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Retraction

Retracted: Sports Dance Movement Assessment Method Using Augment Reality and Mobile Edge Computing

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] F. Xu and W. Chu, "Sports Dance Movement Assessment Method Using Augment Reality and Mobile Edge Computing," *Mobile Information Systems*, vol. 2021, Article ID 3534577, 8 pages, 2021.

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Research Article

Sports Dance Movement Assessment Method Using Augment Reality and Mobile Edge Computing

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AR (Augment Reality) is an emerging technology that combines computer technology and simulation technology. It uses a computer to generate a simulation environment to immerse users in the environment. AR can simulate the real environment or things and present it to users by virtue of its multiperceptual, interactive, immersive, and other characteristics, to achieve an immersive effect. For sports dance, the same can be used to enhance the effect of teaching and learning through the use of AR technology. Aiming at the problems of delay and terminal equipment energy consumption caused by high-speed data transmission and calculation of virtual technology, this paper proposes a sports dance movement transmission scheme that uses equal power distribution on the uplink. Firstly, based on the collaborative attributes of the AR sports dance business, a system model for AR characteristics is established; secondly, the system frame structure is analyzed in detail, and the constraint conditions are established to minimize the total energy consumption of the system; finally, the mathematical model of Mobile Edge Computing (MEC) based on convex optimization is established under the condition that the delay and power consumption meet the constraints, so as to obtain the optimal communication and computing resource allocation scheme of sports dance in AR. The experimental results reveal that the proposed sports dance movement assessment method based on AR and MEC is efficient.

1. Introduction

Dance is a highly practical subject, and most of the knowledge and skill information in the training process requires learners to obtain by imitating and feeling the teacher's movements. Practical dance training can hardly be the same as other training methods. Modern training methods such as online teaching and remote teaching are adopted. Because in these training methods, learning is only by watching movement teaching videos, it is difficult to get an immersive and expressive feeling of dance movement performance, and it is impossible to evaluate and feedback the effect of movement learning in time. At the same time, traditional classroom teaching methods are limited by time and space after all, and students' review of learning content after class will also be affected. The application of AR provides the possibility of solving these problems to a large extent. As a new human-computer interaction method in the computer field, AR can provide users with a three-dimensional virtual world similar to the real world, with the characteristics of immersion, interaction, and imagination. The virtual reality system can receive movements or other instruction information from the user through input devices such as helmets and gloves, process them in the system, and affect human senses such as vision, hearing, and touch through some output devices, so that people can produce the same feeling like a certain behavior in the real world.

AR applications are being developed day by day and are receiving more and more attention because they can combine computer-generated data with the real world through hardware devices. AR sports dance training is extremely sensitive to delay, and it has high requirements for computing and communication. Moreover, when performing AR sports dance training on a mobile device, it consumes the battery of the mobile device [1] and is unable to meet user expectations. In order to solve this problem, literature [2] has proposed the use of MEC to solve the current problems. Users will migrate the calculation of large amounts of data involved in running AR sports dance training to the nearest cloud connected to the base station. Executed on the server, compared with local computing, it can save local energy consumption, and compared with central cloud computing, it can reduce transmission delay.

The work of literature [3] shows that by jointly optimizing the allocation of communication resources and computing resources, it is possible to significantly reduce mobile energy consumption under delay constraints, and their work can be applied to multiple users independently running general-purpose applications. However, AR applications have their unique properties. All users may upload and download part of the same data, and their computing tasks are also shared on one or more servers. Therefore, communication and computing resources can be jointly optimized and reduce communication and calculation overhead [4].

The AR sports dance application superimposes some computer images onto real-world images through the screen and camera of the mobile device. Five components are needed to complete this process [5]: (1) video source, which can first obtain the original video frame from the mobile camera; (2) tracker, which recognizes and tracks the relative position of the user in the current environment; (3) mapper, which builds a model of the current environment; (4) object recognizer, which recognizes known objects in the current environment; and (5) renderer, which displays the processed frames. The video source and renderer components must be executed on the mobile device, and the calculations performed by the tracker, mapper, and object recognizer with the largest amount of calculation can be offloaded to the cloud. In addition, if the task is offloaded, the mapper and object recognizer can collect input from all user devices in the same geographic location, limiting the redundant information transmitted in the user's uplink. In addition, the results calculated by the mapper and object recognizer can be multicast from the cloud to all users at the same location in the downlink.

Different from literature studies [6, 7], this paper clearly illustrates the collaborative nature of AR sports dance applications to solve the problem of minimizing mobile energy consumption through communication and calculation of dance motion resource allocation under delay constraints [8, 9]. In [10], the continuous convex approximation method is used to solve the mobile energy consumption minimization problem, and the solution method is complicated.

2. Background and Related Work

2.1. Research Background. With the development of mobile networks and smart devices, a large number of resource-sensitive applications have been spawned, such as large-scale interactive games, virtual reality AR, and augmented reality AR [2]. These applications require devices with ultrahigh computing power and battery energy to support ultralow latency requirements, and the most significant of them is AR applications. In the application of AR in dance teaching, in order to realize the interactive strategy of AR in dance teaching and the functional strategy requirements of dance teaching on AR, it is necessary to clarify the four major components of the virtual reality system. The major components are the motion matching system, the motion capture system, the three-dimensional drawing system, and the dance movement database. The movement matching system will match and compare the student's dance movements with the standard movements in the dance movement database; the movement capture system can quickly capture the students' dance movements in real time; the three-dimensional drawing system can perform three-dimensional dance movement information that needs to be learned The model is constructed to form a dance animation that can be demonstrated, replayed, adjustable speed, and visualized. In the dance movement database, a large number of standard dance moves are stored. AR technology highly integrates the real-world environment and virtual information and uses computer graphics to combine the real world with computer-generated virtual images to generate information that is perceived by human senses to obtain a sensory experience beyond reality. AR supports new applications and services such as 3D movies, virtual games, etc. [3], which can be used on mobile devices such as smartphones, smart glasses, and tablets. However, when AR processes complex data such as videos and images, it also needs to interact with users in real time. Therefore, AR requires ultralow latency and extremely high data transmission rates. In order to meet this demand, with the development of 5G, the traditional cloud computing network architecture is quietly sinking to the edge of the network, and an emerging computing model-MEC has emerged. The MEC server is closer to the user and can solve the AR problem well.

AR application is a delay-sensitive application, which has high requirements for computing and communication. Therefore, AR tasks can be offloaded to nearby MEC servers for execution so that AR has less execution delay and mobile devices have lower energy consumption. At present, the technology of applying MEC to AR has attracted extensive attention and research from academia and industry and has achieved preliminary results. Literature [11] proposes that users migrate a large amount of data involved in running AR applications to a cloud server close to the base station for calculation. Compared with local computing, it can save the energy consumption of mobile devices, and compared with traditional cloud computing, the transmission delay can also be reduced. The work of literature [12] shows that joint optimization of the allocation of communication resources and computing resources can significantly reduce the energy consumption of mobile devices under delay constraints. However, all users using AR applications may upload and download the same data, and the data that need to be migrated may also be shared on one or more servers. Therefore, literature also proves through experiments that communication can be jointly optimized and computing resources reduce overhead.

Although the abovementioned researches have achieved good results in the application of AR and MEC, the application of sports dance training still needs further improvement. In addition, the difference is that this article considers using an edge computing framework to transfer complex AR processing data tasks to the edge server for calculation, so as to speed up dance movement matching, capture, imaging, and other processing.

2.2. Research on AR. We realize the construction of a virtual environment based on computer technology, create corresponding scenes suitable for sports dance training, and thus achieve the effect of sports training. This is the basic principle of the integration of AR into the education field. This technology has strong immersion, interactivity, and conception and belongs to the category of computer advanced human-computer interaction applications. In the process of this technology's effectiveness, multidimensional graphics technology, multimedia technology, simulation technology, sensor technology, etc. will be penetrated, and the combination of technologies will ensure that the sensory functions can be simulated, that is to say, as if you are in it, you can hear and touch. At this point, we can see that it belongs to a kind of artificial virtual environment creation process. For the user, with the help of such technology, the interaction with the system can be realized, which can be physical or verbal, and then create a multidimensional anthropomorphic spatial pattern, which will make people feel immersed sense. From this point of view, virtual display technology is not only used for presentation media but also an effective design tool.

2.3. Evaluation Method of AR in Sports Dance Movements. There are many difficult movements in sports dance training, and these movements need to be carried out in accordance with the corresponding music rhythm, which makes it highly performative, which means that the participants need to ensure the music, background, and body. The language is integrated to complete the corresponding deductive task, thereby presenting the values of health and beauty. A set of sports dance training must be of high quality, be able to skip frames for difficult movements, meet the demands of programming and performance, and reach certain artistic targets. In the actual education and teaching process, if the real environment of the competition scene can be simulated, it can ensure that each combined movement enters a state of refined analysis and research. Relying on such refined data can make the students' dance level get. A better evaluation can find the deviations in the corresponding training node and then ensure that the subsequent training develops and progresses in a more ideal direction.

The use of reality and virtual technology can make the various movement parameters of the students in the aerobics process be presented. Whether it is the movement details at the time point or the connection in the continuous movement, it can be presented in this way, so that you can better understand the training knowledge of each student. With the help of AR, the corresponding movements can be incorporated into the virtual environment, and multiple movements can be rehearsed before the corresponding movement points are even reached. With the help of video and professional research software, accurate movements and student movements can be actively realized. The comparative analysis between the two can provide a more comprehensive understanding of the defects and deficiencies of the students in the movement, thereby reducing the difficulty for the teacher to find the differences in the training of the students, so that the teacher can grasp the corresponding movement defects more quickly. The development of follow-up training plans can make the actual education and teaching design develop in a more coherent and interactive direction. Based on this consideration, the actual student's movement quality, corresponding to the overall training effect, will also develop in a more ideal direction [13].

Incorporating the standard parameters of domestic and international sports dance venues and the specifications of actual sports venues into the actual system, and the reasonable setting of subsidy roles from the perspective of software can enable the actual training and competition context to be constructed. It can guide students to enter a more ideal training pattern, which makes the actual AR and sports dance training and competition related. For students, being able to exercise in such a virtual environment can quickly enter the state. During this process, the system will record the student's movement performance and rely on the previously established movement assessment to realize the actual training in time. After the results are generated and the corresponding training report is obtained, students can see their own deficiencies and deficiencies in the system and then use this as a node for subsequent training, so that students can be guided to a good state of self-learning and self-adjustment. In this way, the actual sports dance training can develop and progress in a more autonomous and personalized direction [14].

3. Optimization of Sports Dance Movement Evaluation Based on MEC and AR

3.1. Description of the Dual Objective Problem. At present, immersive AR is still in the immature stage. Some key technologies are being researched, improved, and perfected, such as high-definition panoramic three-dimensional display technology and relatively natural interaction methods. Related hardware devices are inconvenient to use and have unsatisfactory effects. In this case, it is difficult to meet the requirements of the virtual reality system, which affects the interest of the user experience; and the equal power MEC optimization solution that considers the collaborative transmission between users mainly solves the lag of screen imaging and user interaction, and viewing 3D images through eyepieces. The problem of the gap between the real images enables the AR application in sports dance to increase the operating speed of the equipment and reduce the energy consumption in transmission, so that the quality of the displayed pictures is greatly improved.

This section presents the calculation model of sports dance movement on the mobile edge in the AR scenario. Considering a base station, there are a total of K users running AR for sports dance training. The user set is $K = \{1, 2, \ldots, k\}$, and the base station is equipped with a cloud server with high computing power. It is used to process the data of sports dance movements uploaded by users. The cloud server is connected to a single-antenna base station and uses Time Division Duplexing (TDD) to provide services for all users in the dance training venue through a flat frequency fading channel. Based on the content introduced above, this article assumes that the migrated dance motion application shares input, output, and computing tasks, which are related to the tracker, mapper, and object recognizer components. This section specifically introduces the collaboration in the process of sports dance movement data transmission.

3.2. Uplink Sports Dance Data Transmission. When user $k \in K$ runs AR sports dance application in an area, the dance movement data to be processed, such as the input bit D_k^u of object recognition, should be sent to the cloud server for processing [15]. It is assumed that part of the input bit D_s^u is the same in each user's input bit. This means that this part of the dance movement data can be transmitted by all users in the area, rather than the need for multiple users to upload repeatedly. In this paper, the same input bit is called the shared input bit D_s^u and $\sum_{k=1}^{K} D_{s,k}^u = D_s^u$. The input bit $D_{s,k}^u$ is shared by the cooperative transmission part of each user k and $\sum_{k=1}^{K} D_{s,k}^u = D_s^u$. Then, the input bit independently uploaded by each user k is $\Delta D_k^u = D_k^u - D_s^u$.

3.3. Cloud Server Processing Sports Dance Data Process. The cloud server processes the dance movement data uploaded by the user to generate the output bits required by the user [16]. The number of CPU cycles required by the cloud server to process the input bit D_k^u of user k is C_k. Assume that a part of the CPU cycles is used to calculate and generate all the output bits required by the user, for example, update the dance training environment model that the user overlaps. This article refers to this part of the CPU cycle number as the shared CPU cycle number C_s, and $C_s \leq \min_k\{C_k\}$; then, $\Delta C_k = C_k - C_s$ CPU cycles are used to calculate the output bits required by user k individually.

3.4. Downlink Sports Dance Data Transmission. Part of the output bits needs to be passed to all users [17]. For example, users in the same geographic location need the output bits of the mapper component to update the map. To describe this scenario with a model, this article assumes that $D_s^d \leq \min_k\{D_k^d\}$ output bits can be sent to all users in the dance training venue in a multicast manner, and $\Delta D_k^d = D_k^d - D_s^d$ bits need to be sent to each user k in a unicast manner.

4. Transmission Process of Sports Dance Movement Evaluation System

In the key data frame of the dance movement of this system, the shared communication and calculation tasks are performed first, and then, the traditional independent migration tasks are performed, as described below.

4.1. Sports Dance Data Transmission Rate. Assuming that the channel state remains unchanged during the transmission process, let $\alpha_k^{'}$ be the channel gain between user k and the base station, and α_k is the normalized value, then the uplink dance movement data transmission rate is shown as follows:

$$R_k^u\left(P_k^u\right) = B^u \alpha_k \mathrm{lb}\left(1 + \frac{\alpha_k' P_k^u}{N_0 B^u \alpha_k}\right), \tag{1}$$

where P_k^u is the transmission power of the mobile device of user k, B_k^u is the transmission bandwidth allocated to user k, and B^u is the total uplink transmission bandwidth; then, $\sum_{k=1}^{K} B_k^u = B^u$ and N_0 are the noise power spectral density.

For the shared output bit $D_{s,k}^u$, it can be sent to all users in a multicast manner, and the dance movement data transmission rate of the downlink multicast is shown as follows:

$$R_{m,k}^d\left(P_m^d\right) = B^d \mathrm{lb}\left(1 + \frac{\alpha_k' P_m^d}{N_0 B^d}\right), \tag{2}$$

where P_m^d is the downlink multicast transmission power and B^d is the total downlink transmission bandwidth.

For the output bit D_k^d that is sent to user k separately, it is sent by unicast, and the data transmission rate of the downstream unicast dance movement is shown as follows:

$$R_k^d\left(P_k^d\right) = B^d \alpha_k \mathrm{lb}\left(1 + \frac{\alpha_k^{'} P_k^d}{N_0 B^d \alpha_k}\right), \tag{3}$$

where P^d is the downlink transmission power corresponding to user k, B^d is the downlink transmission bandwidth allocated to user k, and $\sum_{k=1}^{K} B_k^d = B^d$.

4.2. Sports Dance Data Transmission and Processing Time. Define the time T_s^u required for user k to upload part of the shared input bit $D_{s,k}^u$ as $T_s^u = D_{s,k}^u/(R_k^u(P_k^u))$.

The time T_s^c required by the cloud server to execute the number of shared CPU cycles is $T_s^c = C_s/(f_s F_c)$, where F_c is the total processing capacity of the cloud server and f_s is the scale factor allocated by the cloud server to execute the number of shared CPU cycles.

The time T_s^d required for user k to receive the multicast shared output bit D_s^d is $T_s^d = D_s^d/(R_{m,k}^d(P_m^d))$.

In the same way, the time T_1 required for user k to independently upload the remaining number of bits ΔD_k^d is $T_1 = \Delta D_k^u/(R_k^u(P_k^u))$.

The time T_2 required by the cloud server to execute the number of individual CPU cycles for user k is $T_2 = \Delta C_k/(f_k F_c)$, where f_k is the scale factor that the cloud server allocates to execute the number of independent CPU cycles for different users k, and $\sum_{k=1}^{K} f_k \leq 1$.

The time T_3 required for user k to receive the unicast output bit number ΔD_k^d is $T_3 = \Delta D_k^d/(R_k^d(P_k^d))$.

It can be seen from the above that in the sports dance movement system, the delay T required for user k to perform mobile edge calculation is

$$T = \max_k\left(T_s^u\right) + T_s^c + \max_k\left(T_s^d\right) + \left(T_1 + T_2 + T_3\right). \tag{4}$$

4.3. Sports Dance Data Transmission Energy Consumption. The energy consumed by users performing MEC lies in the uplink dance movement data transmission and the downlink dance movement data reception.

The energy generated by user k due to the downlink dance movement data reception is

$$E_k^u\left(D_{s,k}^u\right) = \left(\frac{D_{s,k}^u + \Delta D_k^u}{R_k^u\left(P_k^u\right)}\right)\left(P_k^u\right). \tag{5}$$

The energy generated by user k due to downlink data reception is

$$E_k^d\left(P_k^d, P_m^d\right) = \left(\frac{\Delta D_k^d}{R_k^d\left(P_k^d\right)} + \frac{D_s^d}{R_{m,k}^d\left(P_m^d\right)}\right) l_k^d, \tag{6}$$

where l_k^d is the energy consumed by user k to capture the downward dance movement data per second.

4.4. Uplink Equal Power Allocation. Considering that the uplink transmission power of each user is a fixed value, and the uplink and downlink bandwidth of user k changes in proportion to its channel gain [18], suppose that the optimization variable includes the number of shared input bits uploaded by user k D_k^s, and the cloud server allocates it for sharing the scale factor f_s for the number of CPU cycles, the cloud server allocates a scale factor f_k for executing the number of independent CPU cycles for different users k, and the base station corresponds to the downlink transmission power P_k^d of the user k and the downlink power P_m^d for multicast.

Consider the following optimization problem [14]:

$$\begin{aligned}
&\min_z \sum_{K\in M} E_k^u\left(D_{s,k}^u\right) + E_k^d\left(P_k^d, P_m^d\right),\\
&\text{S.t}\, T \le T_{\max},\\
&\sum_{k\in K} f_k \le 1, 0 \le f_s \le 1, f_k \ge 0, \forall k \in K,\\
&\sum_{k\in K} D_{s,k}^u = D_s^u,\\
&\sum_{k\in K} P_k^d \le P_{\max}^d, P_m^d \le P_{\max}^d, P_k^u \le P_{\max}^u, \forall k \in K.
\end{aligned} \tag{7}$$

5. Performance Evaluation

This section presents the results of minimizing the total energy consumption of the user terminal by using the collaborative characteristics of AR sports dance applications based on MEC and using power allocation methods such as uplink transmission. Consider a training venue where 10 users are running AR sports dance applications. The users are randomly distributed in the training venue, and the wireless channel meets the Rayleigh fading [18]. In the sports dance movement system, each user needs to upload dance movement data D_k^u of 10^6 bits, each user needs to receive dance data D_k^d of 10^6 bits, and the total bandwidth of the uplink and downlink channels B^u and B^d is 1×10^8 Hz. Downlink users receive dance movement data energy l_k^d of 0.628 J/s. In addition, the two parameters, N^0 and F_c, are set to 1×10^{-10} and 10^{11} CPU cycles/s, respectively.

This paper proposes to use the sharing factor n as an indicator of the degree of user's calculation migration, where n is the ratio of shared bits to total bits: when $n = 0$, users perform independent calculation migration; when $n = 1$, all bits are shared bits, and users perform fully shared calculation migration.

5.1. To Minimize the Delay as the Objective Function. This article first takes minimizing the delay as the objective function and simulates the sharing factor $n = 0$, that is, the situation where the user independently performs calculation migration and uses the equal power allocation method to obtain the minimum delay that the sports dance movement system can achieve when using different uplink transmission powers. The simulation result is shown in Figure 1.

It can be seen from Figure 1 that if the equal power allocation method is adopted, the uplink transmission power must meet at least 1.0 W to make the delay constrained within 0.1 s; when the delay is constrained within 0.16 s, a smaller uplink transmission power can be satisfied. Transmission requirements are as follows. In this article, we consider that the maximum uplink transmission power of the user is 0.27 W, and the maximum downlink base station transmission power $P_{\max}^d$ is 20.05 W.

If we consider the model in [19] and take minimizing the delay as the objective function, we can get the simulation results of the minimum delay that the sports dance movement system can achieve when using different sharing factors, as shown in Figure 2.

It can be seen from Figure 2 that under the same simulation conditions, the uplink transmission power is used as the optimized parameter in the literature [20], and the bandwidth is evenly allocated. When the sharing factor is used, the delay can be constrained within 0.998 s.

5.2. To Minimize the Total Energy Consumption of Users as the Objective Function. Taking minimizing the user's total energy consumption as the objective function, on the basis of Section 3.1, simulations are carried out under the conditions of $T = 0.1$ s and $T = 0.16$ s, respectively, for the delay constraints. In the simulation, the continuous convex approximation method and the uplink equal power transmission method are used for comparison. Figures 3 and 4 are the simulation comparisons under the delay constraints of $T = 0.1$ s and $T = 0.16$ s, respectively.

It can be seen from Figure 3 that when the maximum delay is limited to 0.1 s, considering that the user's uplink transmission power is at most 0.27 W, when the uplink

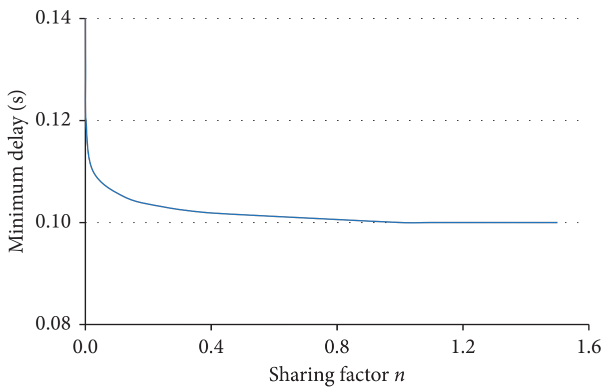

Figure 1: Uplink transmission power versus minimum delay.

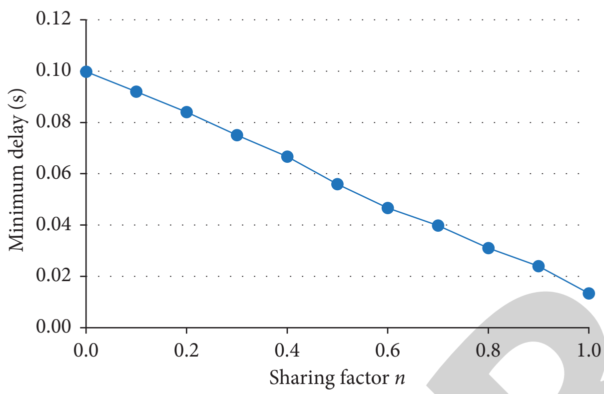

Figure 2: Sharing factor versus minimum delay.

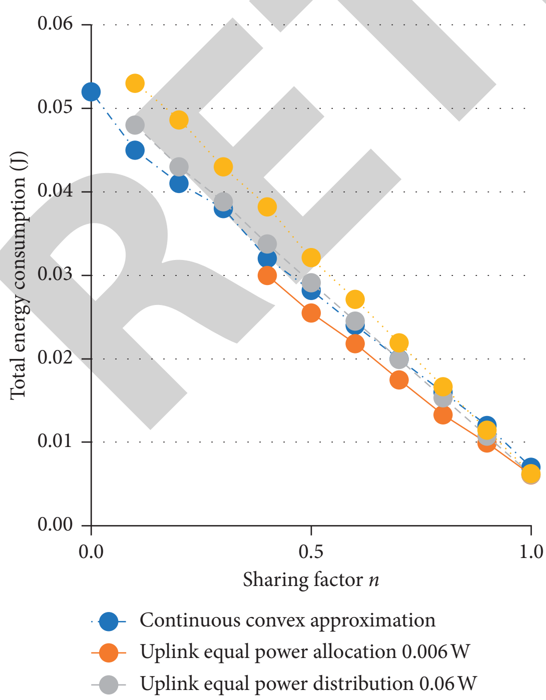

Figure 3: Sharing factor versus sum-energy consumption when the maximum delay is 0.1 s.

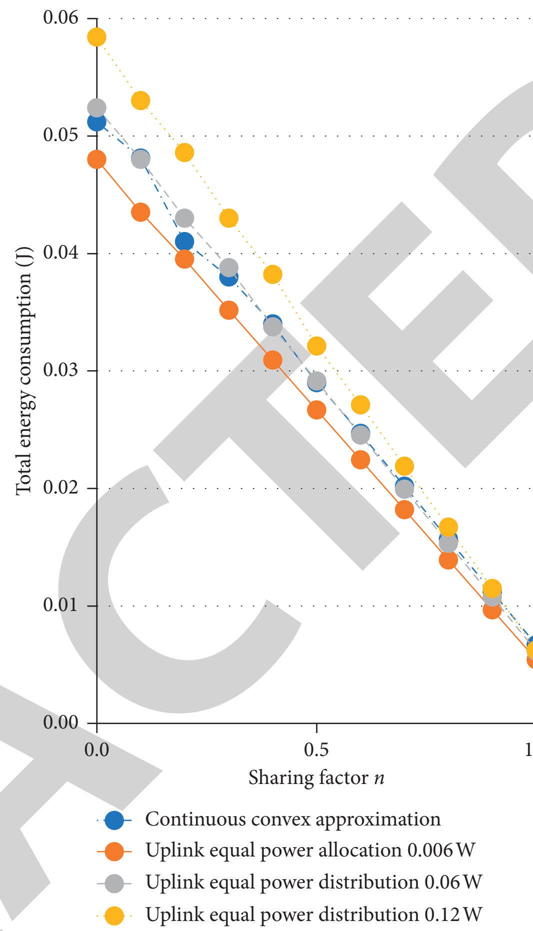

Figure 4: Sharing factor versus sum-energy consumption when the maximum delay is 0.15 s.

transmission power is controlled within 0.27 W, the uplink equal power allocation is used in the case of the sharing factor $n = 0$. The method cannot meet the transmission requirements. When the transmission power decreases, the total energy consumption also decreases, but under the delay constraint, when the sharing factor is small, the large amount of total dance movement data cannot meet the transmission requirements.

It can be seen from Figure 4 that when the maximum delay is limited to 0.16 s, the uplink equal power allocation method is used, and when the user transmission power is 0.06 W, the total energy consumption is relatively close to the continuous convex approximation method in [12], but when the uplink transmission power takes a small value, for example, when the uplink transmission power is 0.006 W, the total user energy consumption obtained by the uplink equal power method is less than the total user energy consumption of the continuous convex approximation method in the literature [21] and can meet the transmission needs.

From the comparison of Figures 3 and 4, it can be found that, with the increase of n, the total energy consumption gap of users obtained by using different uplink equal power transmissions is constantly decreasing. This is due to the total energy consumption of users and the uplink transmission power and transmission. The number of bits is proportional. When the sharing factor is considered in the uplink dance movement data transmission, the number of bits that the user needs to transmit decreases with the increase of n. Therefore, when n does not change, the number of bits transmitted by the user does not change, and the total energy consumption increases; when the uplink transmission power is constant, with the increase of n, the number of bits transmitted by the user decreases, and the total energy consumption decreases; combining the two factors, as n increases, the number of transmitted bits decreases, and the increase in power brings a less obvious increase in total energy consumption.

At the same time, when the uplink power distribution method is used, the solver needs only one solution to obtain the optimal result, while the continuous convex approximation method requires multiple iterations of the solution to approximate the optimal result. It is found through simulation that in the case of accuracy $\varepsilon = 10^{-4}$, the number of iterations is usually between 1 and 35; that is, the solution time of the continuous convex approximation method is a multiple of the uplink power distribution method.

6. Conclusions and Future Research Directions

Aiming at the cooperative transmission characteristics existing in AR sports dance training scenarios, this paper combines bandwidth and channel gain based on MEC to allocate user bandwidth and uses uplink power transmission methods to minimize the total number of users. The energy consumption optimization function, by solving the convex optimization problem, obtains the optimal sports dance movement resource allocation plan. Compared with users performing MEC independently, the user cooperative transmission scheme can significantly reduce the total energy consumption of user equipment during sports dance training. At the same time, when using uplink power transmission methods, it can reduce compared with continuous convex approximation. The sports dance movement system has computing time, and under a certain delay requirement, it can meet the transmission requirements with a smaller power.

The combination of computer virtual technology, edge computing technology, and sports dance training projects has opened up a convenient channel for various types of sports training. The application of virtual technology in the field of sports reduces the danger of training and creates an objective condition that is difficult to achieve or even impossible to achieve in order to optimize the evaluation of sports dance movements based on the network architecture of edge computing and augmented reality technology, in addition to exploring the energy consumption, time optimization, and enhancement technology of MEC, the quality of user experience, and deployment research and practice on optimization and collaboration mechanisms, so as to realize the deep integration of sports dance and edge computing technology under the augmented reality technology, with a view to elevating college sports training to a whole new level.

Data Availability

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

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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