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Research On Monitoring System Of Students' Physical Exercise Based On Internet

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Abstract

Internet based student physical exercise monitoring system; It includes: acquisition module, which is used to collect students' physiological parameters in real time; The storage module is used to store the physiological parameters acquired by the acquisition module; The display module is used to display the ECG, heart rate, respiration and exercise parameters of the human body; The processing module is used to receive the physiological parameters collected by the acquisition module and process the physiological parameters. On the one hand, the physiological parameters are stored in the storage module, and on the other hand, the human ECG, heart rate, respiration and motion parameters are displayed in the display module; The wireless transmitting module is used to send the human ECG, heart rate, respiration and motion parameters to the user. By collecting and monitoring the acceleration of the human body in real time, this design can grasp the movement state of the human body in real time and detect the fall of the human body.

Keywords

Internet, student, physical ability, exercise, monitoring.

1. The purpose and significance of project implementation

Students, especially with the increasing learning pressure, are learning and living at a faster pace, and their physical and mental pressures are also increasing, so that the fast-paced learning and life requires higher and higher physical quality of students, and exercise at ordinary times is the best way to improve students' physical quality.

The purpose of physical fitness monitoring is to help the subjects know the overall results, overall evaluation, health level and disease tendency of their physical fitness, and to maintain and improve their physical fitness level and disease resistance through non-medical intervention measures (exercise and nutrition), so as to provide scientific basis for organizing exercisers to carry out sports.

It is helpful for exercisers to understand and master their own physical fitness and health changes, stimulate their exercise consciousness and enthusiasm, reduce their blindness in exercise, make a scientific exercise plan, and choose the exercise content and methods that are suitable for them, so as to achieve the purpose of strengthening their physical fitness and health.

As far as the current social situation is concerned, more and more students are taking physical exercises due to the increasing pressure of students and the existence of food hidden dangers. With the rapid development of science and technology, how to detect and discover the changes of students' health and establish intelligent health monitoring systems, such as wearable monitoring system and remote medical monitoring, have become the development direction of intelligent monitoring in the future.

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In the existing technical field of student health monitoring, wearable monitoring system is large in volume and single in function, which is far from meeting the needs of life.

2. Research contents of the project and problems to be solved

(1) Technical problems to be solved

In order to overcome the above technical defects in the prior art, this design provides a monitoring system for students' physical exercise based on the Internet, which can effectively solve the problems in the background technology.

(2) Technical scheme

Internet-based monitoring system for students' physical exercise:

Include:

The acquisition module is used for acquiring physiological parameters of students in real time;

The storage module is used for storing the physiological parameters acquired by the acquisition module;

The display module is used for displaying ECG, heart rate, respiration and exercise parameters of human body;

The processing module is used for receiving and processing the physiological parameters collected by the collecting module, storing the physiological parameters in the storage module on the one hand, and displaying human ECG, heart rate, respiration and exercise parameters in the display module on the other hand;

The wireless transmission module is used for transmitting human ECG, heart rate, respiration and movement parameters to the user terminal.

By collecting the acceleration of human body and monitoring it in real time, this design can grasp the motion state of human body in real time, and can detect the fall of human body. Basic conditions for project research and implementation

3. Basic conditions for project research and implementation

Members of our project team study hard, study hard and have a persistent attitude. The members have excellent professional courses, a certain level of theoretical knowledge, and critical thinking ability to ensure the correct analysis of problems. The library of the school is rich in resources, with numerous physical books and a wide range of materials, which is convenient for researchers to have a deeper understanding of research. The school and project execution departments have professional instructors to give guidance.

4. Project implementation plan

As shown in Figure 1, this design embodiment discloses an Internet-based monitoring system for students' physical exercise, which includes:

(1) an acquisition module, which is used to acquire the physiological parameters of students in real time, wherein the physiological parameters include human ECG, heart rate, respiration and exercise parameters;

The storage module is used for storing the physiological parameters acquired by the acquisition module;

The display module is used for displaying ECG, heart rate, respiration and exercise parameters of human body;

The processing module is used for receiving and processing the physiological parameters collected by the collecting module, storing the physiological parameters in the storage module

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on the one hand, and displaying human ECG, heart rate, respiration and exercise parameters in the display module on the other hand;

The wireless transmission module is used for transmitting human ECG, heart rate, respiration and movement parameters to the user terminal.

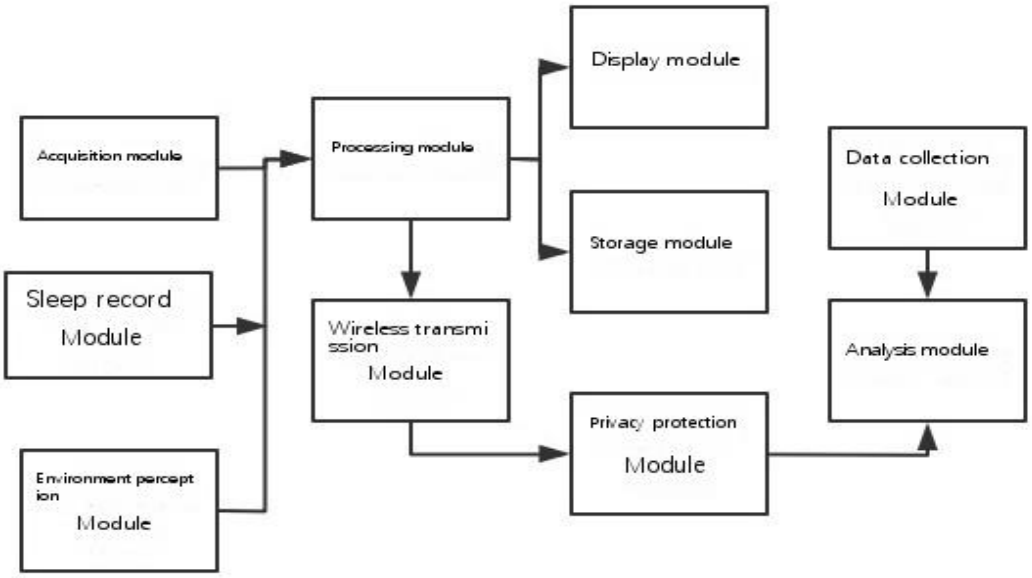

Figure 1 The schematic diagram of the monitoring system of students' physical exercise based on the Internet.

5. Project implementation plan

This design embodiment discloses an Internet-based monitoring system for students' physical exercise, which includes:

(1) an acquisition module, which is used to acquire the physiological parameters of students in real time, wherein the physiological parameters include human ECG, heart rate, respiration and exercise parameters;

The storage module is used for storing the physiological parameters acquired by the acquisition module;

The display module is used for displaying ECG, heart rate, respiration and exercise parameters of human body;

The processing module is used for receiving and processing the physiological parameters collected by the collecting module, storing the physiological parameters in the storage module on the one hand, and displaying human ECG, heart rate, respiration and exercise parameters in the display module on the other hand;

The wireless transmission module is used for transmitting human ECG, heart rate, respiration and movement parameters to the user terminal.

Furthermore, it also includes a mobile terminal, where the acquisition module, storage module and display module are all arranged, and the processing module is arranged on the user terminal.

The mobile terminal can be a portable small acquisition device such as a smart bracelet and a smart watch. By setting a sensor in the small acquisition device, the ECG, heart rate, respiration and movement parameters of the user can be acquired in real time.

The fixed terminal can be a mobile phone, a computer, a tablet computer and other intelligent devices with processors, and the fixed terminal is connected with the mobile terminal through

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a network, so that the physiological parameters collected by the mobile terminal can be processed and viewed through the fixed terminal.

Quasi-development board

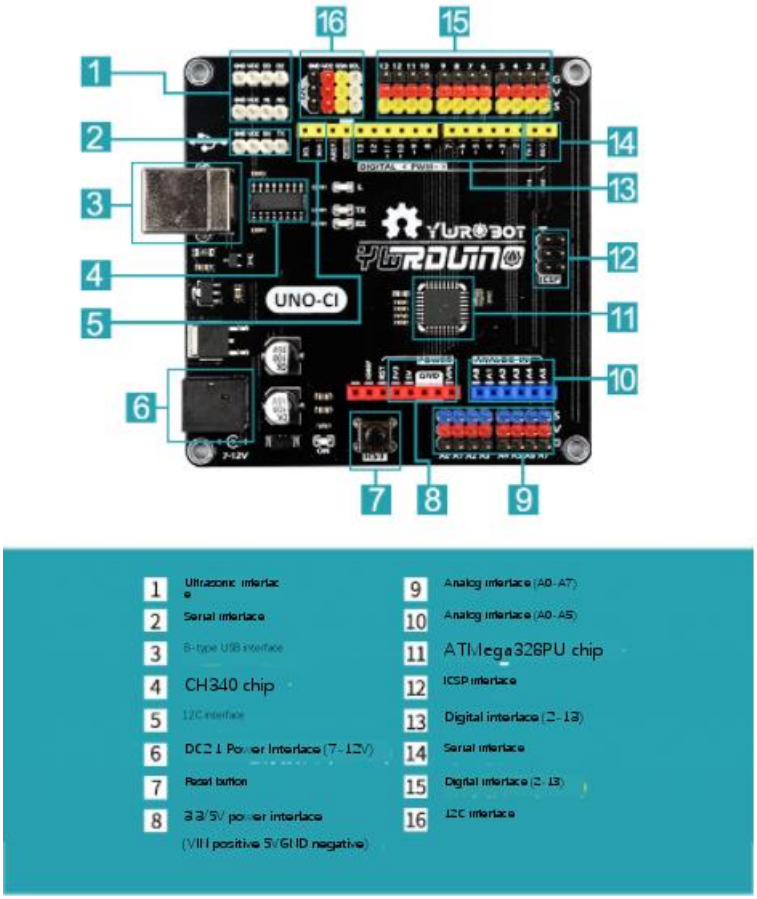

Figure 2 Development environment

(2) The acquisition module includes blood pressure sensor, ECG sensor, temperature sensor and acceleration sensor. The blood pressure sensor is used to collect blood pressure parameters of human body, ECG sensor is used to collect ECG signals of human body, temperature sensor is used to monitor body temperature parameters, and acceleration sensor is used to collect motion parameters of human body.

The acceleration sensors are arranged in three groups, and the three groups of acceleration sensors are respectively used to collect the acceleration of human body in three directions. The acquisition module also includes angular acceleration sensors, which are used to collect the angular acceleration parameters of human body.

The acquisition module also includes a microphone, a speaker and a GPS positioning device. The microphone is used to acquire the sound signal of the mobile terminal and transmit it to the fixed terminal through the wireless transmission module, and the speaker is used to play the sound signal transmitted by the fixed terminal through the wireless transmission module.

The acquisition module also includes a pedometer, which is used to record the number of human steps.

The acquisition module also includes SpO2 detection sensor, two groups of light-emitting diodes (LEDs) and photocell elements, and the two groups of LEDs are red diodes with 660nm wavelength and infrared diodes with 940nm wavelength respectively.

When in use, the 660nm wavelength red light diode and the 940nm wavelength infrared light diode are alternately lit according to a certain time sequence. When the capillaries at the

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fingertips are repeatedly congested with the blood pumped by the heart, the light of the LED is absorbed by the blood vessels and tissues and projected onto the photocell, which can sense the light intensity changing with the pulse blood in the form of changing electrical signals.

(3) When the processing module processes the ECG signals acquired by the acquisition module, it includes the following steps:

Step 1, amplifying the collected ECG signal by using an operational amplifier AD620, wherein the amplification gain of the operational amplifier AD620 is set to 10;

Step 2, filtering the amplified ECG signal with RC filter circuit, and amplifying with operational amplifier;

Step 3: Extract the eigenvalues of the amplified and filtered ECG signals.

When the processing module processes the blood pressure signal acquired by the acquisition module, it includes the following steps:

Step 1, establishing a time-pressure histogram according to a blood pressure signal obtained by a blood pressure sensor;

Step 2, extracting the characteristic value of the blood pressure signal according to the obtained time-pressure histogram, wherein the extracted characteristic value is the maximum value O0 of each detected pulse wave;

Step 3: Calculate the average pressure OM, systolic pressure OS and diastolic pressure OD of human body according to the maximum value O0 of each extracted pulse wave.

Calculate the average blood pressure OM, systolic blood pressure OS and diastolic blood pressure OD of human body by formula and; Where, and are both constants.

(4) When the processing module processes the acceleration and angular acceleration acquired by the acquisition module, it includes the following steps:

Step 1, establishing a motion model according to the obtained acceleration parameters and angular acceleration parameters;

Step 2, calculating the combined acceleration A according to the obtained acceleration, and calculating the combined angular acceleration G according to the obtained angular acceleration;

Step 3, judging the motion information of the human body according to the combined acceleration, the combined angular acceleration, the acceleration in all directions and the angular acceleration in all directions;

Step 4, sending the motion information of the human body to the user end through the wireless transmitting module, and reminding.

Calculate the acceleration parameters of human body by formula; Where is the resultant acceleration of human body; Is the acceleration of the human body in the direction of the human body; Is the lateral acceleration of the human body; Is the acceleration of human body in the vertical direction.

Furthermore, the angular acceleration parameters of human body are calculated by formula. Where it is the angular acceleration of human body; Is the angular acceleration of the human body along the advancing direction of the human body; Is the angular acceleration of the human body along the lateral direction of the human body; Is the angular acceleration of the human body in the vertical direction.

(5) As shown in Figure 2, when the processing module judges the motion information of human body, it includes the following steps:

Step 1, judging the combined acceleration, and if the combined acceleration of the human body is less than the threshold value A at time T, performing the next operation;

Step 2, judging whether the combined acceleration of the human body is greater than the threshold value B at the time of t+T, and if it is greater than the threshold value B, performing the next operation;

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Step 3, judging whether the angular acceleration of the human body is greater than the threshold value C within the time of t+T+T', and if it is greater than the threshold value C, the human body is in a falling state.

Threshold A, threshold B and threshold C are all obtained through experiments.

Comprises an analysis module and a data collection module, wherein the data collection module is used for collecting and sorting out the physiological parameters of patients and the treatment suggestions of doctors, and the analysis module is used for comparing and analyzing the human physiological parameters collected by the collection module with the data in the data collection module, and giving exercise and diet suggestions.

It also includes a diagnosis module, which is used for receiving the human body parameter information sent by the wireless transmission module, reading and diagnosing the physiological parameters of patients by doctors, and sending the diagnosis results to the analysis module.

It also includes a privacy protection module, which is used to encrypt and protect the personal information of users to prevent others from stealing and illegally using the personal information of users. The privacy protection module includes an independent storage, a processor and a cloud storage. The independent storage stores the personal information of users, the processor is used to encrypt the personal information of users, and the cloud storage stores the physiological parameter information of users. The independent storage is only connected with the processor through a local area network or a data transmission line, but not with the outside.

(6) The internal working steps of the privacy protection module include the following steps:

Step 1: Read the personal information input by the user when registering, randomly generate the user code in the processor, and transmit the personal information and the user code to the independent storage for archiving.

When the processor transmits the user's personal information to the independent storage, it first encrypts the user's personal information by encryption algorithm.

Furthermore, the encryption algorithm can be DES encryption algorithm.

Step 2: Give the user a user code, and use the user code when transmitting user information.

Step 3: Calculate the user code, bind it with the geographic location information of the user, and store it in the cloud storage.

It also includes an environment sensing module, which is used to monitor the temperature and humidity parameters of the user's environment, and when the temperature and humidity of the user's environment are abnormal, it wants to send an alarm to the fixed end.

Comprises an identity identification module, and the identity identification module is used for identifying the identity information of the user according to the collected ECG signals.

(7) When the identification module identifies the user's identity information, it includes the following steps:

Step 1: preprocess the collected ECG signal, first decompose the ECG signal by wavelet, then denoise it by default threshold method, then find the nth layer low frequency coefficient after wavelet decomposition, set it to zero, and then reconstruct the ECG signal;

Step 2, extracting the features of the preprocessed ECG signals, wherein the extracted features include R wave peak points, QRS wave templates and heart beat templates;

Step 3: Analyze the correlation of ECG signals by using the extracted characteristics of ECG signals, and perform dynamic time warping by using DTW algorithm to obtain the optimal matching object.

It also includes a sleep recording module, which is used to record and analyze the sleep status and time of users.

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Furthermore, the sleep states of users are divided into three states: awakening period, REM sleep and non-REM sleep.

(8) When analyzing the user's sleep state, the sleep recording module includes the following steps:

Step 1, extracting the preprocessed ECG signal of the user, and calculating the heart rate ai of the user in the ith minute according to the ECG signal of the user;

Step 2, calculate the heart rate a0 of the user in the normal state, and when ai<(0.8*a0+5), judge that the user has entered the sleep state, and record the sleep time V;

Step 3, judging whether the user flips during sleep according to the motion information of the human body collected by the collecting module, and recording;

Step 4, when the time interval Tj of the human body turning over two times in sleep is greater than the threshold Tb, the user is judged to enter deep sleep, and the sleep time Va is recorded;

Step 5: Calculate the sleep efficiency η=Va/V of human body. When η<η0, the user's sleep quality is poor, and send a message to the fixed terminal for reminding.

Concept map of mobile terminal:

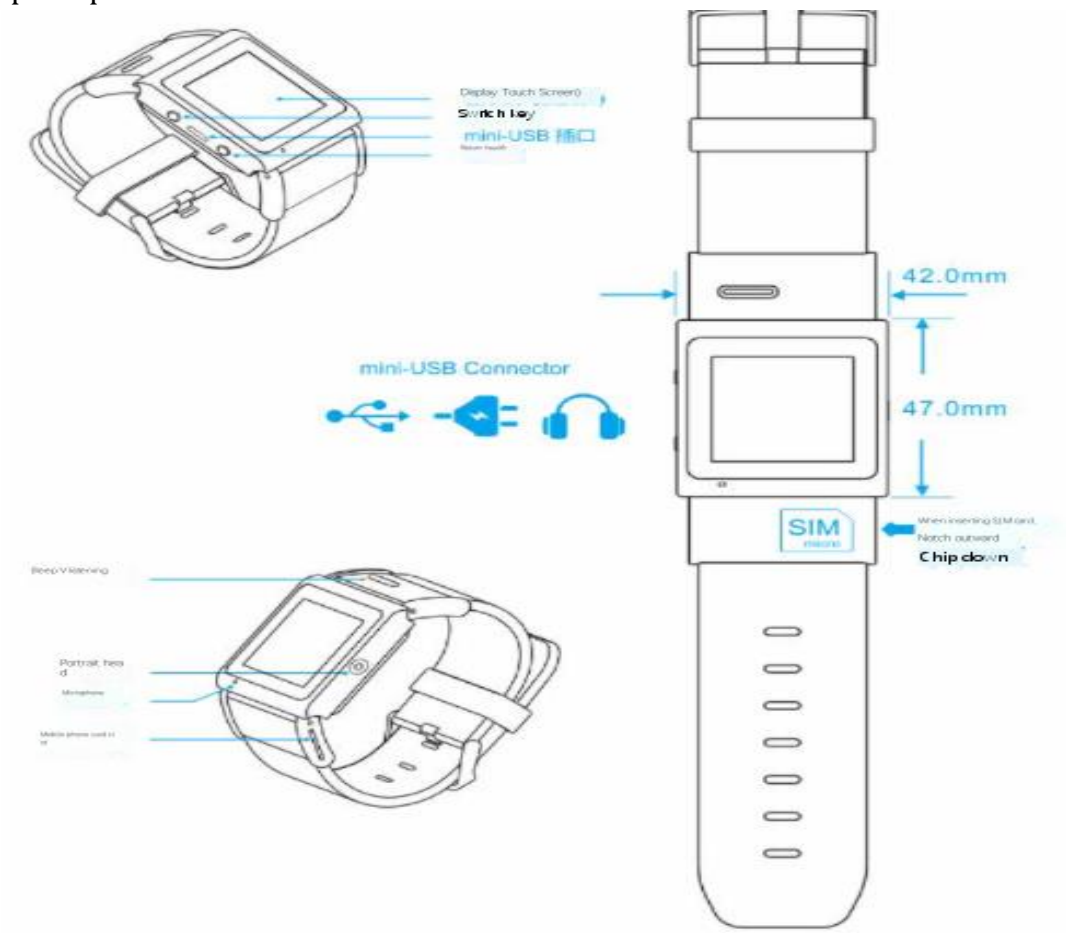

Figure 3 Internet students' physical exercise monitoring equipment

(9) The mobile terminal includes a smart watch, which includes a watch body, a display assembly, a power supply assembly and a sensing assembly, both of which are arranged inside the watch body, the display assembly is arranged on the upper surface of the watch body, the sensing module is used to collect the ECG, heart rate, respiration and motion parameters of the human body, the display assembly is used to display the ECG, heart rate, respiration and motion parameters of the human body, and the power supply assembly is used to provide energy for the display assembly and the sensing assembly.

The display unit is a commercially available display screen, and the power supply unit is a common battery or button cell.

Sensing components include pressure sensor, ECG sensor, GPS positioning device and temperature sensor.

It also includes functional components, the acquisition components are all arranged in the watch body, and the acquisition components include a pedometer, a microphone and a speaker.

Two ends of the watch body are connected with watchbands, and the watchbands are used for users to wear the watch body on their arms.

The side wall of the watch body is provided with a charging socket and a card slot socket, wherein the charging socket is connected with the power supply assembly, and the card slot socket is used for installing the SIM card.

(10) The mobile terminal also includes a monitoring pendant, and the monitoring necklace includes a shell, a motion acquisition component and a health care component, both of which are arranged inside the shell, the health care component is used to care for the human body, and the motion acquisition component is used to acquire the motion parameter information of the human body.

The motion acquisition component includes an acceleration sensor and an angular acceleration sensor.

The health care component comprises a storage bag and a spraying device, wherein the storage bag is arranged in a shell, and a button is arranged on the shell, and the button is used for squeezing the storage bag, and the storage bag is used for storing medicines.

The shell is connected with a rope or a metal chain so as to be worn by a user.

6. Concluding remarks

By collecting the acceleration of human body and monitoring it in real time, this design can grasp the motion state of human body in real time, and can detect the fall of human body. By collecting the angular acceleration of human body, this design can prevent the misjudgment of human body falling due to running or other sports, and increase the accuracy of the device. This design can effectively monitor the health problems of human body through real-time monitoring of ECG, blood pressure and blood oxygen saturation. By setting the storage bag and the button, this design can carry the emergency medicine with you, and it is convenient to use.

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