Research Article

Design of the Physical Education Teaching System by Using Edge Calculation and the Fuzzy Clustering Algorithm

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With the increasing number and types of terminal access, real-time processing of increasingly complex Internet of things applications has become increasingly difficult. On the one hand, cloud computing environment in virtual reality, ultra-high definition live video, intelligent manufacturing, and other application fields put forward complex, diverse, real-time, and other new business requirements. On the other hand, modern IOT terminals have shortcomings such as insufficient computing power and limited battery capacity, which make it difficult to provide real-time processing for Internet applications. The emergence of edge computing services provides effective solutions for these applications, which can improve the local data processing capacity, shorten the data transmission delay, and reduce the hardware cost to a certain extent. Since computing offload, resource allocation, cache content placement, and edge server deployment are the basis of localized data processing and resource allocation, their performance is closely related to the efficiency and accuracy of data processing in the whole system. In the application of the current system, online learning resources and cutting-edge software and hardware teaching environment continue to emerge, shaping a unique smart classroom. The system proposed in this paper not only has the traditional physical education knowledge but also the advanced visualization principle. The combination of them can promote the practice of the new concept of physical education. Through research on edge computing and resource allocation, this paper applies it to the development of cloud computing environment and sports teaching visualization system so that the cloud computing environment and sports teaching visualization system can flourish.

1. Introduction

There are many definitions of cloud computing. At present, the most widely accepted definition is the new computing mode that cloud computing charges through cumulative usage. This computing mode provides customers with more convenient and efficient computing services [1]. As long as they are allowed to enter the resource sharing pool, cloud computing environment resources such as servers can be provided immediately, and customers do not need to invest too much management work on the cloud platform [2]. Due to the limited service capacity of a single server and the need to wait for task execution, the efficiency is very low. Therefore, this paper collects data through sensors, cameras, smartphones, and other devices, provides computing and storage capabilities at the edge of the network close to the user end, and processes IOT applications in real time [3, 4]. When the edge computing resources are not allocated enough, user terminals can be allowed to use cloud computing resources. We can clearly see from edge computing applications that remote network communication is required between user devices such as sensors and smartphones and cloud computing [5]. In order to reduce data traffic and provide low latency services, edge servers are deployed at the edge of the network close to terminal devices to take over part of computing, caching, and communication with cloud data centers. The closer the edge server is to user devices, the faster the response speed is. However, the more nodes it is needed to be deployed, the higher the cost [6]. Then this paper also studies physical education. Education is the development direction of improving productivity and culture, representing the interests of the people. Vigorously giving priority to the development of education can meet the growing cultural needs of the people [7]. Traditional physical
teaching pattern, although in the past time is proved on the promotion of students to have a good effect, is not consistent with the current development of science and technology level. As the development and demand of science and technology also promote the improvement of teaching technology, sports teaching has carried out diversified reforms to adapt to the existing scientific and technological environment [8]. In order to promote the scientific construction of physical education, it is necessary to build an effective sports science and technology teaching platform. Only when relevant knowledge is perfected can scientific and technological means be combined with traditional physical education and a new mode of physical education be developed [9]. Physical education can significantly improve the physical quality of the people, which is a major livelihood project benefiting the people. It is also an important carrier for the implementation of the strategy of strengthening the country with science and technology, strengthening the country with talents and modernizing education [10].

2. Related Work

The relevant concepts of cloud computing are sorted out in the literature, including the way of its generation and the development status at home and abroad, which provides the basic concept analysis for this paper [11]. The literature introduces the concept of cloud computing and specifically defines the characteristics of cloud computing from three aspects: the basic characteristics of cloud computing, cloud computing architecture, and cloud computing service mode [12]. Then it summarizes the problems encountered in the current resource allocation and lists the existing improvement methods. At the same time, the most commonly used resource allocation algorithm is also obtained. Finally, the related resource allocation technologies are introduced, including parallel programming technology, virtualization technology, and load balancing technology [13]. A resource allocation model based on time energy consumption is proposed in the literature, and the specific implementation of ant colony algorithm and genetic algorithm is introduced later. Three improvements of the ant colony algorithm are also mentioned, which improve the transfer probability, improve the pheromone volatilization coefficient, and introduce the load balancing adjustment factor [14]. Then the combination of ant colony algorithm and genetic algorithm is introduced in detail. The literature introduces the competitive model of multiple service providers in the edge computing environment. This paper considers the competition and cooperation among multiple service providers and believes that the resources provided by the servers of multiple service providers have a certain substitution relationship, so it is difficult for service providers to know the resource prices of other competitors [15]. Based on the vision of service providers to improve benefits, this paper determines the game model as Bayesian game and estimates the server location to meet the server resource requirements of terminal devices. The literature explains the benefits of service providers, resource utilization, user satisfaction, etc., and uses user information to make decisions on the layout of servers to maximize the benefits of service providers under the constraints of meeting the delay requirements to the greatest extent [16].

3. Research on Edge Computing Resource Allocation in Cloud Computing Environment

3.1. Relevant Calculation Model Design. In order to enable enterprises to work efficiently, cloud computing usually uses three service models: infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS), as shown in Figure 1:

At the bottom of the cloud computing service model is IaaS, which means that enterprises and individuals can use cloud computing technology to achieve the goal of efficient use of various computing resources in the cloud environment. Hosts, storage centers, and communication networks work together to create IaaS infrastructure. The unique cloud computing virtualization technology enables IaaS to provide customers with exclusive personalized services such as data storage, big data computing, load balancing control, and key data backup. IT companies such as Microsoft, Google, and HP can now rely on virtualization technology to combine different computing resources to form a resource pool. Customers can choose appropriate services from the resource pool according to their actual needs. In addition to providing ultra-high computing power, IaaS can also rearrange and arrange cloud computing resources on demand, and dynamically deploy applications installed in IaaS. With IaaS, users can quickly acquire DevOps capabilities. According to the actual business needs, people choose IT resources and middleware models. Through customization, packaging, and other operations, new IT products can be delivered quickly in a very short time. IaaS provides the most advanced operation functions for IT companies. IT enterprises are not only an operation and maintenance platform but also an operation platform and a platform that can constantly exchange services for different customers.

\[ T_{exe}(i,j) = \frac{X_{lon}(i)}{Y_{cal}(j)} \]  

where \( T_{exe}(i,j) \) represents the expected execution completion time of node \( i \), \( X_{lon}(i) \) represents the task data length \( i \), and \( Y_{cal}(j) \) represents the execution rate \( j \) of the computing node, then \( T_{exe}(i,j) \) can be expressed as

\[ T_{dur}(i,j) = \frac{X_{trans}(i)}{Y_{def}(j)} \]  

where \( T_{dur}(i,j) \) represents the expected time required to transfer task \( i \) to computing node \( j \), \( X_{trans}(i) \) represents the amount of data to be transmitted by task \( i \), and \( Y_{def}(j) \) represents the data transmission speed of computing node \( j \), then \( T_{dur}(i,j) \) can be expressed as

\[ T_{sum}(i,j) = \frac{X_{stream}(i)}{Y_{server}(j)} \]  

where \( T_{sum}(i,j) \) refers to the expected time taken to calculate the target \( f \) to complete all tasks in task \( I \), and its value can be expressed as
Since the allocation of cloud computing resources is parallel, and each computing node completes its own work independently, the expected time for the system to process all tasks higher than $T_{cos}$ can be expressed as

$$T_{cos} = \max \left( \sum_{i=1}^{m} T_{sum}(i,j) \right).$$

(4)

The energy consumption cost of $C_{cos}$ to complete resource allocation can be expressed as

$$C_{cos} = \sum_{j=1}^{n} \sum_{i=1}^{m} \left( T_{exe}(i,j) \times C_{exe} + T_{dur}(i,j) \times C_{dur} \right).$$

(5)

### 3.2. Unloading Strategy of Edge Computing

Component clustering should collect data about component behavior to express its characteristic attributes. According to the characteristics of Internet of things applications, this search selects the behavior of components for classification. The behavior of components includes relevant information, performance information, and basic information. The information describing component behavior can be obtained from the component document, and the CBD matrix using component behavior description can be defined as

$$CBD = \begin{bmatrix} c_{d}, c_{re}, c_{r}, \ldots \\ c_{dt}, c_{rm}, c_{m}, \ldots \\ c_{b}, c_{c}, \ldots \end{bmatrix}^T.$$  

(6)

The topological information between components $(i, j)$ includes the amount of data transmission, the amount of data feedback, and the proximity between components. When there is an adjacency relationship, the $t_{ij}$ value of the topological information index is defined as equation (7), and $a$ is the influence factor of attribute $0 \leq a \leq 1$.

$$t_{ij} = a \times c_{di} + (1 - a) \times c_{re}.$$  

(7)

Component performance information includes CPU call $C_d$, delay $c_{time}$, and memory requirement $c_m$. The $p_{ij}$ value of the performance information index is defined as (8). $b_1$, $b_2$, and $b_3$ are the factors that affect the attributes $0 \leq bi \leq 1$.

$$p_{ij} = b_1 \times c_{di} + b_2 \times c_{time} + b_3 \times c_m.$$  

(8)

Basic component information includes $c_k$ component type and security level $c_s$. When the component can be unloaded, the value $f_{ij}$ of the component basic information index is defined as formula (9), $d$ is the influence factor of attribute, $0 \leq d \leq 1$, which can be given as

$$f_{ij} = d \times c_{k} + (1 - d) \times c_{s}.$$  

(9)

Therefore, the $w_{ij}$ weight of the directed arc on the component dependency graph is the dependency between $v_i$
and $v_j$ components, which can be quantified by weighted summation as

$$w_{ij} = k_1 \times t_1 + k_2 \times p_1 + k_3 \times f_j.$$  

(10)

Among them, $k_1$, $k_2$, and $k_3$ represent the weights of topology information, function information, and basic component information, respectively. $k_1 + k_2 + k_3 = 1$. Map the weighted digraph to the dependency matrix $W$, and the dependency matrix between $n$ components is

$$W = \begin{bmatrix}
  w_{11} & w_{12} & \cdots & w_{1n} \\
  w_{21} & w_{22} & \cdots & w_{2n} \\
  \vdots & \vdots & \ddots & \vdots \\
  w_{n1} & w_{n2} & \cdots & w_{nn}
\end{bmatrix}$$  

(11)

Specific components have different degrees of membership, which belong to multiple sets. The classification matrix corresponding to the component classification result is fuzzy matrix $R$. Because the diagonal element of fuzzy matrix is 0, fuzzy clustering cannot be carried out directly, and it must be transformed into fuzzy similarity matrix. The transfer function $h_j = (w_{ij} + w_{ji})/2$ is used to determine the component dependency, and then the included angle cosine method is used to calculate the similarity coefficient $r_{ij}$ between components in the application as

$$r_{ij} = \frac{\sum_{k=1}^{n} (h_k h_{jk})}{\sqrt{\sum_{k=1}^{n} h_k^2} \cdot \sqrt{\sum_{k=1}^{n} h_{jk}^2}}.$$  

(12)

Then, the component fuzzy similarity matrix $R$ composed of $r_{ij}$ is

$$R = \begin{bmatrix}
  r_{11} & r_{12} & \cdots & r_{1n} \\
  r_{21} & r_{22} & \cdots & r_{2n} \\
  \vdots & \vdots & \ddots & \vdots \\
  r_{n1} & r_{n2} & \cdots & r_{nn}
\end{bmatrix}$$  

(13)

$$\lambda r_{ij} = \begin{cases} 
1, r_{ij} \geq \lambda \\
0, \text{otherwise}
\end{cases}$$

3.3. Edge Computing Resource Allocation Based on Energy Consumption Perception. The definition of indication variable is

$$x_{ij,m}^{p,q} = \begin{cases} 
1, & \text{or} \\
0
\end{cases}$$  

(14)

Therefore, the completion time of DAG workflow job $j_i$ with dependency is

$$ET_{j_i} = \max \{FT(j_i^s, s_m^a) \times x_{i,m}^{p,q}\},$$

$$FT(j_i^s, s_m^a) = ET(j_i^s, s_n^a) + EST(j_i^s, s_m^a).$$  

(15)

In the project executed by the application, EST is recursively defined, as

$$EST(j_i^s, s_m^a, s_n^a) = \max \{TM(j_i^s, j_m^s) \times \rho_{j_i}^{s_m}, \rho_{j_i}^{s_n}\},$$

$$TM(j_i^s, j_m^s) = d_{j_i}^{s_m} \cdot d_{j_m}^{s_n}.$$  

(16)

When online jobs are constantly submitted to the system, each server node in the cluster is in a specific state, such as running, idle, conversion, and shutdown. It is assumed that the host server consumes power when running, idle, and switching states. Let $P_i$ be the power of each node in the indicated state, which has four constant values as

$$P_i = \begin{cases} 
0, & \text{or} \\
e_1, & \text{or} \\
e_2, & \text{or} \\
e_3
\end{cases}$$  

(17)

Therefore, the definition of total energy consumption of the system is

$$E_{\text{cluster}} = \sum_{j=1}^{m} \left( \int_{t_{j_i}}^{t_{j_i} + \lambda} P_i \, dt \right).$$  

(18)

Each subtask can be sent to each resource for execution. The resource is an abstract unit. Different resource management systems have different number and performance of resources such as CPU and memory, and the execution time of each task allocated to resources is also different. When a user submits a job request, the resource scheduler must provide specific resources and allocate resources to the corresponding job. Due to the limited resource capacity (processor, memory, storage space, and network resources) of the edge MDC data center, the job request tasks that can be performed are also limited; At the same time, some tasks require a lot of resources, and the processing of the resources they depend on cannot be carried out. Multiple resources are needed to manage it. The more resources invested in the same time period, the larger the scale of parallel processing, and the shorter the completion time; Otherwise, it will either queue in the edge environment for processing, or send it to other data centers for collaborative processing, which will increase computing time and energy consumption. Then the energy aware multilevel resource allocation problem is expressed as the multidimensional knapsack problem (MKP) as

$$\min \sum_{m} \sum_{q} \sum_{p} x_{i,m}^{p,q} \cdot t_{i,m}^{p,q} \cdot p_{i,m}^{q}$$

$$\text{C1:} \sum_{i} x_{i,m}^{p,q} \cdot q_{i}^{p,q} \leq c_{i}^{q,m} \forall m, q$$

$$\text{C2:} \sum_{i} x_{i,m}^{p,q} \cdot q_{i}^{p,q} \leq 1$$

$$\text{C3:} \max ET_{j_i, \text{level}} \leq D_{\text{level}}$$

$$\text{C4:} \sum_{i} x_{i,m}^{p,a} \cdot x_{i,m}^{p,b} \cdot d_{i}^{p} \leq B_{a,b} \forall m, a, b.$$  

(19)

According to the weighted vino diagram, the terminal set provided by the ESM edge server is
The autocorrelation model AR (P) can be expressed as

\[ \theta \text{method} \]

obvious superiority when dealing with high-capacity tasks.

of several algorithms is similar when dealing with low-
process data. It can be seen from the figure that the efficiency
in Table 3.

setting of parameter node startup time is 30 s, idle duration
is 60 s and 120 s, the number of violations increases com-
pared with the startup time of 30 seconds.

is 60s and 120s, the number of violations increases com-
and finally remains stable.

resources is 27135.4kJ, 28381.4kJ increases to 29020.3kJ,
and the execution time of the two tasks begins to decrease,
and the sampling interval is 5S and the delay interval of idle
nodes changes from 60s to 100s and 120s, respectively, the
sampling interval is 5S and the delay interval of idle

\[ \text{Table 1: Values of three performance indicators when the starting time is 30 seconds.} \]

| Idle node delay | Sampling interval (5 s) | Sampling interval (10 s) | Sampling interval (20 s) |
|----------------|-------------------------|--------------------------|--------------------------|
|                | \( N_{2,\text{total}} \) | \( E_{\text{total}} \) | \( T_{1,\text{exe}} \) | \( T_{2,\text{exe}} \) | \( N_{2,\text{total}} \) | \( E_{\text{total}} \) | \( T_{1,\text{exe}} \) | \( T_{2,\text{exe}} \) | \( N_{2,\text{total}} \) | \( E_{\text{total}} \) | \( T_{1,\text{exe}} \) | \( T_{2,\text{exe}} \) |
| 60             | 9.2                     | 27135.4                  | 5.5                      | 43.8                    | 12.4                     | 27036.7                  | 4.8                      | 46.2                    | 9.8                     | 26484.2                  | 5.8                      | 46.2                    |
| 100            | 8.2                     | 28381.4                  | 5.5                      | 43.8                    | 6.2                      | 28384.3                  | 4.8                      | 46.2                    | 9.3                     | 28346.3                  | 5.8                      | 43.3                    |
| 120            | 10.8                    | 29020.3                  | 5.5                      | 43.8                    | 7.8                      | 28844.6                  | 4.8                      | 46.2                    | 5.5                     | 29103.5                  | 5.8                      | 40.4                    |

\[ \text{Table 2: Values of three performance indicators when the starting time is 60 seconds.} \]

| Idle node delay | Sampling interval (5 s) | Sampling interval (10 s) | Sampling interval (20 s) |
|----------------|-------------------------|--------------------------|--------------------------|
|                | \( N_{2,\text{total}} \) | \( E_{\text{total}} \) | \( T_{1,\text{exe}} \) | \( T_{2,\text{exe}} \) | \( N_{2,\text{total}} \) | \( E_{\text{total}} \) | \( T_{1,\text{exe}} \) | \( T_{2,\text{exe}} \) | \( N_{2,\text{total}} \) | \( E_{\text{total}} \) | \( T_{1,\text{exe}} \) | \( T_{2,\text{exe}} \) |
| 60             | 25.4                    | 28041.2                  | 17.3                     | 46.4                    | 34.3                     | 27669.5                  | 18.7                     | 46.8                    | 34.3                     | 27619.3                  | 18.8                     | 47.1                    |
| 100            | 17.6                    | 28718.1                  | 16.2                     | 45.2                    | 21.1                     | 28516.3                  | 16.6                     | 45.9                    | 12.7                     | 28654.5                  | 15.3                     | 44.3                    |
| 120            | 12.8                    | 28962.4                  | 15.8                     | 43.3                    | 23.2                     | 28974                    | 14.3                     | 42.8                    | 13.9                     | 29134.6                  | 14.3                     | 43.2                    |

\[ V(\epsilon m, \epsilon m^\text{exe}) = \bigcap_{m \neq m'} \{u \mid d(u, \epsilon m') \leq x_{m}^{\text{exe}} \} \quad (20) \]

The terminal equipment collection of all edge MDC service areas is

\[ V_{EC} = \bigcup_{\epsilon cm \in EC} V(\epsilon m, \epsilon m^\text{exe}), m = 1, 2, 3, \ldots, N_{ec}. \quad (21) \]

For the time series load at \( i \) edges of the service area, the autocorrelation model AR (P) can be expressed as

\[ x_i = \theta x_{i-1} + \theta x_{i-2} + \ldots + \theta x_{i-p} + \epsilon_i, \epsilon_i \sim \text{NID}(0, \sigma^2_i). \quad (22) \]

The \( p + 1 \) parameter is estimated using the least square method \( \theta_1, \theta_2, \ldots, \theta_p \) and \( \sigma^2_i \):

\[ \epsilon_i = x_i - \theta_1 x_{i-1} - \theta_2 x_{i-2} - \ldots - \theta_p x_{i-p}, \quad (23) \]

\[ \sigma^2_i = \frac{1}{p} \sum_{i=p+1}^{n} (x_i - \theta x_{i-p})^2. \quad (24) \]

3.4. Analysis of Simulation Results. Table 1 shows that when the sampling interval is 5S and the delay interval of idle nodes changes from 60 s to 100 s and 120 s, respectively, the corresponding energy consumption value of "cloud edge" resources is 27135.4 kJ, 28381.4 kJ increases to 29020.3 kJ, and the execution time of the two tasks begins to decrease, and finally remains stable.

As can be seen from Table 2, when the node startup time is 60 s and 120 s, the number of violations increases compared with the startup time of 30 seconds.

As the result of parameter sensitivity evaluation, the best setting of parameter node startup time is 30 s, idle duration delay interval is 100 s, and sampling interval is 10 s, as shown in Table 3.

Figure 2 starts from the time taken by the system to process data. It can be seen from the figure that the efficiency of several algorithms is similar when dealing with low-volume tasks. The algorithm presented in this paper shows obvious superiority when dealing with high-capacity tasks.

The reason is that both PSO-GA and PSO-ACO algorithms adopt the random path selection strategy, which affects the search speed to a certain extent. The LBGACO algorithm proposed in this paper first uses GA algorithm for global search at the beginning of the algorithm and then converts the better solution obtained from the search into the initial pheromone distribution of ACO algorithm. This makes the convergence speed of LBGACO algorithm faster than PSO-GA and PSO-ACO algorithm. In addition, by changing the transition probability and the pheromone volatilization coefficient, the globality of the algorithm search is improved.

In Figure 3, the power of the system is analyzed based on Figure 2, which also proves the superiority of the system in this paper. With the increase in the number of tasks, this phenomenon will become more obvious. This further proves that the power optimization model in LBGACO algorithm proposed in this paper can track the power consumption of each node of computing resources in real time and effectively prevent a large number of tasks from being concentrated on specific nodes of computing resources, resulting in the increase of energy consumption of the whole system.

In this set of experiments, we compared the performance of the four strategies by installing different number of servers on each edge MDC. The number of servers per MDC increased from 2 to 12. As shown in Figure 4, the x-axis represents the number of servers in each MDC, and the y-axis represents the number of job violations, system power consumption, and average job completion time. As the number of servers in edge MDC increases, the ability of edge servers to share resources will also increase. In the figure, we can see that the number of task violations decreases with the increase of the number of MDC edge servers. When the size of the edge resource is 12, the number of violations of the task is the smallest. This figure shows the energy consumption of EAGA compared with that of auto scale. Even if the number of servers is small, the energy-saving effect of EAGA is good. With the increase of server resources, the load of the system decreases. The energy-saving effect of EAGA is better than auto scale and is close to opt strategy.

The estimated time to complete the job is shown in Figure 5. Under heavy load, the job execution time is better than autoscale. When resources are sufficient, this strategy
carries out energy-saving scheduling and energy-efficient allocation of resources on the premise of deadline driven. Although when the number of nodes is greater than or equal to 8, the job completion time is higher than AlwaysOn and autoscale, making it close to opt, but the number of job violations is relatively small. From experiments, it can be seen that the performance of Eaga in power consumption and the number of job violations is significantly better than the autoscale dynamic resource allocation strategy, close to opt, and while ensuring the lowest power consumption, it meets the low latency requirements of users.

4. Requirements and Application of the Physical Education Visualization System

4.1. Development and Demand of Physical Education Teaching Concept. The historical experience of Chinese school physical education concept research is mainly reflected in China which attaches great importance to the development of school sports. Through the promulgation and implementation of China’s major policies and policies, we need to promote physical education in the contemporary new development.

The essence and core of Chinese school sports ideological trend is the law of internal development of school sports. After 40 years of reform and opening up, its development has become irreversible. The formation and changes of the ideological trend of school physical education in China can reflect the connotation and extension of school physical education and will change with the passage of time and evolution. The concept of school physical education belongs to the category of educational concept, and its reform and development are consistent with the overall direction of the development of educational concept. With the implementation of quality education and health in school sports and the implementation of the healthy China strategy, the concept of school sports has also changed, showing the characteristics of "richer connotation and broader extension."

Adhering to educational ideas is as important as innovation. In the new era, under the guidance of the core connotation, Chinese school physical education must assume responsibility, fulfill its mission, think and explore new development paths. The renewal and development of the concept of school sports in China must comply with the trend of social development, actively integrate with the world’s advanced school sports in China, actively participate in global competition, cultivate more talents, strive to occupy an active position in the competition, and grasp the initiative of competition.

We should adhere to the values and concepts of traditional school sports with Chinese characteristics, critically learn from the essence of foreign higher education concepts when introducing and learning foreign culture, not stick to foreign models, innovate implementation methods, and adhere to Chinese characteristics as the starting point and foothold.
4.2. Construction of the Visual Teaching Model for Indoor Sports Teaching. Visual teaching design in smart classroom must fully combine the “wisdom” of smart classroom with the educational advantages of visualization. The advantage of visualization in teaching lies in the use of various visualization technologies to express tacit knowledge by different visual representation means, which directly affects people’s visual senses, so as to promote the dissemination and innovation of knowledge. “Intelligence” includes five aspects such as the presentation of learning content, the management of classroom environment, the acquisition of learning resources, in-depth and timely interaction, and the perception of learning situations. It is a high-quality form of traditional multimedia and online classroom.

Due to the shortcomings of Addie model, a visual teaching model suitable for intelligent classroom is constructed on this basis, as shown in Figure 6. In this visual teaching model, students can fully participate in the learning process. From preclass preparation to active classroom interaction, and finally after class evaluation and feedback, students actively participate so that students can change from traditional simple knowledge reception to active participation in classroom interaction and improve classroom performance and students’ interest in learning. Teachers led the whole teaching process and are mainly responsible for guiding students to learn, tapping and developing learners’ potential, and conducting curriculum evaluation. The visual teaching model in the whole smart classroom is divided into preparation stage, design stage, learning stage, evaluation stage, and feedback stage.

4.3. Analysis of Visual Teaching Design Concept. Visual representation is the theoretical basis for the development and application of visual education. Only a reasonable concept of visual representation can play the greatest role. Visual teaching takes visual representation as the main teaching method, which requires learners to compile the characteristics, color, depth, and other information of the object image and then to simplify and organize this information to understand how the image is transformed into knowledge. Its characteristics are the visualization of text knowledge, the simulation of abstract knowledge, and the virtualization of complex knowledge, and make full use of
Figure 5: Operation completion time.

Figure 6: Visual teaching model in smart classroom.
various visual elements (image, text, color, etc.) to express some information or relationships that are difficult to understand by text and data alone. Using the communication advantages of visual language to promote effective knowledge dissemination and communication innovation can also reduce the cognitive load of text knowledge and encourage learners to explore deep meaning. External things need our subjective choice and participation in order to enter visual thinking and be perceived and understood.

The teaching method of combining words with visual knowledge helps to improve the effectiveness of learning and improve students’ understanding and memory of knowledge. According to the dual coding theory, there are two independent and interdependent cognitive systems in the representation and semantics of human cognitive system. They process information through representation code and semantic code and are activated by corresponding stimuli, which refers to an important principle; that is, knowledge presented together with language and visual information can get better recognition and memory effects. With the help of the teaching method of double electronic whiteboards, we can not only realize the joint display of visual images and words but also create conditions for the interaction between students and the media. This can not only adapt to different learners’ learning styles but also provide learners with sufficient opportunities to participate in learning activities.

### 4.4. Visual Teaching Design Based on the Classroom Mode.

Multiterminal interaction gives students more opportunities to interact with multimedia and teachers and students, which is one of the keys to create an active, efficient, and harmonious classroom. In the traditional multimedia environment, teaching methods are mainly based on teachers who impart knowledge to students. There is little or no interaction between teachers and students, and students are in a state of passive acceptance of knowledge. In the multiterminal teaching method, learners can more naturally integrate into teachers’ teaching, question and answer, classroom homework, and other learning activities. The classroom gradually changes from knowledge instigator and lecturer to the guide and organizer of classroom activities, and students also complete the role transformation from the knowledge receiver to active participant in the classroom. Through multiterminal interactive learning, students can use various touch terminals for collaborative learning, synchronous exercises, student competitions, and other activities to improve students’ learning experience, help improve students’ practical ability, and cultivate students' team spirit. Teachers can change the overall learning state of teaching strategies and classroom interactive participation through the resource organization technology of mind mapping and resources, synchronous visual multiterminal teaching methods, real-time data analysis homework and other activities, and help create interactive classes and inquiry learning, which lays a solid foundation for improving teaching efficiency and implementing effective learning.

Based on the self-built smart classroom, this paper summarizes three typical teaching modes of smart classroom. As shown in Table 4, according to the teaching characteristics of various classroom operation modes, combined with the concept of intelligent classroom visual teaching design, different classroom visual teaching designs are carried out from three perspectives such as visual presentation, interactive form, and dual-track teaching.

### 5. Conclusion

Firstly, this paper combs the concept and logic of the system applied in this paper, and on this basis, it emphasizes the importance of resource allocation selection for research. At the same time, it introduces the research results of using the metaheuristic algorithm to solve the resource allocation problem of cloud computing at home and abroad. Then, introduce the relevant background of cloud computing in more detail and explain the concept of cloud computing from three different perspectives. Then, it launches the related technologies of resource allocation, introduces the specific workflow and allocation idea of parallel programming of resource allocation, explains the virtualization technology and load balancing technology, and finally makes a brief summary of the concepts of four commonly used metaheuristic resource allocation algorithms. Then people apply it to the physical education teaching environment. Generally speaking, the emergence and development of the traditional school physical education concept with Chinese characteristics are closely related to the general policy. At the government level, China has continuously promoted the reform of school physical education, vertically from the central to the local, and horizontally from the sports department to the major systems. School physical education policies, opinions, revision opinions, notices, and other

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**Table 4: Visual teaching design of a typical classroom in the smart classroom.**

| Classroom mode       | Teaching characteristics       | Visual representation            | Interactive form                                           | Dual-track teaching                |
|----------------------|--------------------------------|---------------------------------|-----------------------------------------------------------|-----------------------------------|
| Teaching classroom   | Teachers teach and students accept | Concept map and mind map        | Focus on teacher-student interaction                      | Mind map + knowledge content      |
| Inquiry class        | Teacher guidance and student inquiry | Animation and simulation tools    | Focus on the interaction between teachers and students and vitality | Simulation animation + difficult and difficult tips |
| Collaborative classroom | Teacher assistance and student collaboration | Interactive visual science tools | Focus on the interaction between teachers and students and vitality | Interactive visualization + operation skills |
policies have been issued and implemented, promoting the continuous development of Chinese School Physical Education to the visual system teaching mode so that physical education and the development of science and technology truly combined to promote the progress of physical education cause.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

All the authors do not have any possible conflicts of interest.

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