Research Article

5G Wireless Multimedia-Assisted Marketing Strategy Establishment and Effect Evaluation

Tieyan Fu and Bei Zhang

Xi'an Mingde Institute of Technology, School of Economics and Management, Xi'an Shanxi, 710124, China

Correspondence should be addressed to Tieyan Fu; futy@mdit.edu.cn

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5G wireless networks are attracting attention due to their high data rates and robustness to multimedia options. Based on 5G wireless multimedia technology, this paper constructs an auxiliary marketing strategy for multipath collaboration. Based on the 5G wireless network system, the model solves the optimization problem of effective service energy consumption. The solution of the problem is obtained through a two-step solution and related algorithms, and the numerical simulation proves that the multipath cooperative transmission strategy has the advantages of network delay and effective service performance. In the simulation process, a 5G NR downlink system simulation model is established according to the wireless data transmission theory; in the marketing strategy estimation, the decision feedback marketing strategy estimation algorithm is improved to improve the marketing strategy estimation performance, which can effectively reduce insertion loss of the network. The results show that with the increase of the marketing data center density, the receiving delay decreases and the energy efficiency increases; when the number of video contents in the marketing data center is configured as 264, the effective service performance under the single-path transmission strategy can be achieved. Compared with the minimum value of the effective service energy consumption under the single-path transmission strategy, the minimum value of the effective service energy consumption under the multipath cooperative transmission strategy is reduced by 11.5%, which effectively improves the network throughput of data.

1. Introduction

With the continuous development of mobile 5G communication technology and the increasing demand for wireless 5G communication services, the fifth-generation mobile 5G communication system is being commercialized, and research on more related technologies is being carried out in an all-round way [1]. In response to the demand for higher-definition and faster service quality in multimedia and Internet applications, wireless 5G communication systems face the problem of high-speed transmission [2]. However, the data rate is limited by the intersymbol interference, which reduces the system transmission performance [3–5]. The main challenge in achieving reliable 5G communication depends on the marketing strategy conditions encountered when transmitting information through wireless marketing strategies [6]. Therefore, the research on marketing strategy has received extensive attention from scholars at home and abroad [7]. As the coverage of 5G base stations decreases, intercell interference becomes particularly serious, and more accurate marketing strategy estimates are required to eliminate the interference [8–11]. In addition, when the sender performs forward precoding and the receiver performs signal detection, it is necessary to use the marketing strategy status information [12]. Therefore, the quality of the marketing strategy estimation is crucial to whether the 5G communication system can achieve the goal of ultra-high spectrum utilization [13].

Under the current background of 5G commercial use, the research on 5G-related communication technologies has become the focus of domestic and foreign scholars [14–16]. 5G is the latest manifestation of the current development of communication technology. Compared with the 4G mobile communication network, the transmission rate...
is higher, the transmission bandwidth is larger, and the transmission delay is lower [17]. 5G combines advanced network technology and new high-end equipment; its connection speed will be much faster than the current connection speed, each mobile base station at least 20 Gbps downlink and 10 Gbps uplink; the peak transmission rate of mobile devices can reach more than 10 Gbps [18]. In addition to higher peak transmission rates, 5G networks also provide greater network capacity by expanding into new spectrum using millimeter-wavelength bands. Marriwala et al. [19] conducted research on the current development of the Internet of Things, smart industry, and smart infrastructure; pointed out the important role of optical 5G communication systems in modern network areas; and affirmed the efficiency and accuracy of optical components and optical effect sensors; Han et al. [20] gave an overview of the optical technologies that can be used for 5G communication and sensing, reviewed their applications to realize infrastructure and intelligent systems in the context of the Internet of Things, and looked forward to possible future application scenarios. Considering the marketing strategy sparsity of actual 5G communication wireless marketing strategies, Zhou et al. [21] adopted the orthogonal matching tracking technique to improve the marketing strategy estimation, which can make full use of the sparse characteristics of the channel. Because there is no separate network for marketing strategy estimation, the algorithm can greatly improve spectrum utilization. Rinaldi et al. [22] proposed a new method for estimating sparse multipath marketing strategies based on compressed sensing theory. The researchers investigated marketing strategies with Doppler expansion under multicarrier underwater, using compressed sensing methods in the form of orthogonal matching pursuit and base pursuit algorithms.

In this paper, 5G wireless multimedia is used in marketing strategy equalization and detection, and a network model including joint marketing strategy equalization and detection is proposed. The simulation results show that in the case of a small number of networks, the LMMSE (Linear Minimum Mean Square Error) marketing strategy is used to estimate and then go through Zero Forcing (ZF) equilibrium as the initial scheme of the 5G network. The normalized marketing activities are mainly in charge of the store packaged with the movie hall. Each week, a community is selected to carry out marketing activities for 2-3 days. The organizers are generally 3-5 people. The combat scale of the corps is generally 10-20 people, and the on-site activity time is 4-5 days. The simulation results are comparable to the performance of traditional methods using LMMSE marketing strategy estimation and Minimum Mean Square Error (MMSE) equalization. In the case of increasing the number of networks, using the LS (Least Squares) marketing strategy estimation and the initialization after ZF equalization as the network input obtains a lower bit error rate than the classical LMMSE marketing strategy estimation and MMSE equalization algorithm. Finally, by further studying the problem of multimarketing node matching for cache content sharing, the Nash stable solution is obtained by designing a hierarchical structure and DU-pairing algorithm, and then the optimal marketing node cache allocation strategy in the optimal matching scenario is obtained. Finally, it is verified by experiments that the proposed algorithm can maximize the total profit of the system.

2. 5G Wireless Multimedia Architecture

2.1. Hierarchical Distribution of 5G Networks. In the 5G network layer, the aggregated interference of marketing nodes has temporal and spatial uncertainty. Among them, the time uncertainty of interference is mainly caused by the asynchronous transmission of marketing nodes and the time-varying characteristics of wireless marketing strategies. The network topology also changes between different time slots; that is to say, the network topology has a dynamic change characteristic at the time slot level. The spatial uncertainty $R(i,j)$ of interference is mainly caused by large-scale fading from different sources of interference $\log(a-i)$ and different path losses. Based on the analysis of user mobility and communication connection status during mobile process, this paper proposes a coding caching strategy that combines user interest and mobility awareness from the perspective of coding caching to maximize the cache hit rate is the optimal problem model.

$$R(i,j) = \begin{cases} \frac{1-a}{2} \log(a-i), \\ 1 - \log(a-j), \end{cases}$$

$$|u(in) - u(key)| > \min \{u(i) - u(j)\}. \tag{2}$$

Various fadings occur during wireless signal transmission, such as large-scale fading due to long-distance transmission $1-i-j$ and shadow fading due to terrain relief or back-checking of buildings. Therefore, the received signal min $\{R(i,j)\}$ will travel through different paths to reach the destination $y(i) - y(j)$. When these multipath signals arrive at the receiver, they are different in time and phase. The amplitudes of the received signals are superimposed to produce jitter fading.

$$\max R(i,j) = \begin{cases} \frac{1-i-j}{2} u(i) - u(j), \\ \min \{R(i,j) - u(i) - u(j)\}, \end{cases} \tag{3}$$

$$E\{|y(i) - y(j)|\} = \frac{T}{2} (R(i,j) - 1). \tag{4}$$

In wireless 5G communication systems, the design and performance evaluation of any transceiver can be achieved with the help of an approximate marketing strategy model. Since different 5G communication marketing strategies have their own unique transceiver structures, a general system model applicable to the entire marketing strategy is very useful. Typically, the transmitted signal $pa-pb$ passes through the marketing strategy subject min $\{pa-pb\}$ to the conditions of the marketing strategy and is received at the receiver $In x$. 


Each frame can also be divided into two fields of equal size, and each field contains 5 subframes; that is, field 0 consists of subframes 0-4, and field 1 consists of subframes. Different from the fixed 15 kHz subcarrier spacing, each subframe is corresponded to a time slot, 5G adopts a variety of subcarrier configurations, and each subframe corresponds to one or more time slots, and a time slot contains 14 symbols.

\[
\begin{align*}
\log(1 + \min\{pa - pb\}) & < 1, \\
\log(1 - \min\{pa - pb\}) & > 1,
\end{align*}
\]

\[
\frac{x - y}{|1 - y(i) - y(j)| - |1 - x - y|} - \ln x = 1.
\]

Each frame can also be divided into two fields of equal size, and each field contains 5 subframes; that is, field 0 consists of subframes 0-4, and field 1 consists of subframes. Different from the fixed 15 kHz subcarrier spacing, each subframe is corresponded to a time slot, 5G adopts a variety of subcarrier configurations, and each subframe corresponds to one or more time slots, and a time slot contains 14 symbols.

\[
\begin{align*}
\frac{\partial r(x) - \partial r(y)}{\partial r} & < \frac{\partial f(x) - \partial f(y) - \partial f(y - x)}{1 - \partial r} < \frac{1 - \partial f(y - x)}{1 - \partial r},
\end{align*}
\]

\[
\frac{1}{2} \log \left(1 - \frac{ax}{1 - ax}\right) \in [x - 1, x - 2, x - 3, \ldots, x - n + 1, x].
\]

In mode 1 − ax, if a subframe ax is configured for uplink, all symbols within the subframe should be used for downlink or uplink. The concept of slot format is defined in 5G, which dictates how each symbol in a single slot is used, which symbols are used for uplink, and which symbols are used for downlink within a particular slot. We do not need to use every symbol in a slot, a single slot can be divided into multiple consecutive symbol segments, which can be used for downstream. In theory, we can consider an almost infinite number of possible combinations of downstream symbols, upstream symbols, and flexible symbols within a slot.

Based on 5G communication, a 5G communication link is established between the marketing nodes that are physically close to each other in the cellular network in Figure 1, and data mutual transmission is directly performed without relaying and forwarding by the base station, which can improve the data transmission rate and reduce the end-to-end data transmission delay and transmission power. With the assistance of mobile terminal caching technology, mobile terminals can pre-cache hot files during off-peak periods of 5G communication, so whether the requester can search for the requested file in its local cache and in the local cache of its neighboring marketing nodes is determined.

2.2 Wireless Multimedia Coding. The basic idea of wireless multimedia coding is to recursively generate a sequence, and each time a sample value is generated by dividing the interval, and each time a Gaussian offset is used to determine the sample value in the middle of the interval, the information transmitted on the PDCCH (Physical Downlink Control Channel) is called downlink control information (DCI), which has a variety of formats. Multiple PDCCHs can be sent on one downlink subframe, and one PDCCH can only have one format of DCI. The logical resources of the PDCCH are composed of Control Marketing Strategy Elements (CCEs). After the burst service traffic, especially the multimedia service traffic is aggregated, when the traditional service traffic model is used to model, analyze and control it, the network performance \( p(a) - x(a) \) will become worse. In a word, the service flow model \( n(x, a) \) in multimedia network \( k(a, r) \) must be able to capture the autocorrelation of network flow min \( \{p(a), p(r)\} \) effectively.

\[
\sqrt{p(a) - x(a)} + \sqrt{(p + x)(p - x) - s(x) + n(x, a)} > 0,
\]

\[
P(k(a, r) | a < r) = \min \{p(a), p(r)\} - \max \{p(a), p(r)\}.
\]
A single NR carrier has a maximum of 3300 active subcarriers and a maximum bandwidth of 400 MHz. In 5G NR, a set of parameters is defined which indicates the different frequencies of the subcarriers. There is a set of resource grids in each direction of uplink and downlink. In addition, 5G adopts multi-antenna technology, and the corresponding antenna port \( p(xt) \) on each antenna may be different, and the corresponding reference signal \( |g(i) - i| \) distributions are different, so the resource grid \( px(r,i) \) also needs to be defined for the antenna port \( p(i) - p(j) \).

\[
\sum px(r,i) - ((g(i) - i)/(p(a)) - (1/p(xt))) = 1, \quad (11)
\]

\[
I(k, i, j) = \begin{cases} 
\frac{1}{2} \log \left( 1 - \frac{p(k)}{p(i) - p(j)} \right), \\
1 - \log \left( \frac{1}{p(k)} \right). 
\end{cases} \quad (12)
\]

In 5G NR, the combination log \( (1/p(k)) \) of SS and PBCH is called a synchronization signal block (SSB). The subcarrier spacing of SSB can be 15 or 30kHz in FR1 and 120kHz in FR2. In the time domain, one SSB occupies 4 symbols, and in the frequency domain \( n(r) - n(i) \), it occupies 20 RBs, and its subcarrier number is 0.239. PSS (Packet Switching Service) is located on the middle 127 subcarriers of symbol0, and SSS (Silicon Symmetrical Switch) is located on the middle 127 subcarriers of symbol2. The parts of symbol1, 3, and symbol2 except SSS are PBCH data \( d(r) \). SSS is generated by using BPSK- (Binary Phase Shift Keying-) modulated sequences of length 127. PSS and SSS together may be used to indicate a total of 1008 different physical cell identities.

\[
n(r) - n(i) \rightarrow c(n, 0) \cup \{0, d(r, r^i), d(r, r^{i+1}) \}, \quad (13)
\]

\[
\sum \sqrt{p(r,i) - \frac{1}{p(t)}} + \sum \sqrt{s(i) - h(i)} = 1 - k. \quad (14)
\]

The time \( p(r,i) \) when the two SS Burst Sets appear, that is, the time when the half frame \( s(i) - h(i) \) with SSB exists, can be configured. One SS Burst set will be sent in one SS Burst set period, the SS Burst set takes 5 ms, and only the first 5 ms of the SS Burst Set period exists. Since the destination 5G multimedia base station \( s(a) \) can only be in two states, idle and receiving, and the time in the idle state is far less than the time in the receiving state, this chapter approximately considers that the destination 5G multimedia base station is always in the receiving state.

Figure 2 depicts the relationship between energy efficiency and marketing data center density considering the number of collaborative marketing data centers. The simulation results clearly show that when the number of collaborative marketing data centers is fixed, the energy efficiency increases with the density of the marketing data centers. When the marketing data center density is fixed, energy efficiency increases with the number of collaborating edge data centers. However, on the one hand, the user’s usage data and package choices may change at any time, and the data will lag. At the same time, big data analysis is still a new topic within the period, and many data analysis work is not 100% accurate, and marketers need to check again whether it matches the policy according to the list in the system.

2.3. Marketing Weight Distribution. It can be observed that when the maximum transmission distance of the 5G multimedia link is fixed, the increase in the density of the
marketing data center leads to a decrease in the reception delay. The value of the transmit power of the 5G multimedia base station is set to 30 dBm, the value of the receive power of the 5G multimedia base station is set to 0.8 times the value of the transmit power of the 5G multimedia base station, and the value of the idle power of the 5G multimedia base station is set to 5G multimedia 0.5 times the value of the base station’s idle power. When the marketing data center density is fixed, the reception delay decreases with the increase of the maximum transmission distance of the 5G multimedia link.

The 5G multimedia base station density is fixed; the network throughput of Figure 3 increases request probability. When the 5G multimedia base station request probability is fixed, the network throughput increases with the increase of the 5G multimedia base station density. It can be seen from the simulation results that when the request probability of the 5G multimedia base station increases, the network throughput increases. When the request probability of the 5G multimedia base station is fixed, the increase in the density of the 5G multimedia base station can improve the network throughput. When the number of collaborative marketing data centers is fixed, the backhaul latency decreases as the density of marketing data centers increases. When the density of marketing data centers is fixed, the backhaul latency decreases as the number of collaborative marketing data centers increases.

2.4. Self-Similar Coefficient Coupling. The description of the multipath cooperative transmission strategy is as follows: a marketing node requesting marketing video content sends a request signal to the macro base station in the macro cell where it is located through the uplink, and the macro base station that receives the request signal first processes the request signal and then searches the marketing data center near the destination 5G multimedia base station. After the selected multiple marketing data centers receive the request signal, they simultaneously transmit the marketing data to the destination 5G multimedia base station through the 5G multimedia wireless multihop link. According to the multipath cooperative transmission strategy, the destination 5G multimedia base station simultaneously receives the marketing data sent from the adjacent marketing data center through multipath wireless routing. Finally, the destination 5G multimedia base station is transmitting the marketing data to the marketing nodes in Table 1.

The effective service energy consumption under the multipath cooperative transmission strategy is always smaller than that under the single-path transmission strategy. When the number of marketing video contents in the marketing data center is configured as 144, the minimum effective service energy consumption under the multipath cooperative transmission strategy can be achieved. When the number of marketing video content in the marketing data center is configured as 264, the minimum effective service energy consumption under the single-path transmission strategy can be achieved. Compared with the minimum effective service energy consumption under the single-path transmission strategy, the minimum effective service energy consumption under the multipath cooperative transmission strategy is reduced by 11.5%. The existing mobile-aware caching strategies all assume that the user can transmit the complete content in one contact and ignore the physical link state that will affect the communication connection of the mobile user, which is not in line with the realistic scenario; secondly, these studies do not predict the similarity of user interests.

3. 5G Wireless Multimedia-Assisted Marketing Strategy Establishment and Effect Evaluation Model Establishment

3.1. 5G Network Networking Data Extraction. After receiving the request, the connected macro base station searches for several marketing data centers closest to the marketing node. If there is a marketing data center that is not located in the macro cell, the macro base station in the cell sends the request signal to the macro base station in the cell where the marketing data center is not located in the cell through
the SDN (Self-Defending Network) controller. Users will encounter other users with similar interests in the process of moving. If the needs of users can be known in advance, this can bring a qualitative improvement to the performance of the caching strategy. Aiming at the above problems, this paper proposes an encoding caching strategy that combines user interest and mobility awareness.

Finally, the destination 5G multimedia base station sends the marketing data to the requesting marketing node through the 5G multimedia link. In the above scheme, the SDN architecture is used to realize the request/feedback transmission initiated by the marketing node. This paper mainly discusses the corresponding analysis and discussion by considering the number of DU-pairing pairs, the total capacity of the service cache, the number of algorithm iterations and the influence of the parameter $t$ value on the total profit. The hardware environment on which the simulation platform in this section depends is an Intel i5-6500 Core processor with a CPU frequency of 3.6 GHz and a memory size of 8 GB. The software environment is Windows 10 64-bit system and MATLAB 2019b.

The PDCCH search space refers to the area in the downlink resource grid that can carry the PDCCH. Figure 4 performs blind decoding in the entire search space in an attempt to find PDCCH data. All possible locations of the PDCCH are called “search spaces,” and each possible location is called a “PDCCH candidate.” By clarifying the goals of the project or business, find the advantages and disadvantages of the achievement of the goals. Advantages mainly refer to advantages relative to other projects or businesses; opportunities mainly refer to the development opportunities of organizations or projects, which need to be reflected by environmental advantages; threats mainly refer to the adverse effects that the existing environment may bring to the project or enterprise.

3.2. Auxiliary Marketing Strategy Transmission. Within each time slot, the network topology is randomly generated. Assuming that the time slot interval of each marketing node is 5 ms, the corresponding maximum number of data packets sent by the marketing node per unit time is 200. For the network homogeneous marketing node business, the average business arrival rate of all marketing nodes is set to 40 packets per second, and the delay boundary is set to 0.015 s.

This chapter applies blockchain technology to the D2D cache network and proposes an incentive caching strategy based on blockchain technology to encourage more content sharing among mobile terminals. The base station can use the mining revenue to reward the mobile terminal, where the profit depends on the size of the shared data. In order to maximize profit, this paper formulates the cache placement problem and obtains the optimal cache scheme. The 5G wireless multimedia-based approach proves to be more robust than LS and MMSE in the case of using fewer networks and omitting CP. Considering a system with 64 subcarriers and a CP length of 16. For the above model, in order to verify the theoretical results, the simulation results are given below. The simulation environment of ZF and MMSE algorithms is MATLAB, and the simulation environment based on 5G wireless multimedia method marketing strategy estimation is Python3.5 and TensorFlow simulation framework.

The parameter settings in Figure 5 are consistent with the previous parameter settings, except that the average value is used for the setting of $t$ and the total cache capacity of the cachers; that is, the average value of the $t$ vector is taken as 1, and the average value of the total cache capacity vector is taken as 1000. Both scenarios show that the overall profit increases gradually until the pairing algorithm proposed in this paper reaches convergence. This result is consistent with the ratio of accepting only improved interchanges until none of the matched pairs can find an improved interchange. As the computing power $f$ allocated by the base station to the marketing node gradually increases, the profit of the marketing node will increase, because the increase in the distribution of computing power allows it to obtain more mining profits. If the power allocated by the edge is not limited, content sharing marketing nodes can gain more computing power and maximize profits by caching more popular content.

3.3. Probability and Statistics of Effect Evaluation. When the network is at an intermediate business load level, the global optimization strategy proposed in this chapter can still obtain the best network throughput performance under the condition that the network has different numbers of marketing nodes. In addition, it can also be seen that with the increase of the number of marketing nodes, the performance gain of the global optimal strategy proposed in this chapter
gradually increases compared with the marketing strategy, but its performance gain is less than that of the marketing node compared with the Min-MAP strategy. When the number is 30, it decreases. By comparing the performance of the three strategies under network conditions with different numbers of marketing nodes, it can be seen that with the increase of the number of marketing nodes, the performance gain of the global optimization strategy compared with the marketing strategy is also more obvious. When the number of marketing nodes in the network increases, the marketing nodes in the marketing strategy all send data packets with the maximum probability, which will lead to more and more serious interference of the marketing nodes and reduce the throughput performance of the network shown in Figure 6.

The results show that the network throughput of the global optimization strategy proposed in this chapter is also significantly improved with the increase of the number of marketing nodes in the network under the high business load level, which further shows that the global optimization strategy proposed in this chapter is suitable for the interference-limited network scenario. In addition, it can also be seen from this figure that as the number of marketing nodes increases, the performance gain between the global optimization strategy and the other two strategies also increases.

4. 5G Wireless Multimedia-Assisted Marketing Strategy Establishment and Effect Evaluation Model Application and Analysis

4.1. Auxiliary Marketing Strategy Simulation. Point-like networks are often used in practical applications. Based on the state of marketing strategies, one to four symbolic network configurations are used in a time slot. Marketing strategy estimates for each sub-carrier above. Whether it is first time domain and then frequency domain or first frequency domain and then time domain, there are common intersymbol constant interpolation, linear interpolation and decision feedback marketing strategy estimation. This section proposes an improved algorithm for network-based decision feedback marketing strategy estimation on subcarriers. Finally, by further studying the problem of multiuser matching for cache content sharing, a hierarchical structure and DU-pairing algorithm are designed to obtain the Nash stable solution, and then the optimal user cache allocation strategy in the optimal matching scenario is obtained. It is verified by experiments that the proposed algorithm can maximize the profit.

When the receiver of Table 2 knows the marketing strategy statistics, the LMMSE marketing strategy estimate is optimal from the perspective of minimizing the MSE. However, since the statistics may not be known at the receiver, it is difficult to design a marketing strategy estimator that closely matches the marketing strategy statistics. The performance degradation caused by correlation mismatch can be overcome by using a decision feedback approach in which the detected data is reused as the network for the next symbolic marketing strategy estimation. An LS marketing strategy estimate is first performed on symbols with a network, resulting in an initial estimate of the marketing strategy for subcarriers at all network locations. Once the initial marketing strategy estimates for the previous symbol are available, the decision feedback marketing strategy estimation (DDCE) method can be used to update the marketing strategy coefficients.

Figure 7 can be seen that the traffic load level is low and in the case of three different network marketing node numbers, by comparing with the marketing strategy and Min. Compared with the MAP strategy, the global optimization strategy proposed in this chapter can always obtain the best network throughput performance, which further shows that the global optimization algorithm proposed in this chapter has obvious advantages in improving the network throughput performance. When the number of marketing nodes in the network is small (for example: 12 marketing nodes), the marketing strategy and the global optimization strategy are obviously better than Min. The performance of Min-
MAP strategy is better than that of marketing strategy, because higher node strength implies that the average number of marketing nodes per unit area in the network is higher, resulting in a greater degree of aggregation interference suffered by each marketing node. This is because the more the number of users, the larger the sum of the cache space formed by all mobile terminal cache spaces, and the more content is accessed, and within the coverage of the base station, the more the number of users per unit area, the more requests can be responded to by users in physical proximity, thus increasing the cache hit rate.

Since the frequency response of the equalizer is approximately the inverse of the frequency response of the marketing strategy, at low signal-to-noise ratios, ZF equalization...
will amplify noise and perform poorly. Therefore, if the marketing strategy is low-pass, the equalizer will boost the noise power at high frequencies. The Minimum Mean Square Error (MMSE) algorithm is another option to overcome this problem. MMSE equalization considers the influence of noise and can deal with the noise amplification problem in the ZF algorithm. MMSE equalizer is considered to be a better algorithm for marketing strategy equalization, and at the same signal-to-noise ratio, it considers marketing strategy noise effects and provides a more robust advantage than ZF equalization. But the MMSE equalization algorithm needs to know the signal-to-noise ratio, etc.

4.2. Example Application and Analysis. This section evaluates the performance of the proposed cache deployment combining marketing node interest and mobility awareness in a 5G cache network. The hardware environment on which the simulation platform in this section depends is an Intel
i5-6500 Core processor with a CPU frequency of 3.6 GHz and a memory size of 8 GB. The environment of the software is Windows 10 64-bit system and Python3.6 platform for simulation verification. The feasibility and effectiveness of the algorithm proposed in this chapter are mainly evaluated by comparing with the ERPC and MPC caching strategies. In this summary, the cache hit rate will be analyzed and discussed mainly from three aspects: the number of contents, the value of $a$, and the number of marketing nodes. In order to simplify the model, a cell is considered in the simulation, and the coverage radius of the base station is 500 m. Due to the mobility of marketing nodes, use $t(1, 1/1000)$ represents the exponential distribution parameter of the contact time between the mobile terminal $D_i$ and the mobile terminal $D_j$, and $t(4.43, 1/1088)$ represents the exponential distribution parameter of the contact time between the mobile terminal $D_i$ and the mobile terminal $D_j$. The total number of files requested by the marketing node is 1500, each file is encoded into 10 encoded segments, and the value of the popularity parameter $a$ in Figure 8 is 10.

With the decrease of the number of nodes, under the condition of the same signal-to-noise ratio, the performance of intersymbol data constant interpolation, linear interpolation, and decision feedback marketing strategy estimation all decrease to varying degrees. The improved decision feedback marketing strategy estimation can still maintain good performance, which reflects the good robustness of the improved decision feedback algorithm. In the case of fewer networks, a more accurate marketing strategy estimate is maintained, and the system spectrum utilization is improved. Obviously, as the value of $t$ increases, the cache hit rate will become larger and larger, and the difference between strategies will become more obvious. This is because the larger the value of $a$, the more concentrated the popularity of the files, and the file library has only a few very popular files, so that all these files can be stored on the mobile terminal.

These results show that when the cache capacity, the number of D-Us or $t$ increases, the DU-pairing algorithm in this paper can achieve greater improvement, which indicates the importance of correctly pairing D-Us for the content sharing problem of blockchain-driven catchers. The influence of user interest similarity and mobility on the deployment of cache policies is studied, and the problem of maximizing cache hit rate is established. Since the problem is an NP-hard problem, the problem is transformed into a monotonic submodal optimization problem, and a suboptimal solution to the problem is solved by a greedy algorithm. In this case, all marketing nodes tend to send data packets with a larger media access probability. Therefore, the performance of the marketing strategy is similar to that of global optimization.

5. Conclusion

This paper proposes a distributed architecture for auxiliary marketing under the 5G multimedia network. Through the proposed backhaul network capacity theorem and the minimum average hop number algorithm, Monte Carlo simulation is carried out to analyze the impact of the 5G multimedia base station density and the number of backhaul gateways on the wireless backhaul network. The model takes the most representative marketing data as the starting point, proposes a network model based on multimedia network, and proposes a multipath cooperative transmission strategy. In this case, all marketing nodes tend to send data packets with a larger media access probability. Therefore, the performance of the marketing strategy is similar to that of global optimization.

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 known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

[1] B. S. A. Alhayani, N. Hamid, F. H. Almukhtar et al., “Optimized video internet of things using elliptic curve cryptography based encryption and decryption,” Computers and Electrical Engineering, vol. 101, article 108022, 2022.

[2] Y. Liu, J. Peng, J. Kang, A. M. Iliyasu, D. Niyato, and A. A. A. el-Latif, “A secure federated learning framework for 5G networks,” IEEE Wireless Communications, vol. 27, no. 4, pp. 24–31, 2020.

[3] D. Gomez-Barquero, W. Li, M. Fuentes et al., “IEEE transactions on broadcasting special issue on: 5G for broadband multimedia systems and broadcasting,” IEEE Transactions on Broadcasting, vol. 65, no. 2, pp. 351–355, 2019.

[4] A. Martin, J. Elgana, J. Florez et al., “Network resource allocation system for QoE-aware delivery of media services in 5G networks,” IEEE Transactions on Broadcasting, vol. 64, no. 2, pp. 561–574, 2018.

[5] L. Zhong, X. Chen, C. Xu et al., “A multi-user cost-efficient crowd-assisted VR content delivery solution in 5G-and
beyond heterogeneous networks,” *IEEE Transactions on Mobile Computing*, 2022.

[6] J. Montalban, G. M. Muntean, and P. Angueira, “A utility-based framework for performance and energy-aware convergence in 5G heterogeneous network environments,” *IEEE Transactions on Broadcasting*, vol. 66, no. 2, pp. 589–599, 2020.

[7] X. Xu, D. Li, M. Sun et al., “Research on key technologies of smart campus teaching platform based on 5G network,” *IEEE Access*, vol. 7, pp. 20664–20675, 2019.

[8] S. Vitturi, C. Zunino, and T. Sauter, “Industrial communication systems and their future challenges: next-generation Ethernet, IIoT, and 5G,” *Proceedings of the IEEE*, vol. 107, no. 6, pp. 944–961, 2019.

[9] K. Si, M. Zhou, and Y. Qiao, “5G multimedia precision marketing based on the improved multisensor node collaborative filtering recommendation algorithm,” *Journal of Sensors*, vol. 2021, Article ID 5856140, 11 pages, 2021.

[10] Y. H. Xu, M. L. Liu, J. W. Xie, and J. Zhou, “Media independent mobility management for D2D communications over heterogeneous networks (HetNets),” *Wireless Personal Communications*, vol. 120, no. 4, pp. 2693–2710, 2021.

[11] H. Hui, Y. Ding, Q. Shi, F. Li, Y. Song, and J. Yan, “5G network-based internet of things for demand response in smart grid: a survey on application potential,” *Applied Energy*, vol. 257, article 113972, 2020.

[12] T. Cao, C. Xu, J. Du et al., “Reliable and efficient multimedia service optimization for edge computing-based 5G networks: game theoretic approaches,” *IEEE Transactions on Network and Service Management*, vol. 17, no. 3, pp. 1610–1625, 2020.

[13] L. Chinchilla-Romero, J. Prados-Garzon, P. Ameigeiras, P. Muñoz, and J. M. Lopez-Soler, “5G infrastructure network slicing: E2E mean delay model and effectiveness assessment to reduce downtimes in industry 4.0,” *Sensors*, vol. 22, no. 1, article 229, 2022.

[14] M. Agiwal, N. Saxena, and A. Roy, “Towards connected living: 5G enabled internet of things (IoT),” *IETE Technical Review*, vol. 36, no. 2, pp. 190–202, 2019.

[15] P. N. Srinivasu, A. K. Bhoi, S. R. Nayak, M. R. Bhutta, and M. Woźniak, “Blockchain technology for secured healthcare data communication among the non-terminal nodes in IoT architecture in 5G network,” *Electronics*, vol. 10, no. 12, p. 1437, 2021.

[16] F. Rinaldi, H. L. Maattanen, J. Torsner et al., “Non-terrestrial networks in 5G & beyond: a survey,” *IEEE Access*, vol. 8, pp. 165178–165200, 2020.

[17] V. Koumaras, A. Foteas, A. Papaioannou, M. Kapari, C. Sakkas, and H. Koumaras, “5G performance testing of mobile chatbot applications,” in *2018 IEEE 23rd international workshop on computer aided modeling and Design of Communication Links and Networks (CAMAD)*, pp. 1–6, Barcelona, Spain, September 2018.

[18] C. Colman-Meixner, H. Khalili, K. Antoniou et al., “Deploying a novel 5G-enabled architecture on city infrastructure for ultra-high definition and immersive media production and broadcasting,” *IEEE Transactions on Broadcasting*, vol. 65, no. 2, pp. 392–403, 2019.

[19] N. Marrwala, C. C. Tripathi, D. Kumar, and S. Iain, “Mobile radio communications and 5G networks,” *Lecture Notes in Networks and Systems*, vol. 140, 2021.

[20] B. Han, J. Chen, T. Guo, S. J. Lee, V. Swaminathan, and S. I. Venieris, “Guest editorial: bridging the gap between industry and academia for networking research,” *IEEE Network*, vol. 36, no. 1, pp. 8–9, 2022.

[21] H. Zhou, W. Xu, J. Chen, and W. Wang, “Evolutionary V2X technologies toward the internet of vehicles: challenges and opportunities,” *Proceedings of the IEEE*, vol. 108, no. 2, pp. 308–323, 2020.

[22] F. Rinaldi, S. Pizzi, A. Orsino, A. Iera, A. Molinaro, and G. Araniti, “A novel approach for MBSFN area formation aided by 5G communications for eMBB service delivery in 5G NR systems,” *IEEE Transactions on Vehicular Technology*, vol. 69, no. 2, pp. 2058–2070, 2019.