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Research Article

Optimal Scheduling Algorithm of Wireless Communication Packets Based on Knapsack Theory

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Due to the instability of the wireless channel, data packet loss occurs during wireless communication information transmission. Wireless communication can effectively improve transmission efficiency, study the optimal transmission method of wireless communication data packets, improve the information transmission efficiency and quality of wireless communication, and realize the optimal transmission of wireless communication data packets in order to ensure the reliable transmission of data. It is crucial for increasing wireless communication quality. Natural scheduling and priority scheduling are the only two types of wireless resource scheduling algorithms available so far. These scheduling algorithms are unable to solve the problem of executing the best scheduling under the same priority constraints. This problem is solved using the knapsack theory data knapsack filling procedure. The optimal scheduling of wireless communication packets is investigated in this study using the knapsack theory. The number of destination nodes grows from two to sixteen over time, two at a time. Set the system parameters to a total of 50 original data packets, a packet loss rate of 0.4 in the optimization process, and a packet loss probability of 0.26 in the feedback connection. The KFA approach employed in this study has the highest optimization rate in the three experiments, which can be seen to reduce data packet loss, according to the simulation test. Hybrid coding of data packet transmission is used in conjunction with the buffer feedback method to increase data transmission security. At the same time, it gives practical data for wireless reactive power coded data packet transfer using the time complexity measurement algorithm.

1. Introduction

The wireless communication system can provide more and more services. It not only needs to transmit voice and multimedia data streams but also needs to receive and process a large number of network data packets to meet the needs of users' high-speed Internet access. The task of wireless resource scheduling is to reasonably allocate wireless communication channels among different users, meet the needs of different types of users as much as possible, and optimize the data throughput of the whole system [1, 2]. Due to the influence of the transmission medium characteristics, the wireless communication transmission process will form the phenomenon of simultaneous interpreting and multipath fading between different transmission channels, resulting in a higher packet loss rate. In order to ensure the wireless transmission achieves higher effectiveness, the retransmission effectiveness [3] must be improved. In the process of wireless communication information transmission, due to the unreliability of the wireless channel, there is the phenomenon of data packet loss. In order to ensure the reliable transmission of data, wireless communication can effectively improve the transmission efficiency, study the optimal transmission method of the wireless communication data packet, improve the information transmission efficiency and quality of wireless communication, and realize the optimal transmission of the wireless communication data packet. It is of great significance in improving the communication quality of wireless communication [4, 5]. A good scheduling algorithm should not only accurately and quickly send data packets from different users to the target end but also ensure to meet the requirements of users. More importantly, the scheduling algorithm should make full use of limited system resources, reduce the call drop rate, and maximize the throughput of the system.

Up to now, there are only two kinds of wireless resource scheduling algorithms: natural scheduling and priority scheduling. These scheduling algorithms cannot deal well with the problem of how to schedule optimally under the same priority [6]. The knapsack filling algorithm of backpack theoretical data proposed in this paper is to solve this problem [7, 8]. The source of the backpack problem: Given a backpack of fixed size and quality, choose the most valuable items to put into it. This is a combinatorial optimization problem: given an item with a mass of Wi and a value of Vi, the quantity of these items belongs to a set, the total mass of the item is limited to a certain range, and the total value is required to be as large as possible. This is the most common 0-1 programming problem, and the value that limits whether to select items is either 0 or 1. The knapsack problem is an optimization problem, and the algorithm to solve it is mature. Generally, the 0-1 knapsack problem can be solved by a dynamic programming algorithm, while the fractional knapsack problem can be solved by a greedy algorithm. Backpack theory solves the problem of how to select the items to maximize the total value of the items in the backpack when the quality or volume of the backpack is certain, while the frame scheduling problem is how to select the data packets to be transmitted and schedule them into one frame to maximize the value of the original user data transmitted in each frame [9, 10]. In the process of recovering packet loss data, the sending node will obtain retransmission packets by XOR operation according to the packet loss phenomenon of each destination node and repeat the above recovery process to ensure that all destination nodes can receive all data packets [11].

On the basis of understanding the channel environment and service type, the grey correlation evaluation is carried out on the data packet sequence, the grey correlation coefficient is extracted, the queue priority is specified according to the size of the grey correlation coefficient, and finally, the knapsack algorithm is applied to allocate bandwidth resources to each group of data packets [12, 13]. Through the preprocessing of data packets, the system performance can be significantly improved, and the waste of resources can be reduced in the case of intensive communication services. When recovering packet loss data, the sending node can form retransmission packets through XOR operation coding according to the packet loss characteristics of each node. The repeated recovery method is used to make all destination nodes receive data packets. Each destination node can give feedback to the sending node during the initial transmission and packet loss recovery. When the sending node does not receive the feedback information sent by the destination node, the feedback information will be lost [14, 15]. In order to collect effective and safe data packets, the knapsack theory first needs to analyze the characteristics of data packets and collect data packets according to the characteristics so as to improve the credibility of this method. Combined with the buffer feedback mechanism, the hybrid coding of data packet transmission is carried out to enhance the security of data transmission. At the same time, it also provides feasible, practical data for the transmission of wireless reactive power-coded data packets under the time complexity measurement algorithm. This paper studies and innovates the above problems from the following aspects:

(1) Based on knapsack theory, a wireless scheduler model of data knapsack filling algorithm is suggested. This paradigm can partition control and data information into different control and data queues and give the control queue higher priority, lowering control information transmission in the switching process and enhancing system throughput. It can enhance data packet transmission rates in particular when the system is congested.

(2) Based on the knapsack theory, a wireless communication packet optimal scheduling system is built. The signal quality is determined by the properties of the actual transmission medium, interference from multiple channels, and other issues during wireless transmission, resulting in a high packet loss rate. It is vital to take appropriate measures to improve the effectiveness of retransmission in order to optimize wireless transmission performance. The scheduler assigns two types of resources to each output connection: bandwidth and buffer space, and selects a data packet to transmit to the output connection at each time.

2. Related Work

2.1. Research Status at Home and Abroad. Peer m et al. proposed the probability of receiving packets in different states under uncertain conditions. Combined with the generalized, it can quickly solve wireless communication, use the maximum weight group to conduct heuristic search to determine the optimal scheduling mode of wireless communication packets, and reduce the optimization times required for packet loss [16]. Singh et al. proposed a wireless communication packet optimal scheduling method based on risk perception, fully analyzed the bounded rationality of risk perception, described its behavior by using relevant theories, and gave the supply rate of the wireless communication system [7]. He and Petit put forward the method of introducing the wired PFQ algorithm into wireless communication. According to the difference between the obtained services and the services that should be obtained in wired PFQ, sessions are divided into three types: lead, lag, and satisfaction. Sessions in the same state are treated fairly, which is the same as PFQ in wired communication. Sessions in different states are handled differently. In particular, leading sessions will hand over some of their services to lagging sessions. However, leading sessions in good channel states are still assigned a predetermined minimum service volume [11]. PG et al. proposed the improvement of wireless communication, constructed the loss generalized immediately solvable wireless communication model, and introduced the processing method of maximum weight group, which can significantly reduce the optimal scheduling delay when the feedback packet loss rate is greater than the transmission packet loss rate [17]. Huang et al. proposed two states. The first is the totalitarian state. In this state, the main wireless communication packet optimization scheduler balances fairness when calculating the schedule. That is, in this case, the scheduler can allocate the bandwidth to the end user according to the predefined fair sharing and bandwidth: if the terminal makes an error, it will not be able to use its bandwidth to prevent the waste of bandwidth. In other words, in a totalitarian system, only those terminals that find a good channel are allowed to enter the channel fairly. The second is the state of egalitarianism. In this wireless communication packet optimization system, fairness is weighed by the terminal. In other words, in order to obtain fairness in a good channel state, the available bandwidth is shared. The bad consequence of this strategy is that if a terminal finds a bad channel, the system throughput will be reduced to close to zero [18]. Zhou et al. proposed an optimal scheduling method of wireless communication packets based on an artificial bee colony algorithm. The loss evaluation function is extended from linear to nonlinear, a multiobjective scheduling model is constructed, and the artificial bee colony algorithm is used to solve the above model to obtain the optimal scheduling scheme. However, there is still room for progress in the reliability of wireless communication packet optimal scheduling [19]. Hosseini et al. proposed a joint rate allocation scheme of distributed power for wireless communication based on wireless sensor networks, built a complete data packet optimal scheduling model in a limited environment, and optimized the system capacity of data collection nodes according to the model, which improved the optimal scheduling efficiency of data information to a certain extent [20]. Zeng et al. proposed an algorithm similar to WFQ in wired network-IWFQ, which was the first algorithm to apply the idea of fair queuing in wireless communication to wireless communication. This algorithm makes full use of data packets for optimal scheduling, and when the channel quality is poor, it will delay the transmission of data packets. In order to ensure fairness, the session will be compensated for additional bandwidth when the channel quality is improved [21]. Erpek et al. proposed that the computing and transmission resources should be optimally scheduled for wireless communication packets, and the energy consumption of UE should be the lowest to achieve the optimization. However, the energy of MEC is still unlimited here [22]. Khelladi et al. proposed that the scheduler keeps track of the extra bandwidth, which is continuously occupied by terminals/streams with good channel status. When a terminal/stream with a bad channel state becomes a good channel state, it will be compensated because it lags behind the leading terminal/stream. Most dispatchers in the literature use this method, but the difference is that the compensation methods used are different [23].

2.2. Research Status of Optimal Scheduling of Wireless Communication Packets Based on Knapsack Theory. The best wireless communication packet scheduling technique based on knapsack theory is investigated in this study. We should additionally consider user quality of service when optimizing wireless communication packet scheduling. User data type, data rate, needed maximum tolerable latency, acceptable JIT ter jitter, and other factors all influence the quality of service provided to them. The optimization algorithm's temporal complexity and precision are frequently at odds. The algorithm's execution time will increase as the precision requirements get more stringent. As a result, a balance between these two variables must be achieved. With the growing growth of wireless communication, it is becoming more important to implement wireless application scenarios via a relay cooperation network. The emergency signal scheduling model is solved using the knapsack theory to obtain the optimal scheduling scheme, and the priority of the packet optimization scheduling target and the amount of information conveyed are weighted and set as the scheduling income. The packet optimization scheduling aim is prioritized, and the data they contain can be acquired through review. Analyze the signal characteristics of a specific area at the same time, assess the priority of various emergency observation signals, and record the quantity of data transmitted via wireless communication. The setting principle of packet value is to ensure that threshold data and important real-time services are sent first. In order to maintain fair scheduling, the value of data services with low priority increases with waiting time so that low priority services can get fair services. The growth rate can be increased by one level every waiting scheduling cycle. It also plays an important role in the data transmission control of nodes. Through this process, it can promote the identification of the network data life cycle, complete the network oil pot process, and optimize the workflow itself in some special working environments.

3. Principle and Model of Data Backpack Filling Algorithm KFA

Inspired by the knapsack problem, a certain frame scheduling problem in the wireless resource scheduling algorithm; that is, the optimal filling of data packets can be realized by improving the knapsack algorithm. Although the KFA algorithm has been widely used in wired networks, the ideal streaming system of wired networks can not be fully applicable to wireless networks, which is determined by two key characteristics of wireless networks: ① wireless communication errors are sudden. ② The capacity and error of wireless communication are location-dependent. Therefore, in most cases, only part of the data flow can be scheduled on the wireless channel. This is different from packet scheduling in wired networks. In a wired network, it is assumed that either all data packets can be scheduled or none can be scheduled, while a wireless network deals with the problem that some data streams can be scheduled, and the data streams that can be scheduled change according to the change of channel state. In the concrete implementation of the KFA algorithm, two factors, system bandwidth and user QoS should be considered. On the premise of meeting these two factors, optimal scheduling should be carried out to maximize the effective throughput of the system.

The parameters in the data backpack filling algorithm KFA are defined as follows: the object i refers to the data packet I to be transmitted. The quality of the object refers to the length l_i of the data packet. In actual algorithm processing, the length l_i C of the data packet is usually converted into the number s_i of time slots. A frame is composed of several time slots, and time slots are the minimum unit of frame resource allocation, $s_i = l_i/l_s$, where l_s is the number of data bits that can be loaded in each time slot. n is the number of data packets to be transmitted; Backpack capacity s refers to the number of time slots of 1 frame; The value v_i of the object is the value of each data packet, the object to be scheduled on the frame scheduling problem, the object refers to the user data packet to be scheduled, and the value of the data packet is determined by the comprehensive benefits generated by sending the data packet, including the contribution of sending the data packet to the throughput of the whole system and the benefits generated by sending the data packet.

KFA algorithm is used to judge whether each destination node has received the data packet and the corresponding time complexity is $Q(MN)$; When all data packets are not received, judge whether all feedback information has been received. At this time, the time complexity is $Q(M)$; After that, the system receiving state is estimated through the confidence degree. The corresponding time complexity is $Q(SA)$. Every time the transmission process is completed, the transmitting node can only observe one state. At this time, $Z = 1$, when the system state is known, the transmitting node can only send one coding packet. Therefore, the $A = 1$ system state only depends on the amount of feedback information lost, and the maximum amount of feedback information that can be lost is m. KFA algorithm first selects the candidate data packets to be sent according to the limitation of system bandwidth, calculates the size and value of these data packets, determines the length of the frame and the number of time slots in one frame, and then selects the actually sent data packets according to knapsack algorithm, loads them into the transmission frame and sends them. The flow of the KFA algorithm is shown in Figure 1.

If the time slot resource in the system is compared to a backpack with a certain capacity, and the time slot with a certain size allocated by the data packet sequence waiting to be transmitted is compared to the item waiting to be loaded into the backpack, the bandwidth allocation problem can be transformed into a backpack problem, and how to select the data packet for transmission will maximize the value of the original user data. The quality of service of wireless communication is satisfied by resource reservation and data packet scheduling. Compared with many factors affecting QoS, packet scheduling is the most meticulous factor that can directly affect the uplink and downlink of data flow in access points. Therefore, the KFA algorithm is the core component of the wireless network system to fulfill the promise of service quality. KFA algorithm determines which packet in the waiting queue should be transmitted at the next moment. A typical scheduler in the wireless communication environment. The wireless scheduler model diagram of the data backpack filling algorithm is shown in Figure 2.

Considering the influence of mobility factors, the control information and data information are divided into different control queues and data queues, and the control queue is given higher priority, which can reduce the transmission of control information in the switching process, reduce the end-to-end delay, and increase the system throughput. In particular, it can improve the transmission rate of data packets when the system is congested.

Article I is a data packet waiting to be processed. The quality of the article indicates the packet length L of the data packet, and the time slot resource occupied by the data packet with length L is $b = B \times (L/L_{TOTAL})$, where B is the total time slot resource, L_{TOTAL} represents the length of the total time slot resource, and b is the time slot resource allocated by the system for data L.

According to the above problems, the knapsack scheduling algorithm can be defined as follows.

The m-th packet sequence is as follows:

$$\overrightarrow{\phi}^{(m)}_{l}(k) = \left(\phi_1^{(m)}(1), \ldots \phi_i^{(m)}(k)\right), \ (i = 1, \ldots N). \tag{1}$$

The dimensioned sequence is as follows:

$$\overrightarrow{\phi}^{(0)}_{i}(k) = \left(\phi_1^{(0)}(1), \ldots \phi_i^{(0)}(k)\right). \tag{2}$$

The coefficients are defined as follows:

$$\gamma\left(\phi_i(k), \phi_j(k)\right) = \left[\left(\Delta_{\min} + \xi \bullet \Delta_{\max}\right) / \left(\Delta_{ij}(k) + \xi \bullet \Delta_{\max}\right)\right]. \tag{3}$$

ξ difference factor, $\xi \in (0, 1)$, is defined as follows:

$$\begin{cases} \Delta_{ij}(k) = \left|\phi_i(k) - \phi_j(k)\right|, \\ \Delta_{\min} = \min\limits_{\forall j \in i} \min\limits_{\forall k} \left\|\phi_i(k) - \phi_j(k)\right\|, \\ \Delta_{\max} = \max\limits_{\forall j \in i} \max\limits_{\forall k} \left\|\phi_i(k) - \phi_j(k)\right\|. \end{cases} \tag{4}$$

Service level is β; modulation mode is η. The length of i packet is L_i. Parameter α is the influence factor weight of modulation mode, β is the QOS level of service, η is the modulation parameter of target terminal, ω is the level parameter of data packet. Considering the network layer packet type and physical layer modulation and coding mode information comprehensively, the rank parameter formula of packet ϕ_i is as follows:

$$\omega_i = (1 - \alpha)\beta + \alpha\eta_i \, (0 \le \alpha \le 1), \tag{5}$$

When the waiting time exceeds the threshold, the data packet is directly discarded.

The expression proposed by the knapsack problem is as follows:

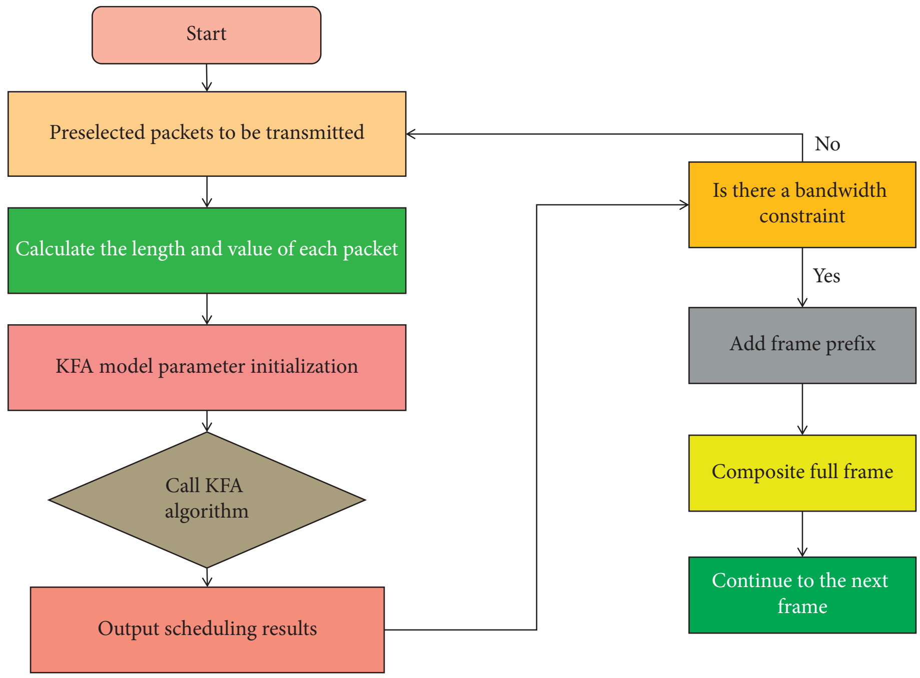

FIGURE 1: Flow chart of data backpack filling algorithm.

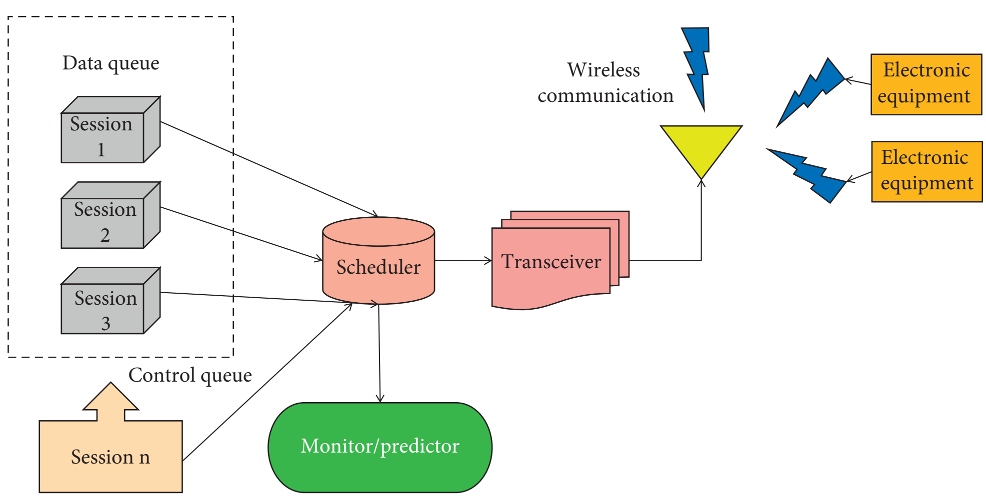

FIGURE 2: Wireless scheduler model diagram of data knapsack filling algorithm.

$$\max \sum_{i=1}^{N} \omega_i \phi_i. \quad (6)$$

$$\sum_{i=1}^{N} b_i \phi_i \leq B, \quad (7)$$

$$\phi_i \in \{0, 1\} \, (i = 1, 2 \ldots, n). \quad (8)$$

B is the total bandwidth resource, b is the bandwidth resource allocated by the system for data packet i, ϕ_i can only take 0 or 1, 1 means that the data packet is selected, and no means that it is not selected.

Assuming that the number of packets is equal to N, the number of packet transmissions can be calculated under the condition of reliable retransmission, as shown below:

$$\overline{N_{\text{num}}} = \frac{N + N_{\text{num}}}{N} = 1 + \frac{N_{\text{num}}}{N}. \quad (9)$$

$$1 + \frac{L_{\max L}}{N} \leq \overline{N_{\text{num}}} \leq 1 + \frac{|L|}{N}. \quad (10)$$

Retransmission reliability is a typical ideal situation, but for the actual environment, due to the joint influence of many factors, there will be unreliable retransmission, and the possibility of packet retransmission loss, which is characterized by random loss. Due to the unreliability of retransmission, the actual bound will exceed the theoretical upper bound of retransmission reliability.

Definition of data packet filling problem: given n data packets to be transmitted, each data packet has a certain length and value. Assuming that the length of the data packet i is l_i and its value is v_i, the data length that can be loaded in one frame is L bit or S time slot. How to select some or all of the data packages from the n data packets to be transmitted and load them into one frame, so as to maximize the value of the data contained in each frame without exceeding the frame length. Therefore, the scheduling strategies of wired communication and wireless communication are different. The scheduling of wired communication mainly considers the following aspects.

① The minimum throughput of each data stream is guaranteed, which is independent of the behavior of other data streams; ② A delay boundary defined for each packet access channel of the data stream; ③ Long term fairness for the backlogged stream with bounded channel errors; ④ Long term throughput boundary for data streams with bounded channel errors; ⑤ Support: support for delay sensitive and error sensitive data streams;

4. Implementation of Optimal Scheduling of Wireless Communication Packets

4.1. Optimal Scheduling System of Wireless Communication Packets Based on Knapsack Theory. The data packets delivered by different users will interact at the switch or node connection in wireless communication, regardless of how complex the topology relationship is. Numerous applications will fight for communication resources together. As a result, based on knapsack theory, this work designs a wireless communication packet optimal scheduling system. The development of a packet scheduling strategy is a key design problem in the KFA algorithm. These interactions will influence the performance of users who use communication if there is no reasonable control mechanism in place. The actual network data transmission can be accomplished only after the network associated equipment completes several tasks, including sending network related information to the user host, in the process of optimizing the scheduling system. Furthermore, the network must capture and parse data packets in order to obtain all data, including source address, source port, a destination address, destination port, protocol type of data packet, packet size, and data. As a result, this data can be used as key basic data for reference and statistics in the flow analysis process. The five major measures of network quality of service (QoS) are availability, throughput, latency, delay change, and packet loss. Delay is one of the most important aspects to consider while developing real-time streaming media applications. For example, when we watch a webcast in our daily lives, we may accept some blurring or mosaic in the picture, but we cannot tolerate video pictures and sound delays or jamming, which would negatively impact the user experience of viewers. To investigate the KFA algorithm in such cases, we must first create delay constraints for data packets, set the deadline constraint for each data packet, and ensure that the data packet arrives at the receiver from the sender within the constraint time, or it will fail. In the process of a wireless communication system based on the KFA algorithm, a complete data packet should have a certain functional basis. It is mainly embodied in the ability to obtain and analyze basic data information, monitor wireless communication, and analyze data packets. It also includes the statistics and analysis of some data from the data packet sender, which is used to identify the identity of hosts in different operating environments and ensure the safety of communication operations. In the process of wireless transmission under this system, the signal quality is jointly influenced by the characteristics of the actual transmission medium, interference of different channels and other factors, resulting in a high packet loss rate. In order to optimize the wireless transmission performance, it is necessary to take appropriate measures to enhance the retransmission effectiveness. In each output connection, the scheduler selects a data packet to transmit to the output connection at each time and allocates two types of resources: bandwidth and buffer space. The packet scheduler has the following features:

① In each switching node, the granularity of scheduling is a data packet, not a bit. Most of the implementation of packet scheduling is nonpreemptive. That is, the transmission service of the next packet can not be started until the current packet has been serviced.

② Since the scheduler selects the next packet to be transmitted in multiple connections, it has the following QoS characteristics: (a) throughput, how many packets are transmitted in each time interval in each connection; (b) queuing delay, waiting time of packets in the buffer; (c) packet loss rate, the ratio of packets lost in the buffer to transmitted packets.

③ Since the minimum granularity of nonpreemptive scheduling is the packet. It is necessary to provide packet level QoS guarantee.

In the current context of wireless communication, packet management has not been fully realized, so managers need to further analyze the wireless communication environment, especially for the overall change, analysis and estimation of the communication operation system, and further optimize its operation parameters to check whether there is any abnormality. Once there is any abnormality, it should be handled in time. In front of different hosts, in order to realize the optimization of data packets, we can also judge the operation state of the host at the user end, so as to realize the safe operation of wireless communication. In short, the management of data packets has a positive impact on the operation system of wireless communication.

4.2. Experimental Results and Analysis. In order to verify the effectiveness and reliability of the optimization of transmission times of wireless network coded data packets, this paper will use Matlab7.0 software to simulate. The node distribution area of the wireless network is a uniform array area of 300 m ∗ 300 m, the sampling amplitude of wireless network coded data packets is 12V, the equalization coefficient is 0.36, and the impulse response intensity of the output link of wireless communication is 120 Buad, and the symbol transmission rate is 1.58 kBaud. The adaptive carrier frequency is 40 KHz. According to the above simulation environment and parameter settings, it is assumed that there are three methods for optimizing the transmission times of data packets available in wireless communication, namely Q0, Q1, Q2, and Q3. Under different transmission methods, the transmission error rate Px of data packets corresponding to different channel states is shown in Table 1.

Based on the above analysis, the same bit error rate test is carried out. Check literature [5], literature [6], and KFA algorithm, respectively, set the number of iterations to 300, and the experimental results are shown in Table 2.

It can be seen from Tables 1 and 2 that the output bit error rate of the method in this paper is the lowest, and the "0" error can be realized. This is because the KFA algorithm analyzes the multipath characteristics of the transmission channel in the process of collecting data packets and obtains effective and safe data packets through multiple collections according to the multipath characteristics, so it reduces the bit error rate of data packet transmission. At the same time, in order to improve the reliability of data transmission, this paper also introduces the cache feedback mechanism to make the transmission and storage of data packets meet the requirements of the network environment and eliminate the interference of error information. In the perfect feedback state, in each transmission feedback process, all the feedback information generated by the destination node will be received by the transmitting node, which improves the transmission efficiency to a certain extent.

This experiment compares the operation of NCIF, CLIF, SRPS, and KFA schemes under imperfect feedback. In order to further analyze the relationship between the performance of wireless communication and the feedback information of packet optimal scheduling, the feedback results were selected as a reference in the test. In the process of optimal packet scheduling in the feedback state, the sending node can receive the feedback information generated by all destination nodes, and the packet loss rate is equal to 0. Three experiments were conducted, respectively, and the experimental results are shown in Figures 3–5.

As can be seen from Figures 3–5, the number of destination nodes gradually increased from 2 to 16 and increased by 2 at a time. The system parameters are set as the number of original data packets $N = 50$, the packet loss rate in the optimization process is 0.4, and the probability of packet loss in the feedback link is 0.26. Through the simulation test, it is found that through the comparison of four methods, the KFA method adopted in this paper has the highest optimization rate in the three experiments, which shows that the packet loss is reduced. When other conditions are kept constant, the relay node can receive each data packet stably, and the source node needs to get more retransmitted data packets. Because the probability of successful transmission to the destination node is lower than that of the destination node, the performance is reduced. Because of the advantage of KFA algorithm's optimal ability, the time for solving the scheduling model is shortened, and the task scheduling time is shorter. However, when the number of tasks is small, there is no significant difference between the above three methods. Through the comparison of

Table 1: Packet transmission error rate corresponding to different channel states (%).

	$a1$	$a2$	$a3$	$a4$
Q1	0.232	0.322	0.212	0.313
Q2	0.324	0.152	0.325	0.144
Q3	0.325	0.323	0.363	0.314

Table 2: Output bit error rate test.

Transmission times	KFA algorithm	Literature [5]	Literature [6]
200	0.103	0.204	0.182
300	0.072	0.182	0.135
400	0	0.161	0.092

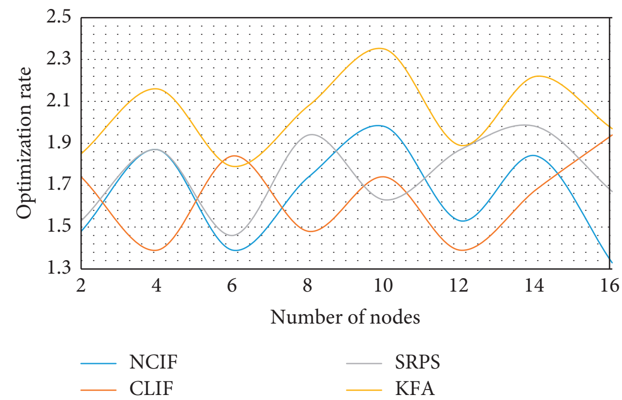

Figure 3: Changes of packet average optimal scheduling.

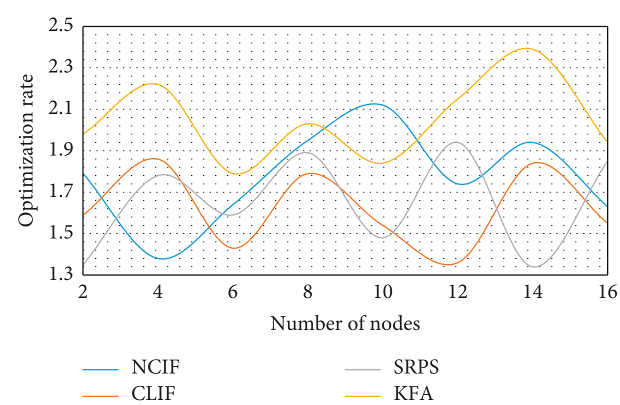

Figure 4: Changes of packet average optimal scheduling.

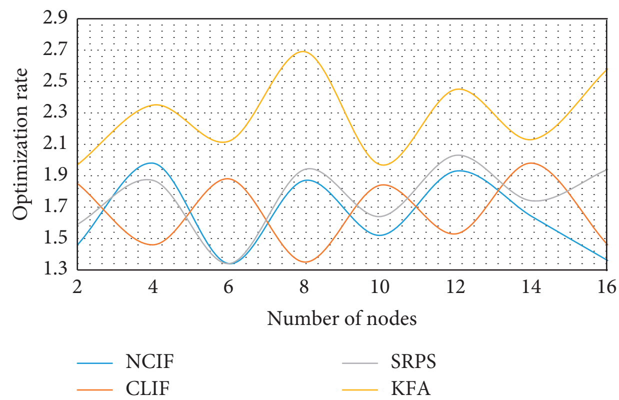

Figure 5: Changes of packet average optimal scheduling.

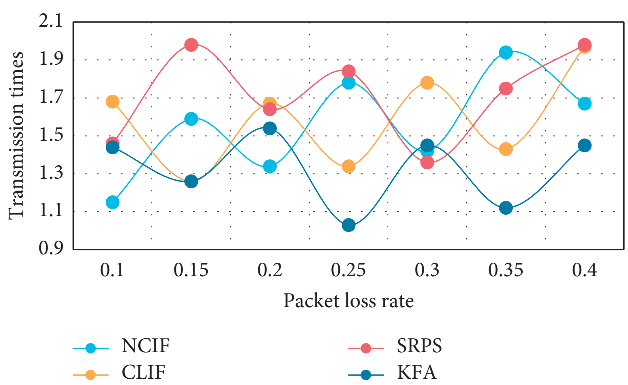

Figure 6: Changes of average transmission times of data packets with packet loss rate.

experimental data, the effectiveness of the KFA algorithm is fully verified.

This experiment compares the operation of NCIF, CLIF, SRPS, and KFA schemes under imperfect feedback. In order to further analyze the relationship between the performance of wireless communication and the feedback information of packet optimization scheduling, the feedback results are selected as the reference basis during the test. Two experiments were conducted to compare the relationship between the packet loss rate generated from the source node s to the relay node R and the number of packet transmission times. The experimental results are shown in Figures 6 and 7.

It can be seen from Figures 6–7 that the system parameters are set according to the following conditions: the number of original data packets $N = 30$, the number of destination nodes $M = 8$, the packet loss rate of transmission link 0.5, and the packet loss rate of feedback link 0.14. The simulation test shows that when the packet loss rate increases, the performance of NCIF, CLIFh, and SRPS schemes will decrease. This is because when the packet loss rate increases during the initial transmission period, the relay node R will gradually accept fewer packets, which will reduce the role of R and make more packets need to be retransmitted and recovered through the source node. However, the KFA algorithm adopted in this paper is obviously in a better

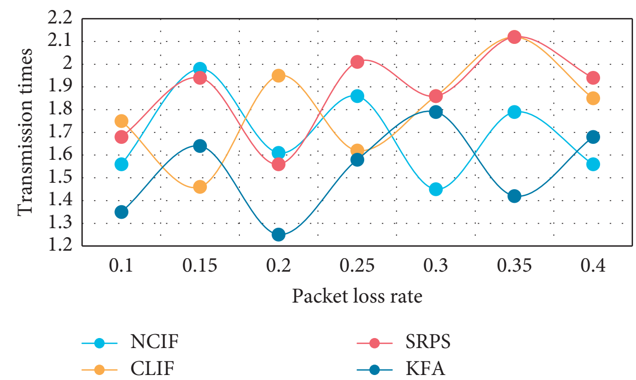

Figure 7: Changes of average transmission times of data packets with packet loss rate.

state and has the highest performance among the four algorithms. Experiments show that the KFA algorithm has strong adaptability and high reliability and can provide better support for the optimal scheduling of wireless communication packets.

5. Conclusions

The related difficulties of packet optimum scheduling in the wireless communication process are examined in this work. The study of packet optimal scheduling can help to ensure that the LAN environment runs smoothly. Because of the effect of variable length data packets on the compensation process in the KFA algorithm, a compensation counter is provided for the data flow in the case of wireless communication channel error to store a certain amount of services for the compensation process so that the increase in compensation service is independent of the data packet length and the compensation problem. It has the ability to optimize system data scheduling, and the algorithm's time consumption is relatively low. The algorithm's parameter design is adaptable, and the data packet's value can be adjusted to meet users' individual needs. The number of destination nodes grows from two to sixteen over time, two at a time. Set the system parameters to a total of 50 original data packets, a packet loss rate of 0.4 in the optimization process, and a packet loss probability of 0.26 in the feedback connection. The KFA approach employed in this study has the highest optimization rate in the three experiments, which can be seen to reduce data packet loss, according to the simulation test. To maximize the output of wireless communication data packets, the KFA algorithm is paired with the adaptive intersymbol interference suppression approach. The KFA method is used to lower the output bit error rate and improve the quality of wireless communication by optimizing and adjusting data packet transmission times. We can determine the operation status of the host at the user end in front of multiple hosts in order to achieve data packet optimization and ensure safe wireless communication operation. In conclusion, data packet management has a good effect on the wireless communication system's operation system.

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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