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Cooperative Communication System For Improving Cooperative Relays In Manets

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Abstract: In the field of wireless communication, the impact of cooperative communication is very advantageous. The previous works done on cooperative communication are corresponds to the issues of physical layer like outage probability and outage capacity. It is discussed on how to control the topology of the network with the help of cooperative communication by considering the issues of network and upper layer like delay time, topology control, network capacity etc.,

As there is an impact of topology control on delay time, the proposed scheme gets benefited by the cooperative communication that is capacity optimized cooperative communication with the improvement of cooperative relay node to enhance the capacity of network by reducing the transmission delay time.

Keywords– Co-operative communication, relay, MANET, Multi-hop, Attacker.

1.INTRODUCTION

The cooperative wireless communication is concerned with wireless nodes, where nodes share and coordinate their resources to improve their data transmission quality by means of cooperation. The relay communication is generalized concept in that various nodes also serve as relays for one another. Data transmission speed is a demanding factor in wireless networks, so as per previous works the limitations of simple wireless networks like cost, size and resource affect the ability of mobile nodes to support various transmit antennas. The single antenna node in wireless network creates virtual Multiple Input-Multiple Output and gains the advantages of actual MIMO by sharing their antennas. In wireless networks there is signal attenuation due to interference, multi path effects etc causes end to end delay problem results in high delay transmission time, in this condition the retransmission needed to transmit the lost packets. So the use of cooperative communication achieves efficient transmission and spatial diversity and results in reducing the signal attenuation and delay time. The idea behind the cooperative relaying communication where some nodes overheard the information transmitted from source node, relay that information to the receiver node instead of considering it as interference. Since there is an acceptance of multiple independent copies of the signals of the transmitted data from sender to relay nodes by the receiver, hence it achieves cooperative diversity.

1.1 Existing System

In most of the current studies the non-cooperative point to point wireless links are used for creation, adaptation and management of networks in Manets. The networks created using such simple links can be seen as complex networks. Even though the most existing works on cooperative communication mainly concentrated on link level physical layer metrics, they are outage capacity and probability. Certainly there is an impact of cooperative communications on network level upper layer metrics for example delay time, routing, network capacity, topology control are highly neglected.

As per the existing system with multihop transmission without cooperation, if there is any occurrence of node failure during the transmission then the signal must have to be retransmitted again. So due to this the delay time will be increased. In addition to this there are various factors that are to be considered as demerits in multihop transmission.

Demerits:

1. Low Network Capacity
2. Low reliability due to high delay time

1.2 Proposed System

The solution to the problem is proposed known as capacity optimized cooperative transmission based on study of different related works. The proposed scheme gets benefited by the cooperative transmission in which the first slot is used to transmit the data from sender to relay node, the relay node performs the decoding and re- encoding of data and the second slot used to forward it to the receiver. The decoding takes place at receiver by combining the data from sender and relay node. As this scheme uses the transmission diversity and other advantages of cooperative transmission the data need not be retransmitted if there is any node failure occurs. So that the relay nodes are improved and this decreases delay time.

1. Enhance the network capacity in mobile ad hoc networks
2. Reliability can be improved by reducing delay time
3. Improved network connectivity

2.Literature Review

Different facets of Cooperative Communication

2.1 Transmission in MANETs

As per the study in [6], it is analyzed three types of transmission manners in MANETS as shown in the fig 2.1:

a) Direct Transmission: There is no utilization of relay nodes.

b) Multi-hop Transmission: There is a utilization relays but does not merge signals at the receiver.

c) Cooperative Transmission: In this other nodes plays as relay for other nodes. They transmit other node's information with their own information.

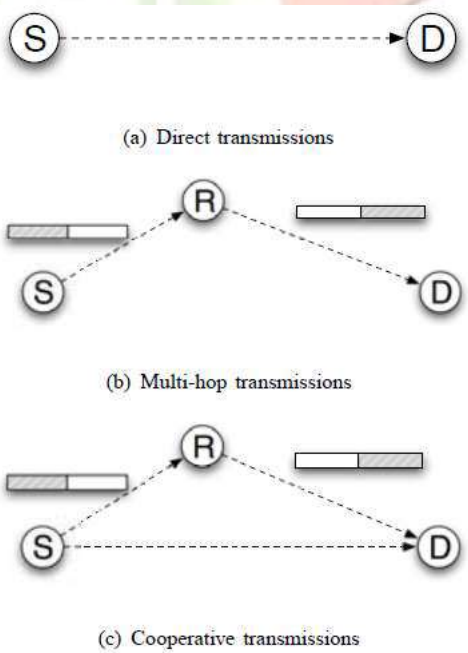


Fig 2.1 a) direct transmission. b) Multi – hop transmission c) Cooperative Transmission

2.2 Cooperative Communications

As per discussion in paper [2], Cooperative transmission uses the strategy of relaying in that various sources plays as relay nodes for one another. The cooperation nature of the intermediate sources helps to transmit other sources data with the combination of data of their own.

As per the study in paper [12], Cooperative transmission notices that the data which is transmitted towards particular receiver may overheard at partner nodes. They are known as relay nodes they process the overheard data and transmit towards the receiver. The relay node here uses the strategies like decode and re encode or simply boost the signal and forward or any other. The signals came from source and relay node are combined at receiver and enables highest rate of transmission.

As per the discussion in paper [5], in interconnected MANET, the specially appointed system is joined with framework system. In Cooperative transmission the source node sends data to destination node through cooperative node CN.

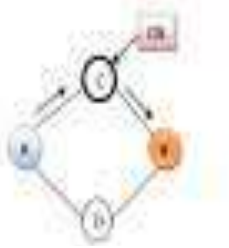


Fig 2.2 Co-operative communication from node A to B through cooperative node C

Fig. 2.2 clarifies the agreeable transmission in the middle of source and destination node through a co-operative concept. The source node A sends information to the destination node B through the helpful node C.

2.3 Relaying Strategies:

As per the study in [3], there are two basic types of relaying strategies

i) Amplifying and then forward

ii) Decoding and then forward

In the concept of amplifying and forwarding technique, the transmitted signal from the sender is amplified and retransmits towards the receiver. The partner node amplify the overheard information and forwards it towards the destination without considering it as interference. The actual information is regenerated by the combination of signals at the receiver. In decode and forward technique, the physical layer decoding will takes place and result will be forwarded towards the receiver. Simple CDMA concept is used to achieve decode and forward if the two nodes decided to cooperate with each other.

Comparing Amplify -forward and Decode –forward:

As per study in paper [13], the presence of relay node facilitates the various links to send the private data and hence results in nonzero rate of secrecy. Deployment of cooperative amplify and forward relay is in larger area with lower rate of secrecy. But the deployment of cooperative decode and forward relay is in smaller area but with highest rate of secrecy. The highest mean capacity can be achieved by single antenna mutihop relay link under decode and forward than under amplify and forward [14].

Anyhow the coding gains and amplify & forward noise are the two demerits faced by amplify and forward as compared with decode and forward. Regeneration of actual signal and the error correction at the relay node are the merits of decode and forward relaying.

2.4 Topology Control

As per the study in [4], Topology is the physical induction of nodes in mobile ad hoc network. Still, the hubs in mobile ad hoc network are not static. Their development is powerfully starting with one territory then onto the next region. This is called as mobility of nodes.

As per the study in paper [7], topology control will choose the presence of remote associations subject to network accessibility; the general topology control issue can be imparted as,

$G^* = \arg\max f(G)$

The mathematical statement utilizes the basic network topology G, which has versatile nodes, connections, as the input. As indicated by the point, a superior topology G* (V, E*) will be encircled thus. G* must have every single migrant nodes in G, onnections E* ought to safeguard network connectivity without apportioning the network. The structure of yield topology is identified with the enhancement point, that is f(G) in mathematical statement.

2.5 Entropy Based Anomaly Detection Method

As per the discussion in paper [11], The Shannon-wiener index hypothesis is an essential hypothesis to break down the arbitrary information and decide the instability associated with information. The more arbitrary in information have more entropy in that. The entropy will be least if the information originating from one IP or port. On the off chance that information has a place with numerous classes, the entropy will be bigger. The adjustments in entropy will demonstrate that the traffic is originating from distinctive sources. A threshold value is registered and characterized to recognize the DDoS assault in the framework. In the event that the entropy increments beyond the threshold value, the framework creates a caution for DDoS.

This can be done in two steps:
(1) the client is permitted to go through the router for first time and recognition algorithm confirms the client.
(2) For the second time when client tries to go through router, the entropy worth is processed relying on the packet size and client authenticity. In the event that the entropy worth does not
meet the standard range value, it is considered as intruder and an affirmation is send to cloud supplier. The entropy worth is figured for every data packet.

3. MODULES

3.1 Service Provider (Sender)

The service provider will browse the file it may be a text file or we can type anything in the text area provided, then the data will be encrypted and now service provider will select the ip address of the router through which transmission takes place to the destination.

3.2 Multihop Router

This module follows the approach of amplify and forward technique, here each cooperative relay node receives a noisy version of the information transmitted by its partner and relay node simply boost the signal and retransmits the noisy data to the receiver without treating it as interference.

The mutihop transmission without cooperative communication uses two time slots, the first slot is used for the data transmission from sender to the cooperative relay node, and the second slot is used to forward the data towards the receiver. Decoding of data takes place at receiver based on the signal from relay node. Due to the lack of transmission diversity the decoding reliability is very low because there is only consideration of relayed signal and signal directly from receiver is not available. Anywhere in the middle of transmission if there is an occurrence of node failure then it has to be retransmitted again from sender, results in increasing delay time and delay time is taken from the time of transmission from sender to the receiver and the results are noted to compare with cooperative transmission.

Here bandwidth will be assigned to each and every link in the network involving in the communication. Based on the selection of efficient bandwidth by the cooperative relay nodes, the data will be transmitted to the destination.

All the bandwidths are compared as per the above coding and if there is any congestion node occurs based on data load then alternate relay node will be selected. Here in this module only from s1 to n1 and from s1 to n2 mentioned and other details are implemented in the project.

3.3 COCO Router

The COCO router follows the approach of Decode and Forward style of relaying, here the decoding and re encoding of the received signal is done by the cooperative relay node, and then it forwards it towards the receiver. Due to the advantage of transmission diversity the decoding reliability is high as the information of the two signals from the sender and the relay node are combined at the receiver. During the transmission if any occurrence of node failure then there is no
retransmission of data takes place due to the advantage cooperative communication so it decreases the delay time. For processing of the information in the relay node the Decode and forward is most preferred one. As compared to Amplify and forward relaying scheme there is no amplified noise in the sent signal. So that there is there is an improvement in cooperative relay node as compared to multihop transmission and reduction in delay time. Here also the delay time is taken to compare the result with multihop transmission.

Here the data pass through the relaying nodes based on selecting the bandwidth, on selecting bandwidth if there is any sort of congestion arises then it treats the node as a congestion node and then it chooses the alternate cooperative relay node in a cooperative manner. At whatever point numerous nodes are accessible for cooperative transmission.

3.4 Destination

In this destination module, the decoded data is received. It is shown that both the sender and receiver nodes can be aided by a cooperative relay node to improve the rate region of the sender. And now it can be understood that the cooperative transmission reduces the delay time as compared to multihop transmission and enhances the capacity of the network by improving cooperative relay nodes to transmit the data in a cooperative manner.

3.5 Attacker

In this work, it uses an efficient Entropy based Anomaly Detection System to Prevent DDoS attacks strategy to filter the induced false information in wireless Adhoc networks and to prevent the attackers or intruders in the router. The entropy will be least if the information originating from one IP or port. This can be done in two steps:
(1) the attacker is permitted to go through the router for first time and
recognition method confirms the attacker.
(2) For the second time when attacker tries to go through router, the entropy worth is processed relying on the packet size and attacker authenticity. On comparison with the conventional reported techniques, this Entropy scheme accomplishes not only high filtering but also maximizes reliability.

4. RESULTS AND DISCUSSION

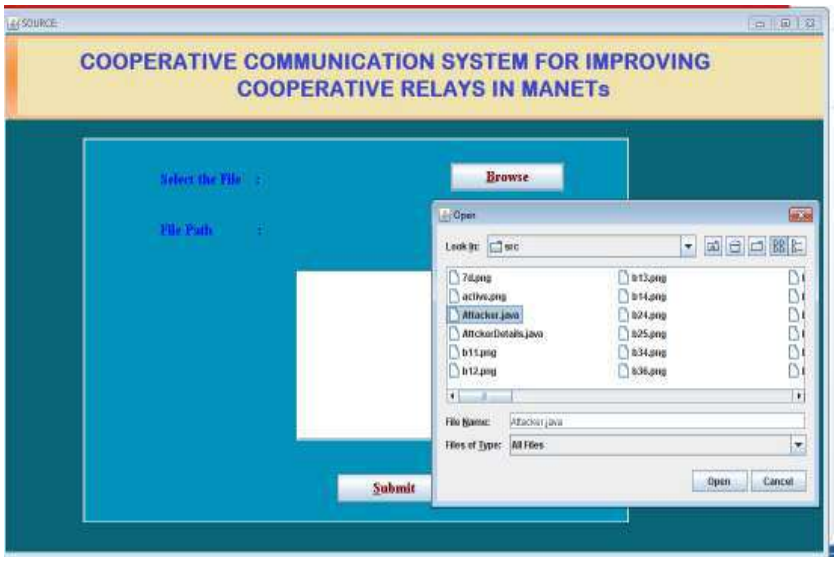
In this testing phase, we have verified and validated all the modules. In the service provider module we have verified whether it browses the file or not and next upon encrypting the uploaded file it has been checked whether it uploads properly or not by selecting the multihop router.

In multihop router, we have verified that each and every link must be assigned with some bandwidth that we can get it from database. On selection of bandwidth between the links, the nodes are mentioned as congestion node, active node, etc. Next the validation takes place on transfer of data from each node to destination.

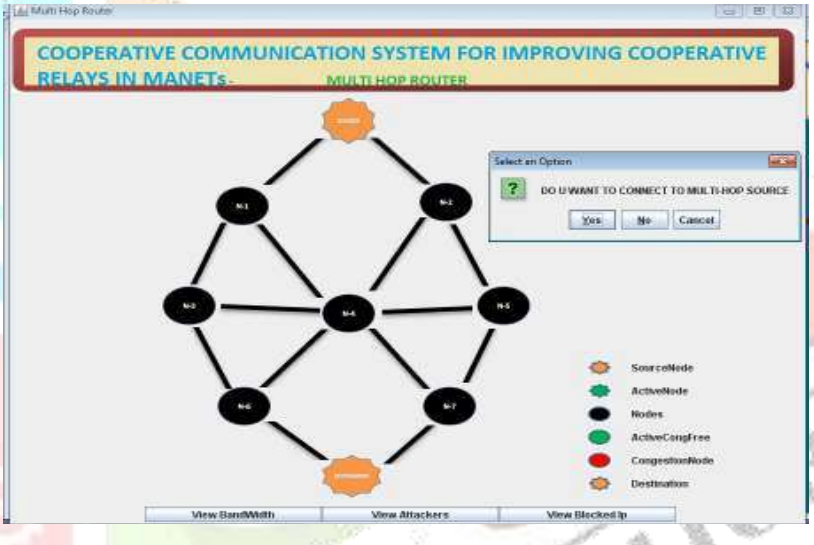
In COCO router we have checked the proper receiving of a file from sender to receiver, here the deciphering of the data and forwarding of such data takes place that have been verified and validated. And in destination module, we have checked whether the decrypted data or file has been received or not in the specified text area.

And finally in the attacker module, we have checked whether the bandwidth details are retrieved properly or not from the database. And after successful attacking on bandwidth the attacker blocked based on his ip address and checked whether the blocked ip address is block listed or not.

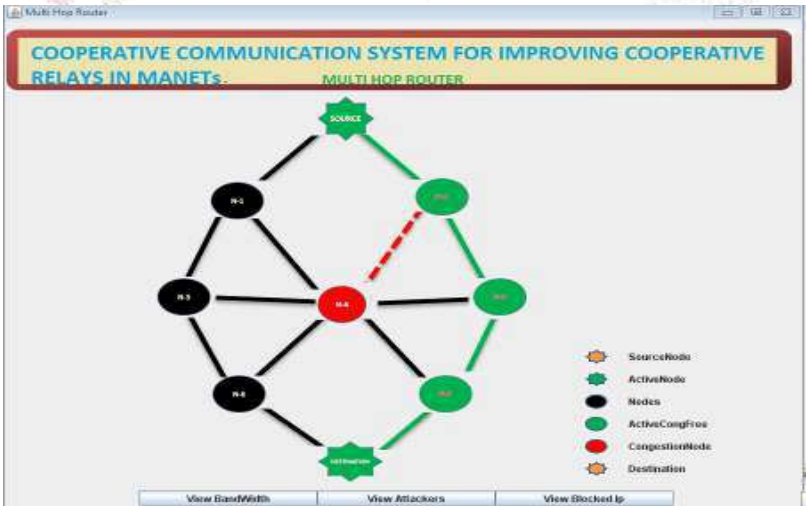
Selecting a file to forward to Destination:



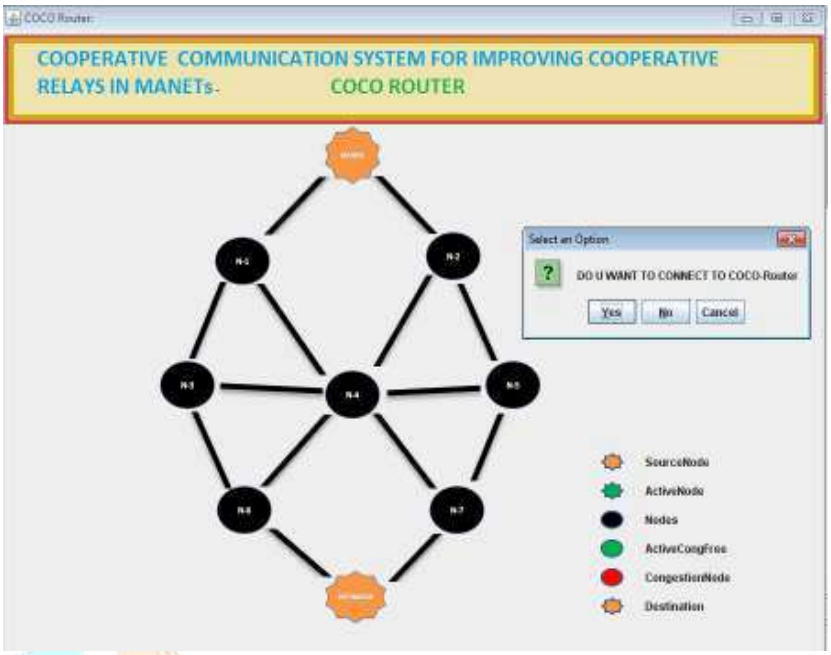
Connecting to Multi-hop router:



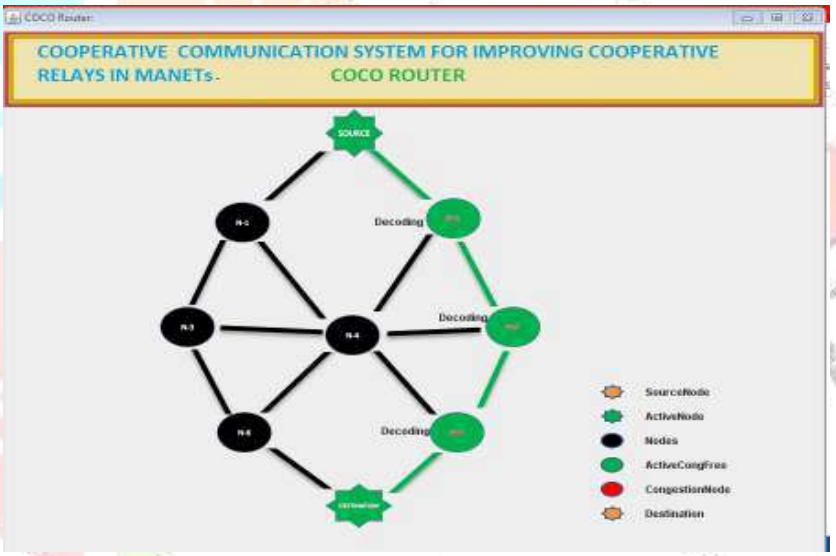
Data transmission in multi-hop router:



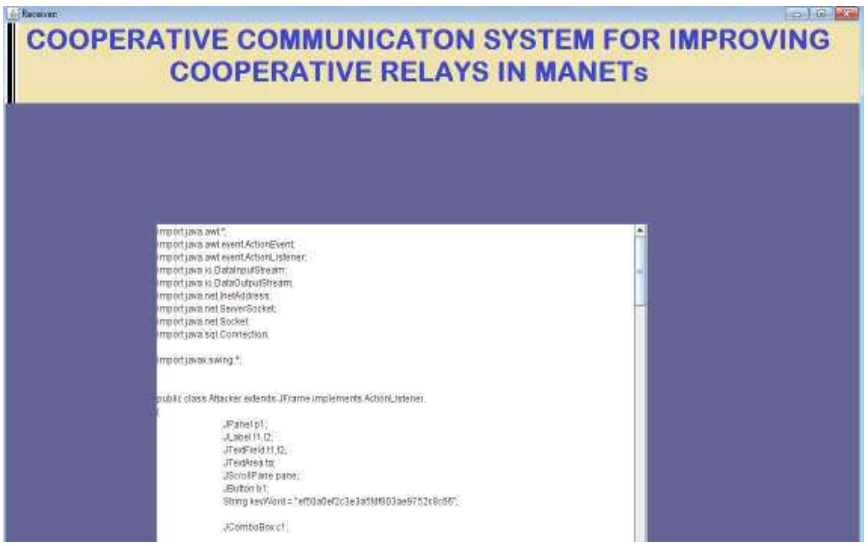
Connecting to COCO router:



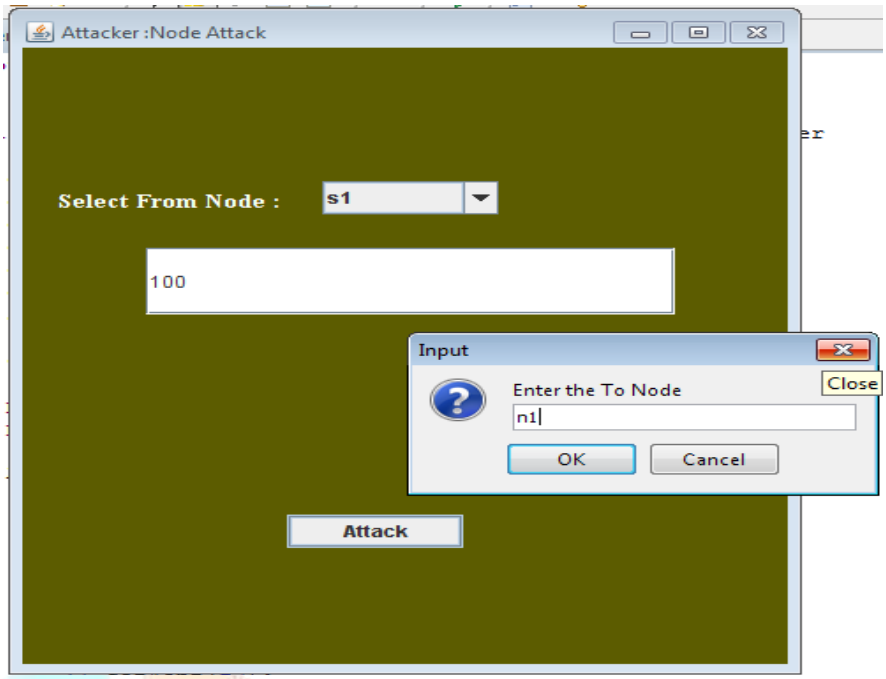
Data transmission in COCO router:



Data Received At receiver:



Attacker: attacking on link bandwidth and blocking the attacker.



Slno	Mutihop transmission time(ms)	Cooperative transmission time(ms)
1	80006.0	62540.0
2	94583.0	68045.0
3	83077.0	71272.0
4	77615.0	57619.0
5	71519.0	50588.0
6	100376.0	77727.0

Table 4.1 : comparison table of transmission time for different file uploads in multihop router and coco router

In the table transmission times of both multihop transmission and cooperative transmission are taken based on sending different files. According to the results bar charts are drawn. By considering the results we can say that cooperative transmission reduces the transmission time as compared to the results of multihop transmission. Hence there is an improvement in cooperative relay nodes to improve the network capacity with cooperative communication system.

5. CONCLUSION

The study based on different papers summarizes that, link wide physical layer metrics like outage probability and outage capacity found and resolved. The challenges related to network level upper layer like delay time, topology control, routing are highly neglected.

This proposed work deals with network capacity to reduce delay time using capacity optimized cooperative scheme. In proposed cooperative transmission scheme we have seen an improvement in delay time as compared to multihop transmission without cooperative communication. Hence the proposed scheme describes how the cooperation strategy in cooperative communication will improve the cooperative relay nodes to enhance the performance of the network by reducing the delay time consumed in sending the information towards the receiver node.

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