A Method for Dynamic Allocation of Wireless Communication Network Resources Based on Social Relations

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Abstract. Due to the large uncertainty of signal reception, the transmission speed of the wireless communication network resource allocation method is low. Based on social relations, a dynamic allocation method for wireless communication network resources is designed. Establish a wireless ad hoc network composed of a random number of nodes to determine the upper limit of its security capacity, and the nodes at the edge need to undertake more communication transmission loads on average. According to the similarity between users, a triple closed model is used to measure the social trust relationship in wireless communication networks. Considering the social trust and encounter frequency among users, the optimal relay node is selected for the wireless network communication link. The sum of data transmission rates under each allocation scheme is calculated and sorted in descending order, and resources are dynamically allocated based on the principle of maximum overall network throughput. Compared with other schemes through simulation, the dynamic allocation method of wireless communication network resources based on social relations can increase the network transmission speed and improve the communication performance.

Keywords: Social relationship · Wireless communication network · Resource allocation · Dynamic allocation · Social trust · Relay node

1 Introduction

The surge of mobile data traffic and the popularization of mobile intelligent terminal equipment will undoubtedly bring a very heavy burden to the future wireless mobile communication system. For example, the shortage of spectrum resources, the overload of base stations and the congestion of communication links will greatly hinder the development of future communication networks. Wireless communication networks can be divided into infrastructure-supported networks and wireless ad hoc networks according to topology types. Infrastructure-supported networks, such as wireless cellular communication networks, use wired networks as the backbone network, and infrastructure-supported nodes (such as base stations) provide data forwarding and user service services to other nodes within their coverage. Social information reduces the interaction between them

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in real life. On the contrary, Internet social software is more and more deeply embedded in people's lives, so social attributes have become a factor that cannot be ignored in wireless communication. Since there is no content of interest or sufficient trust between some users, the establishment of network links may also be hindered in mobile networks while satisfying physical transmission conditions [1].

A wireless ad hoc network is a decentralized transient ad hoc system because it does not depend on pre-existing infrastructure. For example, routers, base stations in wired networks, or wireless switches and access points. In a wireless ad hoc network, each node participates in routing by forwarding data for other nodes, and dynamically determines the node that forwards data based on network connectivity and routing algorithms. In a wireless communication network, each user can not only transmit. It is also possible to receive signals, that is, the user is both a server and a client. And each user has automatic routing function [2]. Each user in the network shares some of the hardware resources they own, such as information storage, information processing, and network connectivity. Users can access these shared resources directly without going through an intermediate entity. This network system breaks through the geographical limitations of traditional wireless networks, and can be deployed more quickly, efficiently, and at low cost, and the failure of any node will not affect the operation of the entire network, and has strong robustness. Device discovery is generally performed by the device sending a known sequence of synchronization or reference signals to detect whether there are other devices around, and requires that the two peer devices sending the beacon have the same sending time and appropriate spatial location. If the devices do not match and there is no redundant matching information, they can only be detected by random beacons, which incurs a loss of time and energy.

In a wireless communication network, the communication probability between nodes is related to the social relationship between nodes. Compared with nodes without social relationship, nodes with social relationship have a higher probability of communication. Obtaining social features from social networks will play an important role in improving the performance of mobile networks. A social network refers to a structure consisting of a set of entities and a series of connections between them, and its main characteristics are community, centrality, and social relations. With social networks, the formation of invalid communication connections can be avoided. From the perspective of content transmission, content popularity reflects the strength of social relationships in the network to a certain extent. When the strength of the social relationship is high, the access and transmission of the most popular part of the content accounts for the vast majority of network traffic. Factors in the social realm.. For example, users' social relations, their willingness to join and their expected data content consistency will also have an impact on the network cluster formation strategy, which will further affect the resource allocation efficiency of the network under multicast communication.

Some scholars have proposed a dynamic resource allocation method for wireless communication networks based on automatic differentiation. The method combines energy harvesting technology with multiary quadrature amplitude modulation of traditional communication. Based on the table format value function reinforcement learning algorithm—Q-learning and SARSA algorithm to find the optimal transmission strategy for each time slot of the automatic differentiation communication system, and finally realize the dynamic resource allocation. However, in the face of a large amount of resources, the transmission rate needs to be improved. Some scholars have proposed a dynamic allocation method of wireless communication network resources based on hierarchical game. This paper proposes two new penalty strategies to promote cooperation among master user networks. By triggering the strategy to promote the formation of cooperation between the main user network to achieve the optimal overall profit, and finally achieve the Nash equilibrium profit. This paper proposes a dynamic allocation method of wireless communication network resources based on social relations to improve the overall performance of the communication network.

2 A Method for Dynamic Allocation of Wireless Communication Network Resources Based on Social Relations

2.1 Determining the Security Capacity of Wireless Communication Networks

This paper considers building a wireless ad hoc network composed of a random number of nodes distributed on a two-dimensional ring with an area equal to the expected number of nodes. The topological structure of the two-dimensional ring can be used to avoid the influence of boundary effects. The positions of the nodes are generated according to a two-step shot noise Cox process. Under the centralized control scheme, the equipment of the cellular network such as the base station will control the users of the wireless network communication, including the establishment of the communication session and other control information. When entering into the process of information exchange between the two parties, the equipment in the cellular network such as the base station will not participate, and all information is sent on the communication link between users [3]. According to the isomorphic Poisson point process of density, a set of cluster heads are randomly distributed on a two-dimensional torus. Each cluster head independently generates nodes of its own cluster, and the density of nodes generated by the cluster head at any position is obtained by the superposition of the node generation process of each cluster head, which can be expressed by the following formula:

$$p(a) = \sum_{i=1}^{m} fh(b, a) \tag{1}$$

In Eq. (1), $p(a)$ represents the node density at position a; m represents the expected number of clusters; i represents the cluster head number; f represents the number of nodes generated by the cluster head; h represents the dispersion density function; b represents the cluster head. The dispersion density function is direction invariant, so the node density at location a is only related to the Euclidean distance between b and a. In the communication mode, a ranking-based model is adopted to describe the wireless network social relationship characteristics in which nodes are more likely to communicate with nearby neighbor nodes. This model is used to estimate the average transmission distance of unicast transmissions. For example, when the user reuses the resources of the cellular network, the base station will send a corresponding signaling message through the control link to notify the device to reduce the transmit power during communication. On the one hand, it reduces the interference to the cellular network users, and on the other hand, it also reduces the energy consumption of the device. When there are resources that can be reused in the network and the user has communication needs, the base station can also implement the function of resource management, that is, the communication user [4].

Legitimate nodes can send packets to legitimate nodes in the same cell or in adjacent cells. According to the definition of cell area, the area of each cell in the inner ring is much smaller than that of each cell in the outer ring. From the perspective of the interference model, the transmit power of the legitimate nodes located in the inner ring should also be smaller than the transmit power of the legitimate nodes located in the outer ring. It is assumed that the channel fading between different users and between users and base stations in the system obeys a large-scale fading model. The noise in all channels is white Gaussian noise with mean 0. Moreover, the distance between the wireless communication network user pair and the cell base station is far greater than the communication link distance between the two. Therefore, the transmit power of a legitimate node is related to the position of the ring where it is located.

The transmission range of a node is related to the density of nodes in the area. During the transmission process, it is necessary to restrain the interference from other nodes in the adjacent area to ensure the successful transmission of the node. The upper limit of the security capacity of the wireless communication network can be calculated by the following formula:

$$c(o) = m \int_{0}^{2\pi} \int_{0}^{\sqrt{r}} wp(a)da \tag{2}$$

In Eq. (2), o represents the equivalent wireless resource area; c represents the upper limit of network capacity; r represents the radius of the general cluster; w represents the weight parameter corresponding to the heterogeneous distribution of nodes. The idea of relay communication technology is to use one or more relay nodes for communication between two parties, which can convert a link with a lower communication rate into two or more links with better channel performance. Thus, the system throughput can be improved. When the degree of heterogeneous distribution of nodes is high, the capacity of each node will be reduced due to the reduction of the equivalent wireless resource area. Therefore, the nodes at the edge of each cluster domain need to bear more communication transmission load on average.

2.2 Metrics of Social Trust Relationships in Wireless Communication Networks

In the social domain, mobile users form a social network with stable social relationships, and the connections between users represent the strength of users' social relationships. Whether there is a social path between users has nothing to do with the physical link in the physical domain, but is determined by the social relationship between users. Social modeling among wireless communication network users takes the form of a social graph W = (P, Q), where the set of vertices P represents the set $S = (1, 2, \cdots, s)$ of devices in the network. Vertex $s \in S$ represents a mobile device or a user carrying this device.

Edge $q \in Q$ represents the social connection (distance) between two users x and y with direct interaction. In this network model, it is divided into social level and physical level. The social level reflects the real social relationships of users in real life. Social relationship is a concept that reflects the strength of the relationship between users in a social network, and the lower layer is the physical level. If user x and user y are within the range where they can communicate, direct wireless communication is used between them. Otherwise, a multi-hop wireless network communication path will be established between user x and user y. When the distance is close enough, the communication device can communicate and transmit information through the wireless network. In the physical layer, the physical channel is affected by the communication environment. Users can transmit information through the base station of the cellular network, or use the wireless network communication technology. In this case, it is very important which device the user chooses as a relay to forward his data. Because the selected device must be its trusted device, data forwarding will fail even if there is only one untrusted device [5].

In reality, a user device is likely to have no direct connection with its neighbor devices, so it is necessary to analyze how to calculate indirect trust through direct trust. The social relationship between users is related to many factors. The relationship between relatives and friends, encounter history and geographical location between users can all affect the strength of the social relationship [6]. Different users form different groups according to the strength of their social relationships. In real scenarios, network user pairs are composed of a sender and a receiver. In order to ensure the communication quality between wireless communication network users, the distance between user pairs needs to meet the maximum distance condition for communication. The triple closure model is an effective tool to identify the indirect trust relationship between them. The measurement process of social trust relationship in wireless communication network is shown in Fig. 1.

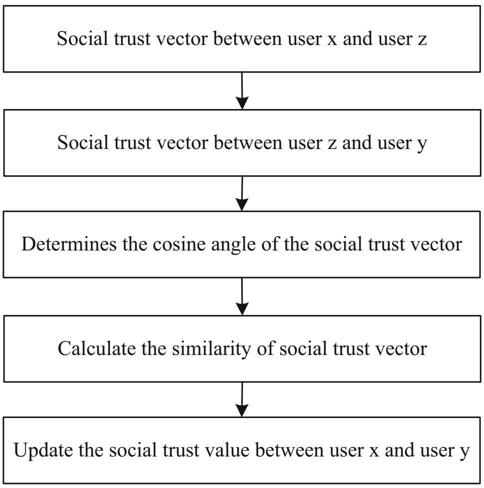

Fig. 1. Social trust relationship measurement process

Suppose there are social connections in the social graph between user z and user y, and between user z and user x. The social trusts between user x and user z, and between user z and user y are ϑ_{xz} and ϑ_{zy}, respectively. During communication, each cellular user will occupy a fixed channel resource allocated by a base station. Users share the channel resources occupied by ordinary cellular users for communication, so the two will interfere with each other during communication. To limit interference, we assume that a user pair can only use one channel. Therefore, user pairs do not interfere with each other. Then, considering the influence of user z, the mutual friend of user x and user y, the social trust between user x and user y can be updated as:

$$\vartheta_{xy} = \sqrt{\vartheta_{xz}^2 + \vartheta_{zy}^2 - 2\vartheta_{xz}\vartheta_{zy}\beta(x, y)} \tag{3}$$

In Eq. (3), ϑ_{xy} represents the social trust between user x and user y; $\beta(x, y)$ represents the similarity between user x and user y. The strength of social relations between users often affects the stability of network connections, and users with close social relations with surrounding users are more willing to establish and maintain wireless communication and share data. The calculation equation of similarity is as follows:

$$\beta(x, y) = \frac{\sum_{j=1}^{u} \left(\varphi_{xj} - \varphi'_x\right)\left(\varphi_{yj} - \varphi'_y\right)}{\sqrt{\sum_{j=1}^{u} \left(\varphi_{xj} - \varphi'_x\right)^2}\sqrt{\sum_{j=1}^{u} \left(\varphi_{yj} - \varphi'_y\right)^2}} \tag{4}$$

In Eq. (4), φ represents the user's interest rating for content j; u represents the total number of contents; and φ' represents the average rating. At the social level, the frequency of communication, the duration of communication, and the interaction activities are used to represent the intimacy between users. Social attributes include the user's gender, job, age, education level, hobbies, etc. Users with similar interests are more likely to interact or request similar data and establish stable links. Under the condition of the same social trust value, a larger similarity value will result in a higher trust value, which is more in line with common sense [7]. Users with strong social relations have a high probability of forwarding data packets, requiring more energy resources and spectrum. Discovering the interaction patterns among users can help to significantly improve the allocation of wireless network communication resources.

2.3 Optimal Relay Node Selection Based on Social Relations

In a wireless communication network, how to select a suitable relay node and how to design a reasonable and effective resource allocation algorithm is very important to improve the performance of the network. By understanding the social relations between users, it is helpful to select trusted relay nodes. This paper mainly uses the social relationship between users and relay nodes to select the optimal relay node for the wireless network communication link. The main reason for using social trust to decide candidate relay nodes is to enable reliable and trustworthy wireless communication between users. Forwarding data through trusted nodes can not only provide better privacy protection, but also increase the chance of data being successfully forwarded. The area division mechanism is used to limit the number of user candidate relay nodes. Two circles are drawn with the source user and the communication user as the center and the communication distance between the source user and the relay nodes in the network as the radius. Only relay nodes located in the overlapping area of the two circles are eligible to be candidate nodes in the network. The schematic diagram of the area division mechanism is shown in Fig. 2.

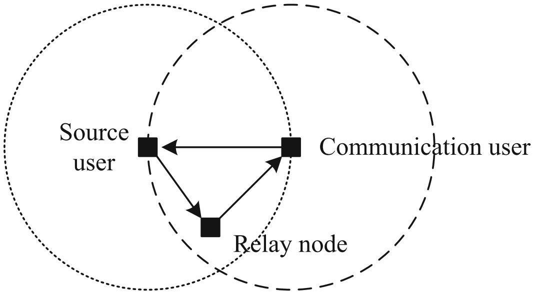

Fig. 2. Schematic diagram of the regional division mechanism

Usually, terminal devices are held by users, and the social relationship between users plays a decisive role in whether the terminal device is willing to become a relay node. Different groups are formed between different users according to the strength of social relations. According to the relationship and needs between users, spectrum resources need to be allocated in different groups. Users who are more popular in the network and interact more with other users can be regarded as relay nodes in the network. In social networks, the willingness of nodes is very important for the formation of social relations and the dissemination of information, and the strength of social relations between two users plays a very important role in whether they can form relay wireless communication. That is, the stronger the social relationship between users, the easier it is to form relay wireless communication.

Considering the social trust and the frequency of encounters among users, a set of candidate relay nodes can be reasonably allocated to users. Candidate relays in the set can encounter frequent encounters with the current user and are willing to provide data forwarding cooperation. Sort users in descending order according to the strength of their social relationships. Then, according to the order of centrality, it is judged in turn whether each user can become a relay node. In addition, distance information should also be considered in the judgment. When the distance between the user to be determined and the relay node that has become a relay node exceeds the specified distance, the user to be determined can be used as the next relay node. According to the above method, all relay nodes will be finally determined. The user's candidate relay set must meet the following conditions:

$$k = \{\vartheta_{lk} \leq \vartheta_0; v_{lk} \geq v_0\} \tag{5}$$

In Eq. (5), k represents the relay node; l represents the target user; ϑ_0 represents the social trust threshold; v_{lk} represents the encounter probability between the target user and the relay node; v_0 represents the encounter probability threshold. Relay nodes, as resource providers, play a dominant role in the cooperative communication process. Obviously, the relay node will consume resources in the process of data forwarding, such as energy and cache resources. With the help of the base station, every mobile user can detect the neighboring devices in his vicinity at any time. Based on this information, the user is able to know the number of encounters he has with other users.

The scenario in this paper is how to reasonably allocate power to maximize the benefits of cooperative users and requesting users when the total amount of power that relay nodes can provide is fixed when multiple requesting users make data requests. Assuming that the encounter duration distribution among users is continuous, the encounter duration distribution is usually centered around the mean. The encounter probability of the target user and the relay node can be calculated by the following equation:

$$v_{lk} = 1 - \left(\frac{\min \delta_{lk}}{\Delta t} \right)^{\varepsilon} \tag{6}$$

In Eq. (6), $\min \delta_{lk}$ represents the minimum value of the meeting interval between the target user and the relay node; Δt represents the communication time; ε represents the probability distribution function parameter. In order to ensure the successful transmission of data and the minimum transmission delay. The user will prefer to choose a device that he can encounter frequently as his relay.

2.4 Establishing the Dynamic Allocation Model of Wireless Communication Network Resources

Mobile devices are usually carried by people, and there is a social relationship between people. This relationship is usually related to a short-term stable social structure and form, and even forms a medium- and long-term social network. Due to the randomness of wireless channels, there is a large uncertainty in signal reception, and users with strong social connections have a higher probability of successfully transmitting data within a certain period of time. In order to find the best assignment result from all feasible mappings for channel assignment, the channel matching process can be abstracted into the maximum weight matching process of the bipartite graph. The objective function can be expressed as the sum of the rates of two users using the same channel plus the rate of a cellular user occupying a channel alone. Each node can only transmit interest data packets or content to nodes in the same cell or adjacent cells, so the node can perceive the transmission of interest data packets or content in adjacent cells.

Users gradually form a stable trust relationship due to their similar interests and the existence of historical interaction information, and jointly optimize the effect of dynamic resource allocation by combining network social characteristics and network physical characteristics. The essence of resource allocation is to determine the correspondence between resource blocks and users on the premise of maximizing throughput and ensuring the quality of service for different types of users. Considering all possible allocation combinations in the network, then calculate the sum of data transmission rates of cellular network users and D2D users under each allocation scheme according to the above calculation method of the sum of data transmission rates, and sort them in descending order. The dynamic allocation model of wireless communication network resources is shown in Fig. 3.

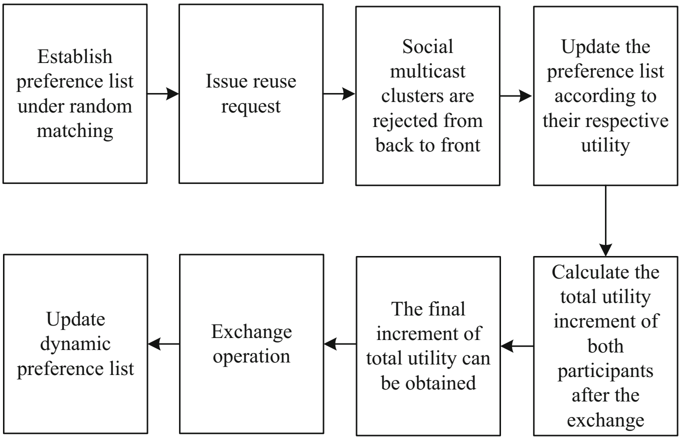

Fig. 3. Dynamic Allocation Model of Wireless Communication Network Resources

Resource allocation allows multiple social multicast clusters to reuse the same cellular user resources to improve spectrum utilization efficiency. From the perspective of channel interference relationship and physical domain model, the mathematical expression of the optimization problem to maximize the overall throughput of the network can be written as:

$$F = \max \mu\eta + \chi\varsigma \tag{7}$$

In Eq. (7), F is the overall throughput of the network; μ is the social matrix reflecting the strength of social relations between users; η is the utility function of rate and social relations; χ is the data rate; ς is the channel gain of the sender and receiver. Define a power control variable, which represents that the user's transmit power on the channel in the joint communication mode cannot exceed the power limit on the channel. It is assumed that a cellular user can only reuse one wireless communication channel, and a wireless communication user can reuse multiple cellular channels. When an interest data packet is sent to a node, if the content requested by the interest data packet exists in the node cache space of the same cell or a neighboring cell of the node, the interest data packet request is satisfied. The node storing the request content of the interest packet will opportunistically (while active) send the request content of the interest packet to the node that received the interest packet. Users establish connections with wireless communication networks whose stability is related to the social strength of multicast clusters. The corresponding utility should be a utility function of the reachability rate and the strength of the link's social relationship. The calculation equation of the utility function can be expressed as:

$$\eta = \chi\theta \log_2\left(1 + \mu^2\right) \tag{8}$$

In Eq. (8), θ represents the power cost, which is used to switch between data rate and power utility. The rate received by the user can be calculated from the channel state. For a fixed channel, it can only be used by one user in either the cellular mode or the D2D communication mode. As there are many different data rates and power utility requirements in wireless network communications. Therefore, θ is dynamically adjusted according to different wireless channel states, QoS, different transmit power constraints and interference levels. We preferentially select the combination with the largest sum of data transmission rates, and judge whether the interference generated by this allocation combination can make the communication quality of cellular network users and D2D users meet the requirements. That is, it is judged whether the SINR values of cellular network users and D2D users are greater than the specified threshold until all allocation combinations are determined. So far, the design of the method for dynamic allocation of wireless communication network resources based on social relations is completed.

3 Experimental Study

3.1 Experiment Preparation

In order to verify the performance of the wireless communication network resource dynamic allocation method based on social relations proposed in this paper, it is verified in the MTALAB simulation platform next. The simulation scenario considers the independent distribution of a single cell, the coverage radius of the cell is 500m, and the cellular users and D2D are randomly distributed in the cell. The base station is located in the center of the cell and is responsible for resource scheduling of the entire system. Each cellular user has the same number of orthogonal resources, and D2D users reuse uplink resources. The maximum transmission distance of D2D communication is set to 20m, and the transmit power of cellular users and D2D users is 25dBm. D2D sending and receiving devices form D2D pairs through a pair matching algorithm according to social and physical constraints. At the same time, it is assumed that cellular users occupy all spectrum resources in the system, and the shadow fading of all communication links in the system obeys a log-normal distribution with a mean value of 0. The simulation parameters are shown in Table 1.

Table 1. Simulation parameter table

Serial number	Simulation parameters	Value	Serial number	Simulation parameters	Value
1	Cell radius (m)	500	5	Noise power (dBm)	−135
2	D2D maximum distance (m)	20	6	Path Fading Index	2.5
3	D2D maximum transmit power (dBm)	25	7	Minimum data rate (bps/Hz)	0.48
4	Base station transmit power (dBm)	40	8	Cellular user transmit power (dBm)	25

In order to better reflect the performance of the method, the dynamic allocation of wireless communication network resources based on social relations is compared with the methods based on automatic differentiation and layered game theory.

3.2 Results and Analysis

Tables 2, 3, 4 and 6 show the comparison results of the network transmission speed of each network resource dynamic allocation method under the test conditions of different numbers of users.

Table 2. Comparison of network transmission speed with 20 users (Mbps)

Number of tests	Dynamic resource allocation of wireless communication network based on social relationship	A dynamic resource allocation method for wireless communication network based on automatic differentiation	Hierarchical game-based wireless communication network resource dynamic allocation method
1	100.15	89.39	93.89
2	102.47	91.08	94.58
3	103.58	92.47	85.67
4	100.96	86.14	94.36
5	104.65	87.05	86.05
6	102.21	88.66	95.14
7	103.54	89.83	93.48
8	105.88	91.55	92.12
9	104.62	90.21	91.23
10	102.36	92.64	90.16

Table 3. Comparison of network transmission speed with 40 users (Mbps)

Number of tests	Dynamic resource allocation of wireless communication network based on social relationship	A dynamic resource allocation method for wireless communication network based on automatic differentiation	Hierarchical game-based wireless communication network resource dynamic allocation method
1	123.07	112.16	108.14
2	128.44	110.53	107.58
3	129.56	110.85	106.82

(*continued*)

Table 3. (*continued*)

Number of tests	Dynamic resource allocation of wireless communication network based on social relationship	A dynamic resource allocation method for wireless communication network based on automatic differentiation	Hierarchical game-based wireless communication network resource dynamic allocation method
4	126.65	109.68	105.63
5	125.22	113.34	112.26
6	127.81	114.59	103.50
7	128.35	109.26	109.47
8	126.68	108.03	112.79
9	128.06	115.45	114.61
10	127.23	113.74	115.52

Table 4. Comparison of network transmission speed with 60 users (Mbps)

Number of tests	Dynamic resource allocation of wireless communication network based on social relationship	A dynamic resource allocation method for wireless communication network based on automatic differentiation	Hierarchical game-based wireless communication network resource dynamic allocation method
1	142.65	124.63	118.06
2	146.87	126.92	124.44
3	148.54	125.51	119.86
4	147.21	122.72	120.63
5	140.42	123.41	122.35
6	145.16	120.18	118.52
7	139.48	123.29	120.72
8	146.80	124.86	122.12
9	142.52	123.81	125.28
10	143.61	122.65	126.94

When the number of users is 20, the network transmission speed of the dynamic allocation method of wireless communication network resources based on social relations is 103.04 Mbps, which is 13.14 Mbps and 11.37 Mbps higher than the dynamic allocation method of wireless communication network resources based on automatic differentiation and hierarchical game theory.

Table 5. Comparison of network transmission speed with 80 users (Mbps)

Number of tests	Dynamic resource allocation of wireless communication network based on social relationship	A dynamic resource allocation method for wireless communication network based on automatic differentiation	Hierarchical game-based wireless communication network resource dynamic allocation method
1	167.49	141.49	136.43
2	165.84	139.57	142.97
3	164.67	138.25	144.84
4	165.30	136.36	145.61
5	162.56	142.03	139.35
6	163.23	143.85	139.16
7	168.15	140.67	140.78
8	167.47	138.58	138.52
9	169.82	137.78	137.36
10	165.63	142.22	142.26

When the number of users is 40, the network transmission speed of the dynamic allocation method of wireless communication network resources based on social relations is 127.11 Mbps, which is 15.35 Mbps and 17.48 Mbps higher than that of the dynamic allocation method of wireless communication network resources based on automatic differentiation and hierarchical game.

When the number of users is 60, the network transmission speed of the dynamic allocation method of wireless communication network resources based on social relations is 144.33 Mbps, which is 20.53 Mbps and 22.44 Mbps higher than that of the dynamic allocation method of wireless communication network resources based on automatic differentiation and hierarchical game.

When the number of users is 80, the network transmission speed of the dynamic allocation method of wireless communication network resources based on social relations is 166.02 Mbps, which is 25.94 Mbps and 25.29 Mbps higher than that of the dynamic allocation method of wireless communication network resources based on automatic differentiation and hierarchical game.

When the number of users is 100, the network transmission speed of the wireless communication network resource dynamic allocation method based on social relationship is 182.41 Mbps, which is 21.22 Mbps and 17.79 Mbps higher than the automatic differentiation and hierarchical game-based wireless communication network resource dynamic allocation method.. With the increase in the number of D2D users, the network transmission speed is also increasing. The reason for this phenomenon is that the number of users participating in the communication increases, and the throughput of the system also increases. In the same simulation environment, the performance of the

Table 6. Comparison of network transmission speed with 100 users (Mbps)

Number of tests	Dynamic resource allocation of wireless communication network based on social relationship	A dynamic resource allocation method for wireless communication network based on automatic differentiation	Hierarchical game-based wireless communication network resource dynamic allocation method
1	182.92	159.34	164.08
2	180.67	158.41	162.56
3	181.94	159.77	166.62
4	185.81	162.69	165.35
5	182.46	161.06	164.87
6	183.25	162.33	167.04
7	180.38	160.85	166.56
8	181.62	163.57	165.74
9	182.43	164.22	164.13
10	182.57	159.64	159.29

method proposed in this paper is improved in terms of network transmission rate, so the performance of the dynamic allocation method is better than that of the compared resource allocation methods.

4 Conclusion

With the popularization of smart terminals and the rapid growth of data traffic, the emerging demand for local services is growing. Wireless network communication can improve spectrum utilization, reduce the burden on equipment, and increase system capacity. This paper proposes a dynamic allocation method of wireless communication network resources based on social relations, in order to achieve the goal of improving the network transmission rate. We construct a wireless ad hoc network consisting of a random number of nodes to determine an upper limit of its security capacity, with edge nodes on average bear more communication transmission load. Considering the social trust and encounter frequency, the users. The sum of the data transfer rates under each allocation scheme is calculated and sorted in descending order, and the resources are dynamically allocated according to the principle of the maximum overall throughput of the network. Due to the complex and open nature of social networks and the dynamic changes of mobile users, there may be security issues such as malicious nodes stealing, forging or tampering with information in the network, resulting in unreliable information sources in social networks. Therefore, it is necessary to further design the detection mechanism of non-cooperative nodes to realize the safe sharing of data.

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