray value of the area where the object is located also changes periodically with time. Therefore, it is theoretically possible to identify periodically moving objects by analyzing the periodically changing pixel regions in the video.

2.2 The Evaluation of the Effect of Intelligentization of Sports Training

The use of intelligent evaluation does not mean abandoning the traditional evaluation methods. The two evaluation methods are combined in the classroom to make the evaluation more effective and make the classroom more dynamic. The performance of students' learning ability, learning habits and learning effect in the classroom. In this paper, the EM series ID card of Taiwan SYRIS is used to attach to the surface of the facility to identify sports resources. The ID card is a non-writable proximity card, which is associated with different degrees of learning investment, including two categories of indicators, namely quantitative indicators and qualitative indicators.

The quantitative indicators represent the evidence status between data, and will have different orders of magnitude for different data sets, as shown in Figure 2 below. The only data stored in it is a fixed label identifier (UID). The UID is permanently set by the label manufacturer and conforms to ISO/IEC DTR15693. The schematic diagram of the DC bridge is shown in Figure 2. R1, R2, R3, and R4 are called the bridge arms of the bridge, and R5 is its load. The line circuit for parallel compensation is to replace the load R5 with a parallel resistor. The power consumption collection of the equipment is realized by the single-chip power metering chip HLW8012. The chip can measure active power, electricity, voltage RMS, and current RMS. HLW8012 integrates built-in oscillator and reference power supply. The peripheral circuit mainly includes current. STC12C5A60S2A/D is converted in P1 port. After power-on reset, 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, data mining and analysis can also be carried out according to the records of students' learning activities, which can increase the difficulty of the task and improve the application ability. The more optimized learning strategies are recommended to achieve the purpose of teaching students in accordance with their aptitude. The evaluation feedback module is based on the records of students' learning activities. The system development process is arranged: input part, statistical analysis part, indicator generation, report generation, dictionary maintenance. According to the idea of software engineering and the needs of users, the input part first establishes the initial model framework.

2.3 The Evaluation of Sports Training Effect Based on Extreme Respiratory Rate Detection Equipment

Extract a fixed number of frames from the input video, and perform grayscale and Gaussian blur processing on each frame to reduce image noise; in the grayscale compensation stage, the grayscale value of each pixel in each frame is compensated by the designed grayscale compensation algorithm. Objective, comprehensive, smooth, and motivating; the collection of sports and health data is completed, and students' evaluation indicators in this area are

increased. Improve the overall quality assessment system for students for knowledge base (KnowledgeBase, KB) and its reasoning (implicated reasoning).

In the grading evaluation, the grading evaluation index should be determined, and the weight coefficient of the evaluation system should be set according to the index. The hierarchical structure model of the educational effect grading evaluation should be established. The model includes the target layer, the criterion layer, and the result layer. A set of transmission protocols is designed according to the general requirements of transmission and the special requirements of the wireless transmission transceiver module chip used. The identity authentication unit is the personnel management part in the intelligent management system of sports resources, which mainly realizes the identity confirmation of personnel and the diversion of personnel. The QR code pasted on the shell of the device adapter is a unique ZigBee node MAC address to identify the device adapter.

During the experiment, firstly, the flow sensor detects the person's breathing, and the characteristic value of the person's breathing pattern is extracted and recorded by the control algorithm. Combined with the teaching schedule, provide suitable test points, test the learning effect, find out the problems in the learning, and make the students have a correct understanding of their own learning status, so as to get feedback and adjust the learning strategy. The temperature sensor is placed near the mouth and nose to sense the temperature change of exhalation and inhalation. When the temperature detected by the sensor reaches a certain threshold, the controller outputs a signal to control the fan to start and stop according to the existing breathing mode.

3. CONCLUSIONS

This paper focuses on the informatization of sports resources and the use process, and designs an intelligent management system of sports resources based on cloud platform. A non-contact respiratory rate measurement method based on RGB video information is proposed. Through multi-level spatial and temporal filtering methods, the position of the human body in the video is marked and the breathing frequency is calculated. A more systematic grading evaluation was carried out on the effect of individualized physical training, which greatly improved the similarity between the evaluation results and the students' actual learning results, and ensured that the evaluation results were authentic and reliable.

4. REFERENCES

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