Hindawi
Journal of Sensors
Volume 2022, Article ID 5348222, 11 pages
https://doi.org/10.1155/2022/5348222

Research Article

Visual Communication Design Based on Collaborative Wireless Communication Video Transmission

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Received 11 November 2021; Revised 14 December 2021; Accepted 21 December 2021; Published 15 January 2022

Academic Editor: Gengxin Sun

With the development of wireless communication technology, video and multimedia have become an integral part of visual communication design. Designers want higher interactivity, diversity, humanization, and plurality of attributes in the process of visual communication. This makes the process of visual communication have high requirements for the quality and real-time data transmission. To address the problem of transmitting HD video in a heterogeneous wireless network with multiple concurrent streams to improve the transmission rate and thus enhance the user experience, with the optimization goal of minimizing the system transmission delay and the delay difference between paths, the video sender and receiver are jointly considered, and the video transmission rate and the cache size at the receiver are adaptively adjusted to improve the user experience, and a cooperative wireless communication video transmission based on the control model for video transmission based on cooperative wireless communication is established, and video streams with self-similarity and long correlation are studied based on Pareto distribution and $P/P/l$ queuing theory, based on which an adaptive streaming decision method for video streams in heterogeneous wireless networks is proposed. Simulation results show that the proposed multistream concurrent adaptive transmission control method for heterogeneous networks is superior in terms of delay and packet loss rate compared with the general load balancing streaming decision method, in terms of transmission efficiency and accuracy.

1. Introduction

Visual communication design is a planned, effect-oriented design image generation and communication activity that people carry out to achieve certain purposes (such as information transmission, promotion, expression, and influence). The design of design images and transmission methods are a marginal discipline that integrates art, science, and technology [1, 2]. It can be seen that visual communication design, as the study of visual information transmission as the main destination, plays a vital role in people's lives. The term "visual communication design" was popularized in the 1960s, and at the World Design Conference in Tokyo, Japan, the participants recognized that print art design could no longer cover new information dissemination media such as images, so visual communication design was born, and it was the expansion of media forms that gave design a new connotation [3, 4]. With 50 years of design life, he has witnessed the transformation of designer's identity from "commercial artist," "graphic designer," to "visual communicator" [5]. The scope of design is expanding, the content and means of design are enriching, and design activities are not limited to a single fixed field, but a cross-cutting, multifaceted, and comprehensive design practice and research are expanding.

The main function of visual communication design is to convey information, which is conveyed by visual symbols, unlike the abstract concept conveyed by language [6, 7]. The process of visual communication is designer's process of transforming ideas and concepts into the form of visual symbols, while for the receiver, it is an opposite process. Visual communication design is precisely the design that uses visual symbols to communicate, the designer is the sender of the information, and the receiver of the information [8]. It can be seen that visual communication design is a design that uses visual media as a carrier to convey information to the public. Visual communication contains two levels of meaning: visual symbols and communication. Visual symbols are the formal language composed of graphics, words, colors, and other design elements, which is the medium to carry information [9, 10]. Therefore, visual communication design not only includes the meaning of design level but also includes the process of information dissemination [11].

Real-time multimedia transmission usually has high network bandwidth requirements, especially real-time HD video services require strict end-to-end delay and delay jitter requirements, while a single wireless access technology cannot provide users with a better user experience due to limited communication capabilities and different working methods [12–14]. Wireless heterogeneous network environment is an important feature of next-generation wireless networks, and there are many different heterogeneous wireless networks, such as 5G, LTE, and WLAN. Multipath parallel transmission systems, by aggregating the transmission performance of multiple links, can effectively improve network resource utilization, service transmission rate, and load balancing capability [15].

Reference [16] proposed an adaptive traffic distribution strategy under the collaboration of wireless WAN and wireless LAN, which minimizes the system transmission delay through internetwork load balancing and extends the communication function of single-mode terminals to support high-rate data streams. 1 queue, while a large number of studies on network traffic presented in reference [17] show that data packet arrivals do not obey exponential distribution and are not Poisson, but have self-similarity and long correlation. Reference [18] also suggested that data packet arrival and packet length obey exponential distributions are not suitable for modeling different kinds of network traffic and pointed out that heavy-tailed distributions are more suitable for data packet arrival and data packet length. In network performance analysis, data flows obeying the heavy-tailed distribution have distinctly different characteristics from those obeying the Poisson distribution. Reference [19] points out that understanding the nature of traffic is essential for the design of wireless networks and wireless services and that the traditional model of network traffic (Poisson traffic) leads to underestimation or overestimation of wireless network performance, and simulation results show that the latency of real-time polling services and best-effort services increases for self-similar traffic, and the request collision probability increases for best-effort services compared to Poisson traffic. The different types of network traffic proposed in Reference [20] exhibit self-similarity characteristics, and their performance characteristics are significantly different from those of traffic that obeys typical Poisson or exponential distributions. Reference [21] proposes a path traffic allocation algorithm that satisfies the delay-constrained jitter optimization, which allocates each path traffic proportionally according to the maximum allowable inflow rate of the path, while minimizing the delay jitter between paths. Reference [22] proposed a traffic adaptive allocation strategy in heterogeneous networks, decomposing data flows into multiple flows and aggregating them at terminals, parallel data transmission using $M/M/1$ queuing theory modeling, and solving the optimization problem by Lagrange multiplier method. However, recent research on the measurement of network communication flows has overturned the traditional communication model based on Berzon theory, and many papers have reported that modern data communication flows have self-similarity properties. Reference [23] established an equivalent queueing theory model for the end-to-end delay of concurrent transmission in heterogeneous multiaccess networks and obtained the theoretical delay bound for concurrent transmission systems from this model. However, the packet arrival is regarded as exponential distribution and the service process as Poisson distribution. References [24, 25] investigated the impact of self-similar traffic in various wireless LAN scenarios using the $P/P/1$ queuing model for the self-similar characteristics of network traffic. Network services with self-similarity pose new challenges to network design. Instead of smoothing the network service, the multiplexing overlay of self-similar services increases its burstiness, and the burstiness of time-aggregated fractal services diminishes much more slowly than Poisson services, so more resources need to be allocated in network design to ensure the quality of service. For solving the problem of transmitting HD video in heterogeneous wireless networks with multiple concurrent streams, improve the transmission rate, enhance the user experience, and minimize the system transmission delay and the delay difference between paths; the main contributions are summarized as follows: (1) based on Pareto distribution and $P/P/L$ queuing theory, video streams with self-similarity and long correlation are studied. On this basis, an adaptive stream decision method for video streams in heterogeneous wireless networks is proposed. (2) GSO algorithm is used to adaptively solve the number of visual transmission to reduce the system delay and system burden; (3) experiments verify the effectiveness and reliability of the visual communication strategy based on cooperative wireless communication video transmission.

In this paper, we address the above issues by first expressing the meaning of visual communication and the need of visual communication itself for interactivity, communication, and diversity of interface display. Then, the link between visual communication and wireless video transmission is developed, and the process of interaction and presentation of visual communication with users is introduced. Then, it focuses on minimizing the system link delay and as well as the delay difference between paths as the optimization objective; firstly, the system model is proposed, and a mathematical model of concurrent video multistream transmission control for heterogeneous wireless networks is established to form an optimization problem of adaptive video traffic distribution in heterogeneous wireless networks, so as to obtain a more reasonable traffic distribution strategy to ensure the quality of service. It also integrates the conditions at the sender and receiver sides and adjusts the rate at the sender side as feedback to improve the user experience. To solve this optimization problem, an artificial firefly swarm optimization algorithm is used to solve the optimization problem. Finally, we compare the effect of the proposed algorithm with that of the visual communication and show that the visual communication has better performance with the application of cooperative wireless communication technology.

2. Visual Communication Design Architecture Based on Wireless Communication Video Transmission

2.1. Structure of Visual Communication Based on Cooperative Wireless Communication. Visual communication design requires designers to put themselves in user's shoes as much as possible, reflecting the concept of human-oriented design. At the level of humanized design, designers need to consider the psychological feelings brought by the form of content writing and presentation. At the level of humanized design, designers mainly consider the feelings brought by external factors such as platform function, influence, and value. At the interpersonal design level, designers mainly consider the relationship between the microplatform, users, and the social environment. These requirements also put higher demands on the video itself. From the old noise-filled black and white images, to the current high definition video and lossless sound quality. The visual communication itself also requires a higher quality and real-time video transmission.

As shown in Figure 1, visual users usually view video in two ways: wired and wireless. Wired is usually in a fixed place and location, connected to the video playback terminal through optical fiber or network cable, which usually has a larger bandwidth, faster transmission speed, and relatively better video quality. The wireless way is usually the video transmission in the process of moving, compared to the wired transmission method; the video quality will be relatively low. Video playback site by collecting the window of the user to watch the video, with geographic location and other information for fusion. The fused information is handed over to the data server for collation and decision-making to match the best visual communication patterns for the user. The server hands these patterns and decisions to the data organization server, which finds the information to be displayed from the servers it manages for video, audio, images, text, etc., and organizes and transmits it. And after users receive it at different terminals, they all need to decode it correspondingly to achieve the optimal display effect on the corresponding terminal.

2.2. Principle of Wireless Cooperative Communication. Joint source channel coding (JSCC) is considered as an effective solution for the above-mentioned problem of reliable transmission of video streams in wireless network environments [26]. However, the main problem of existing JSCC approaches is that the network between the server and the client is considered as a single transmission link, which is more complicated in the multipath case [27]. Therefore, a simpler but equally reliable data transmission method is needed for video transmission. Therefore, in this paper, with the optimization objective of minimizing the system link delay and the delay difference between paths, we first propose a system model to establish a mathematical model for concurrent video multistream transmission control in heterogeneous wireless networks and form an optimization problem for adaptive video traffic distribution in heterogeneous wireless networks. In this paper, collaborative infinite communication video transmission method is designed in Figure 2. As is shown, the self-similarity characteristics of video streams are applied to the multistream concurrent distribution strategy of heterogeneous networks. And the data packet arrival interval and data packet size are modeled using a more realistic self-similarity distribution to obtain a more reasonable distribution strategy to ensure the quality of service by better matching the actual time delay of video streams. And considering the condition of the sender and receiver side, the buffer length of the receiver side is used as feedback to adjust the rate of the sender side to improve the user experience. To solve this optimization problem, an artificial firefly swarm optimization algorithm is used to solve the optimization problem.

3. Collaborative Wireless Communication Video Transmission Algorithm and Implementation Framework

3.1. HD Video Transmission Model Based on Cooperative Wireless Communication. The heterogeneous wireless network video multistream concurrent transmission control system model is shown in Figure 3. The HD video streams are split at the video source side, and through adaptive splitting decision, the video streams are transmitted through different links and multiple heterogeneous wireless terminals; multiple wireless networks work together and finally played after the buffer is integrated at the video playback side. The video source side uses H.264 to compress and encode the video, and the 5G network is used for transmission [28]. Multiple users can use the available terminals in the vicinity to complete the video service with concurrent transmission of multiple streams. Heterogeneous single-mode terminals from different users form virtual multimode terminals, which use different standard networks, such as cdma2000, WCDMA [29]. These cooperative terminals are aggregated into an organic whole with enhanced capabilities, more interfaces, and external collaboration through Wi-Fi networking controlled by terminal controllers, forming a user-centered super terminal, i.e., virtual terminal, to achieve service diversification and enhancement. The virtual terminal can be used to realize service diversification and enhance user experience [30].

Suppose there are K links between the transmitter and the receiver, and the performance of each transmission path varies, such as the packet loss rate and transmission delay of different paths may be different. Assuming that the smallest unit of service transmission is data packet, the transmission rate of service on each path is adjusted by reasonably arranging the rate at which data packets leave the transmission. R is the total data traffic; R_1, R_2, and R_3 are the data traffic divided into individual links; and D_1, D_2, and D_3 are the time delay of each link.

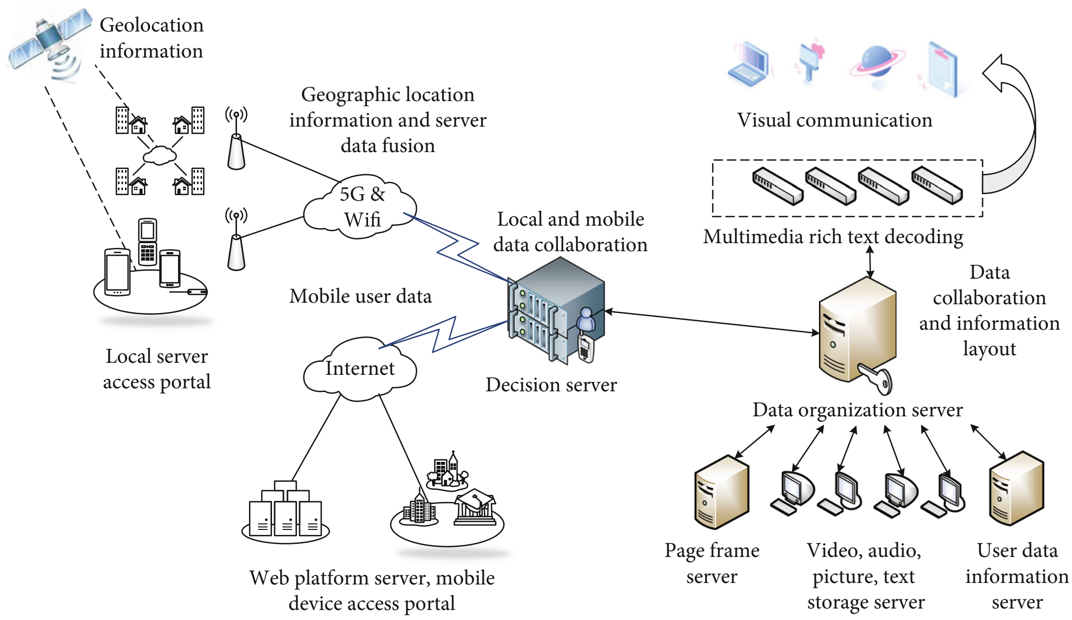

Figure 1: Visual communication framework for collaborative infinite communication video transmission.

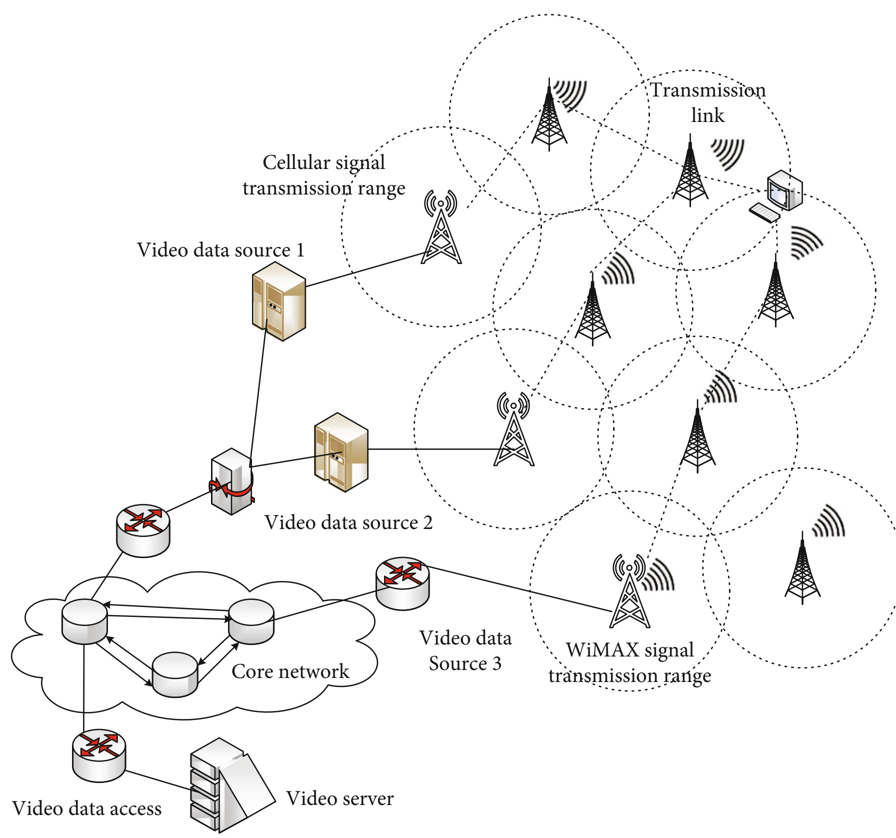

Figure 2: Collaborative infinite communication video transmission method.

A buffer with dynamically adjustable length is set at the video playback end. The video received at the video playback end is temporarily stored in the playback buffer, where short-time rate and bandwidth mismatches can be absorbed to mitigate video interruptions, and video data grouping can be reordered in this playback buffer to absorb the delay jitter between paths. The buffer forms a cache feedback loop between the video playback end and the video source end, and the video source can adjust the sending rate R according to the buffer length at the video playback end, thus keeping

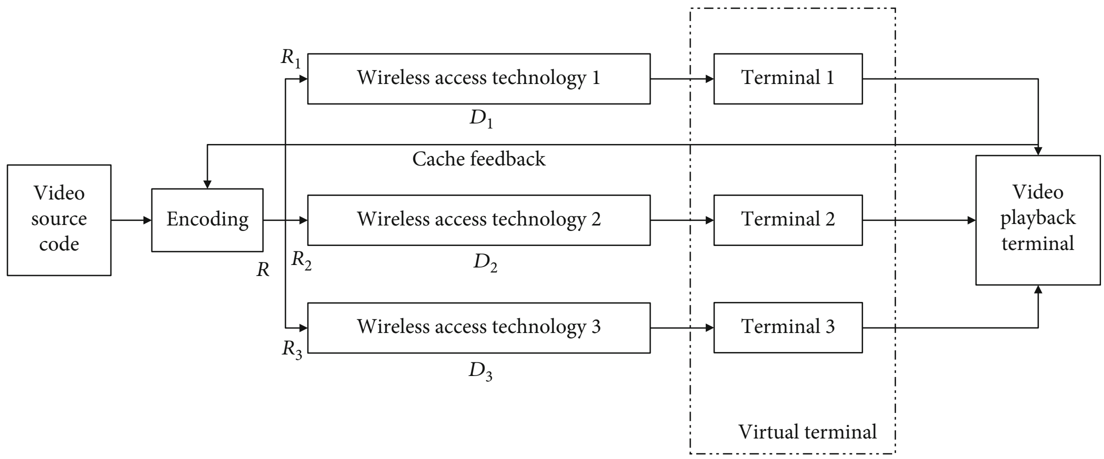

Figure 3: Concurrent video multistream transmission control model in heterogeneous wireless networks.

the buffer length in a normal state and improving the user experience.

Video traffic is self-similar and long-correlated, and long-correlated traffic has a negative impact on network performance, the most important result being that the queue length distribution decays more slowly with self-similar traffic than with short-correlated service sources (e.g., Poisson model). It has also been shown that the self-similarity of traffic leads to high buffer overflow rates, time lengthening, and persistent periodic congestion, which directly affects the design, control, analysis, and management of next-generation networks, while the use of Poisson or Markov business models does not accurately reflect the long correlation of actual traffic and can lead to underestimation of the average packet delay or maximum queue length in the analysis.

3.2. Truncated Pareto Distribution. The self-similarity of traffic has a direct impact on the design, control, analysis, and management of next-generation networks, and the self-similarity of data flows is receiving increasing attention in network performance analysis. Although the cause of the service self-similarity process is not conclusively established, the heavy-tailed distribution is a major cause of the self-similarity process. The commonly used heavy-tailed distributions are Pareto, Weibull, and Log-normal. As shown in reference [31], the video data group size obeys the truncated Pareto distribution, and the arrival interval also obeys the truncated Pareto distribution. By applying a more realistic self-similar distribution to the data group arrival interval and the data group size, we can obtain a delay that is more consistent with the actual video stream.

The tail function of the Pareto distribution is:

$$P(X > x) = \left(\frac{k}{t}\right)^{a}. \quad (1)$$

It is a hyperbolic function, which decays much more slowly than the exponential function. In this paper, the Pareto distribution is used to represent the video stream to fully consider the self-similarity of the video stream. And because x is infinite, the truncated Pareto distribution is used instead of the Pareto distribution, and the actual truncated Pareto distribution is used.

$$F(x) = P[X \le x] = \frac{\left[1 - (k/x)^{a}\right]}{\left[1 - (k/L)^{a}\right]}, \quad k \le x \le L, \quad (2)$$

where $k > 0$ is the position parameter and a is the shape parameter.

Each concurrent link in a heterogeneous wireless network video multistream concurrent system can be modeled as a $P/P/1$ queuing model, and the whole system is a parallel $P/P/1$ queuing model. The delay of a single link in a heterogeneous wireless network is the sum of the average waiting time and the average service time.

$$\begin{aligned} D &= t_w + t_s, \\ t_w &= t_s \frac{\rho}{(1-\rho)} \cdot \frac{{C_a}^2}{{C_s}^2}, \\ t_s &= \frac{8M_s}{B}, \end{aligned} \quad (3)$$

where t_w is the average waiting time, t_s is the average service time, and ${C_a}^2$ and ${C_s}^2$ are the squared variance coefficients of the video stream data packet arrival interval and data packet service time, respectively. ρ, M_s, and B represent the transmission proportion, transmission volume, and total transmission volume, respectively.

3.3. Adaptive Streaming Decision Based on GSO Method. The adaptive streaming decision for video streams in heterogeneous wireless networks proposed in this paper is to design the optimal streaming strategy to minimize the delay of the system while minimizing the delay jitter in the difference of each link. In concurrent transmission, the delay jitter of data packets mainly comes from the difference in transmission capability between different wireless access technologies.

The transmission delay of data packets on different paths D_i is not only related to the transmission capability of the paths but also related to the traffic allocation strategy between the paths. When the transmission capacity of the path is poor, allocating more traffic to it will lead to a sharp increase in D_i. When the transmission capability of the path is good, increasing its transmission traffic appropriately does not have a great impact on the transmission delay D_i. By reasonably allocating the traffic among the paths, the difference in delay between the paths can be reduced, thus achieving the purpose of reducing jitter.

Suppose there are K links between the sender and the receiver, and the performance of each transmission path varies, such as the packet loss rate and transmission delay of different paths may be different. Assuming that the smallest unit of video service transmission is the data packet, the transmission rate of video service on each path is adjusted by reasonably arranging the rate at which the data packet leaves the transmission.

The artificial firefly swarm optimization algorithm originates from the study of the behavior of fireflies in nature such as luminous courtship and communication. It is a swarm intelligence optimization algorithm, which is widely used in resource scheduling. Its bionic principle is that it uses individual fireflies in nature to simulate the points in the search space, and the process of mutual attraction and movement of individual fireflies is simulated as the process of target seeking, and the superiority of the position of individual fireflies is used to measure the objective function of solving the problem, the iterative process of the feasible solution of the function in the process of optimization.

The GSO algorithm is mainly used to simulate the optimal value of the solution function by operating on fireflies through the equation of fluorescein value update in Equation (4) and the equation of probability distribution in Equation (5).

$$l_i(t) = \max\{(0, (1-\rho)\cdot l_i(t-1) + \gamma \cdot J(x_i(t)))\}, \tag{4}$$

$$P_j(t) = \frac{l_i(t)}{\sum_{k\in N_i(t)} l_k(t)}, \tag{5}$$

where $l_i(t)$ means fluorescein value in ith time. $P_j(t)$ means probability distribution. The implementation process of the GSO algorithm is as follows. Relative attraction between fireflies is defined:

$$\beta(r) = \beta_0 e^{-\gamma r^2}. \tag{6}$$

β_0 is its initial attraction, that is, the attraction when the distance between two fireflies is 0, and r is the distance between two fireflies. A firefly will move towards all fireflies with higher brightness than itself, and its moving distance is calculated by the following formula (7):

$$X_i{}' = X_i + \beta_0 e^{-\gamma r^2}\left(X_i - X_j\right) + \alpha \text{ rand }(\,), \tag{7}$$

where represents the position of a firefly with higher brightness than the ith individual, and R represents the distance between the ith firefly and the jth firefly. Rand () is a random disturbance and is the step factor of the disturbance. Generally, the value of rand () is the uniform distribution within the range of [-0.5, 0.5], or the value of standard normal distribution a of U (0, 1) is between [0, 1].

The GSO-based wireless video transmission path optimization algorithm is shown in Figure 4. From the principle of GSO algorithm, the running time of the adaptive triage decision process is mainly consumed by the firefly position update, and its time complexity is mainly determined by the maximum number of iterations M and the number of fireflies n. In one iteration, the frequency of firefly position update operation is $f = 1 + 2 + 3 + \cdots + n = n \times (n+1)/2$, and its time complexity is $O(n^2)$, so after M iterations, the total time complexity of adaptive diversion decision is $O(M \times n^2)$, where M is the maximum number of iterations and n is the number of fireflies.

4. Transmission Experimental Results

4.1. Experiment of HD Video Transmission Based on Cooperative Wireless Communication. In this paper, the performance of the proposed adaptive streaming strategy is evaluated by extensive MATLAB simulation experiments. Assuming three parallel transmission data with transmission capacities of 4 Mbit/s, 2 Mbit/s, and 3 Mbit/s, respectively, the initial population size of the artificial firefly swarm optimization algorithm is 20, and the maximum number of iterations is 300. In this simulation, the video sender rate changes from 2 Mbit/s to 6 Mbit/s. The adaptive shunting decision proposed in this paper is compared with the general load balancing shunting decision The proposed adaptive streaming decision is compared with the general load balancing streaming decision. The general load-balanced streaming decision is shown in Equation (6):

$$R_i = R\frac{R_{a,i}}{\sum_{j=1}^{3} R_{a,j}}(i = 1, 2, 3). \tag{8}$$

Figure 5 shows the variation of the packet loss rate of the system with the transmission rate. It can be seen that the delay and delay jitter-based splitting strategy proposed in this paper has lower packet loss rate than the general load balancing splitting strategy, but the difference between them gradually decreases as the network load increases, and the packet loss rate is close when the sender rate increases to 5.5 Mbit/s and 6 Mbit/s. This is because the optimization effect decreases with higher network load. At the sender rate of 3 Mbit/s, the packet loss rate of the proposed splitting strategy is 10.6% lower than that of the general load balancing splitting strategy.

Figure 6 shows that the delay of the proposed splitting strategy is reduced by 4.67%, 5.89%, and 10.12% mode compared to the general load balancing splitting strategy, real-time multimode transmission mode, and classic video transmission. When the sender rate gradually increases, the delay in both streaming strategies increases significantly because the traffic load is close to the available resources, which will lead to unstable system performance, especially when the

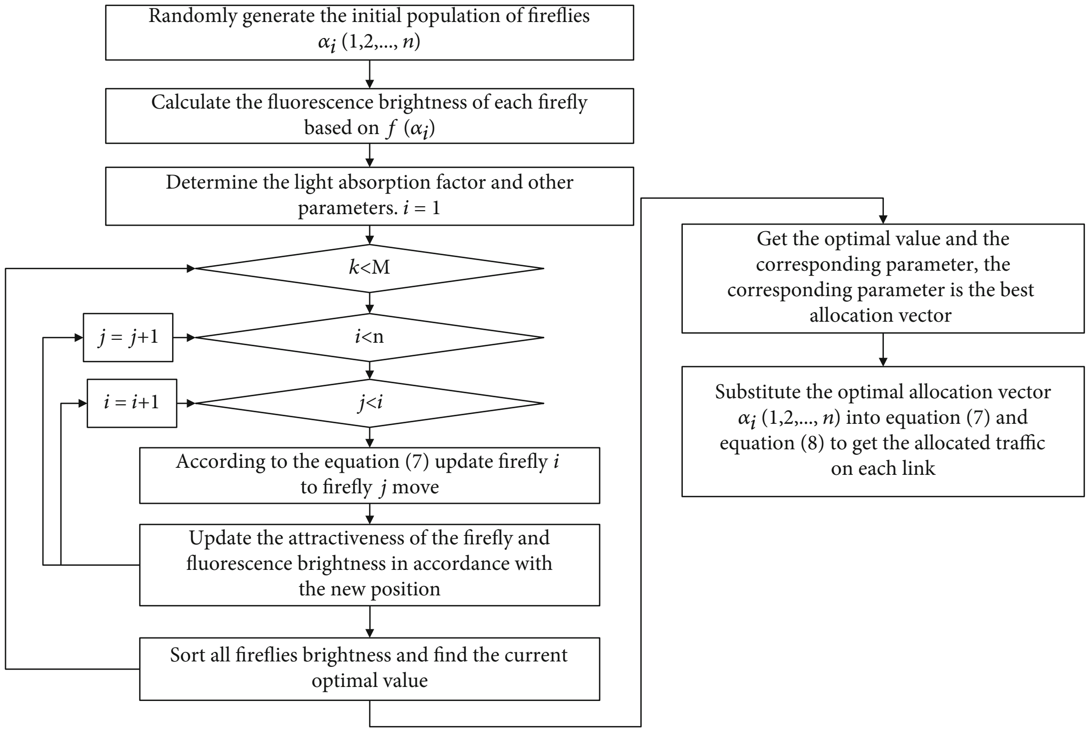

Figure 4: GSO-based wireless video transmission path optimization algorithm.

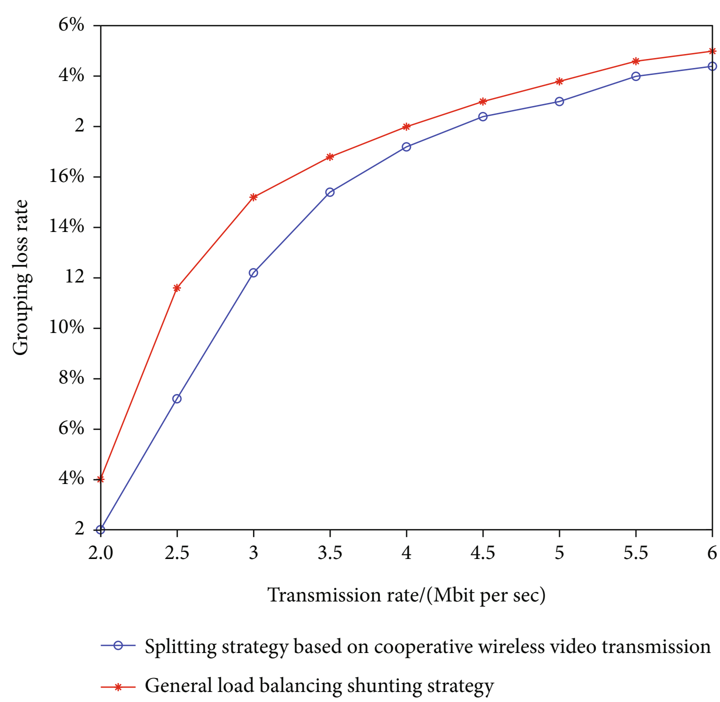

Figure 5: Comparison of packet loss rates for different splitting strategies.

sender rate exceeds 4 Mbit/s, a single wireless access technology cannot meet the requirements because of the limited communication capacity, so single-mode heterogeneous terminals from different users are expanded into user-centric superterminals through LAN networking centered superterminals with enhanced capabilities, i.e., virtual terminals, which can aggregate link resources and improve user experience.

Figure 7 shows that the delay with $P/P/1$ queuing theory is larger than the former compared with that with $M/M/1$

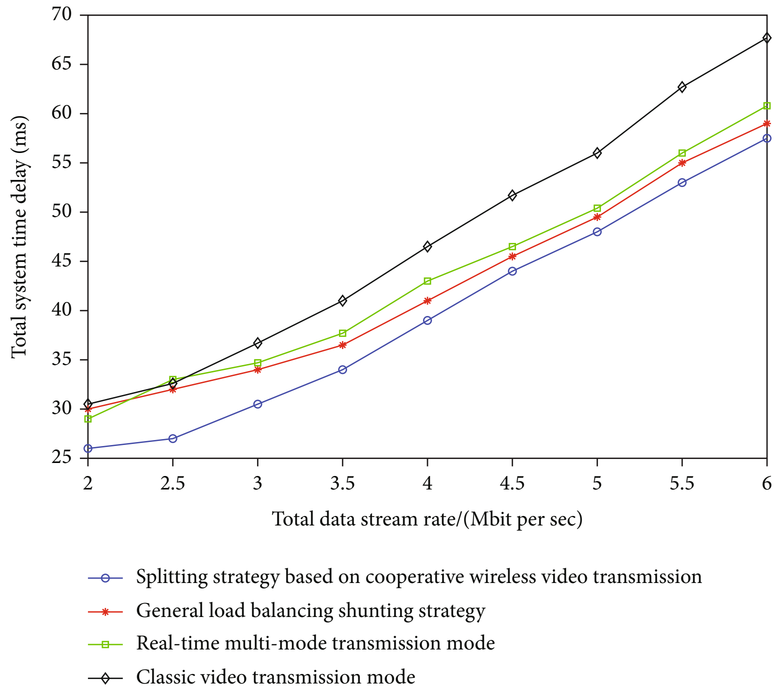

Figure 6: Delay of different splitting strategies.

queuing theory, and the difference increases with the increase of sending rate. This is because the self-similarity of video streams affects the delay, and more resources need to be allocated to ensure the quality of service, so using the $P/P/1$ queuing theory, which is more consistent with the self-similarity of video streams, for the streaming decision can provide a better experience to users.

4.2. Experiment of Visual Communication Design Based on Collaborative Wireless Communication Video Transmission. Common indicators of visual communication design are as follows: (1) video-based: video-based design is an inevitable trend for the future development of visual communication design. Through the new digital media technology and communication medium, it makes the design content richer, the information more communicative and innovative, and makes the visual communication design a new visual form. (2) Humanization: in the era of digitalization, visual communication design bids farewell to the traditional flat paper printing and wants to bring a new experience to customers visually, starting from meeting their visual needs, which is the embodiment of the concept of humanization of visual communication design [32]. (3) Diversity: nowadays, electronic technology and digital media are developing rapidly, and the design field is expanding [33]. In the field of civilian design, visual language presents people with different expressions, graphic that is flat, image that is dynamic three-dimensional, and what they pursue is a broad international vision to make the design with superb quality, so as to express the inner language logic. (4) Multisensory interface user trust: nowadays, the widespread use of mobile APP makes many designers and developers start to pay attention to the trust relationship between users and the product, the so-called user trust, which is what we usually known as "user viscosity". (5) Integrated: visual communication design itself is a discipline containing a variety of fields, modern visual communication discipline is no longer simply graphic design graphics, it is through the visual design performance and other media to convey to the audience, and the distinctive characteristics of the times and the connotation of the times are reflected in its performance.

In this study, two hundred subjects, all divided into two groups, were selected to watch 10 different videos and to rate the visual communication effect of the videos after watching them, using a ten-point scoring method. This study used the self-compiled "Questionnaire on the Performance Effect of Visual Communication Design." The questionnaire includes five dimensions: video, humanization, diversity, multisensory interface user trust, and synthesis. The internal consistency coefficient of this questionnaire was 0.969, and the split-half reliability was 0.820, and the reliability of the total scale was good. The data were collected from the participants of the test and then entered and analyzed. Correlation analysis was used to explore the correlation between the training conditions, research quality, and psychological development of master's students in Jiangsu Province. As shown in the radar (Figure 8), the subjects, without knowing what technology was used for the video, generally perceived that the video using collaborative wireless communication transmission was more visually communicative than the regular transmission video. Specifically, of the five main aspects of video communication, the three aspects of visualization, multisensory interface user trust, and synthesis were significantly better than traditional video transmission methods. The user-friendliness and diversity aspects have also been improved to a certain extent. By further analyzing the

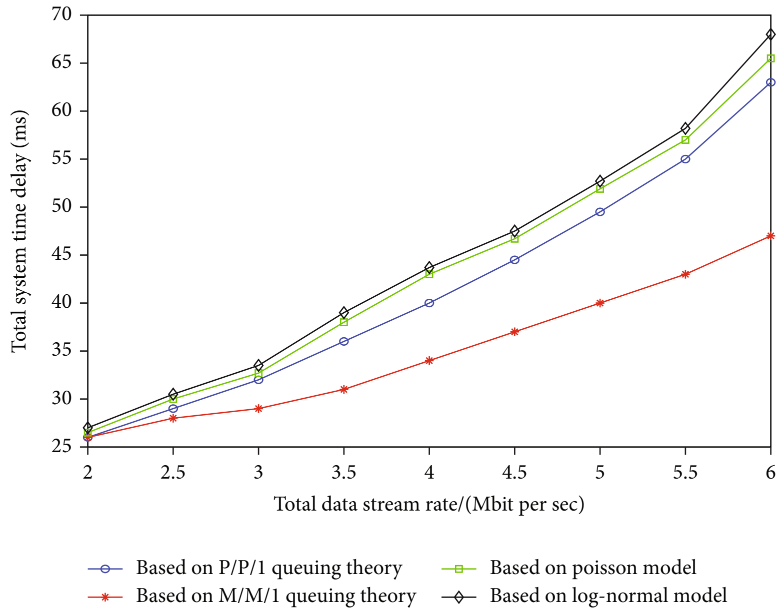

Figure 7: $P/P/1$ and $M/M/1$ transmission delay.

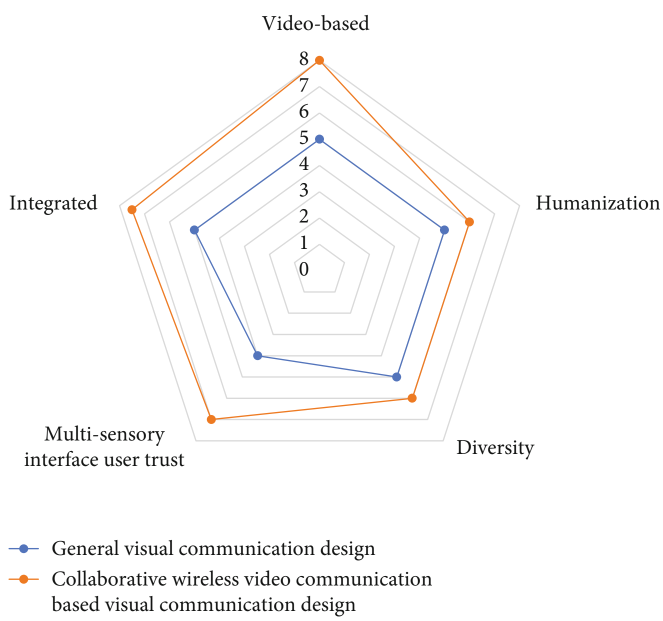

Figure 8: Experimental results of evaluation of visual communication.

user-feeling part of the questionnaire, we can learn that users generally believe that the video quality and fidelity of video transmission based on cooperative wireless communication have been significantly improved, which makes users' viewing experience more comfortable and thus feel more humane and more able to discover the diverse contents of the video.

5. Conclusion

This paper improves the expressiveness of visual communication design based on wireless communication video transmission technology. In order to improve the aspects of diversity, interactivity, and trustworthiness in the visual communication process, the proposed heterogeneous network HD video multistream concurrent transmission control consists of two stages: adaptive streaming decision and receiving buffer length feedback adaptively adjusting the rate at the sender side. The adaptive streaming decision obtains a streaming decision method by minimizing the system delay while minimizing the delay jitter. The buffer length feedback adaptive adjustment of the sender rate is a joint video source side and video playback side, and the sender rate is adaptively adjusted by the buffer length of the playback side.

The simulation results show that the proposed video adaptive streaming decision reduces the delay by 4.67% compared with the general load balancing streaming decision method, and the delay increases based on $P/P/1$ queuing theory compared with $M/M/1$ queuing theory, and the difference increases with the increase of the sender side rate, indicating that the self-similarity of video streams affects the delay, and more resources need to be allocated to ensure the quality of service, so using the $P/P/1$ queuing theory, which is more consistent with the self-similarity of video streams, for the streaming decision can provide a better experience to users. Compared with the general load-balanced streaming decision method, the proposed streaming decision method in this paper has certain superiority in terms of delay and packet loss rate. Finally, experiments on the visual communication effect are conducted based on this algorithm. The experimental results show that the visual communication based on collaborative wireless communication video transmission has a certain improvement over the usual visual communication effect, especially in the two aspects of multisensory interface user trust and synthesis.

Data Availability

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

Conflicts of Interest

We declare that there is no conflict of interest.

Acknowledgments

The study was supported by the Department of Design, Tongmyong University.

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