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Research paper

Implmenting A Modified Shared Tree Multicast O-Corman Protocol in Wireless Adhoc Network

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Abstract

A mobile Ad Hoc network is a Noinfrastructure networkand randomly moves nodes are presented .Multicasting support data forwarding, and thus it is suitable for MANETs.Implementing'Multicast opportunistic cooperative routing in Mobile Ad Hoc Network', (MANET) to improves the %PDR , and reduces the power consumption, multicast is meant for group communication. Multicasting sending copy of the information to all members in a group, it improves, the wireless link in a network.In an Ad Hoc network nodesare randomly distributed and free to fly without any existing infrastructure or infrastructure less administration. In the Networkeach node isfitted out with a single omnidirectional antennaand that multiple nodes are allowed, together their transmissions to take the advantages of spatial diversity to obtain energy savings.It is assumed that some nodes are not a member in a group, hence it does not receive transmission, and packet has be resent again. Where as in existing unicast transmission protocol for multiple hop network picked by multiple intermediate nodes,and only one receiver. Theprotocol performance is analyzed using the ns-2.32 network simulator.
Keywords:

Keywords: *Ad Hoc,cooperative Routing, Energy Efficient,opportunistic, Multicast*

1. Introduction

Multicasting is a group-oriented computing, because in a group multiple sender nodes shares its multicasting address. In this multicast, group can be formed by using the senders and receivers. Multicast routing protocol is efficient and reliable; it reduces the power consumption, Qos over unicast type. When designing a multicasting protocol some keen issues should be considered, it includes constant update of routing path, dynamic group member update and also state information done periodically. In MANET many multicast routing protocol have been developed .For example based on route form, it can be classified as tree based and mesh based. In tree based protocol the source node as the 'root' and all the routers forms a tree structure. Hence the efficient route is formed by using only one routing path from source node to destination node. In contrast less efficient in Mesh type protocol because more than one routing path, from source and destination node.

The proposed an energy efficient Multicast Proactive Source Routing protocol in MANET with less power consumption and high PDR called Multicast O-CORMAN. And construct the shared tree structure with retransmission, if nodes fails to transfer the data packet. The multicast O-CORMAN used opportunistic routing, and more than one nodes are selected. Creates a list of forwarder nodes, it includes overhear packets from the sibling nodes. From the list select the highest priority nodes as forwarder node ,which receives the data with least cost ,No outage and available residual power .Instead of source node each forwarding node updates these information from the previous forward node, thus results effectively reduces the power consumption for maintaining the multicast shared tree structure ,and it consumes less power. This technique prevents the duplicate transmission, and ensures that achieves high throughput.

1.1Mobility and Traffic Models

In a MANETs mobility model is designed, to give information about the mobility of mobile users, location of node, and velocity of node and acceleration varies over simulation time. Since both mobility and traffic patterns may play a significant role in determining the protocol performance, the mobility models to describe the movement pattern of targeted real life applications in a reasonable way. Thus, when evaluating MANET protocols, it is necessary to choose the proper underlying mobility model. Mobility models are based on setting out different parameters related to node movement. Basic parameters are, the initial location of mobile nodes, node movement direction, node velocity range, change of node mobility speed. There are two types of Mobility models are entity, and group mobility models. Entity mobility model describes the individual node movement. Whereas group mobility model describes group movement as well as individual node movement. In this work, consider Random Waypoint mobility models. Based on routing load the traffic pattern classified into three types, such as CBR (Constant Bit Rate) PARETO, EXPONENTIAL (VBR) Variable Bit Rate. It behaves in a predefined structure and schedule manner. In the CBR traffic pattern, the data packets are generated at a constant rate and is good for text transmission, whereas VBR traffic pattern generates data packets at different rate.

1.2 Random Waypoint Model

Random Waypoint (RW) is a model in which nodes move, independently and randomly chosen destination with a randomly selected velocity. In this model pause time is included between changes in direction and/or speed, to avoid abrupt stopping and starting. When this pause time expiry, the node arbitrary selects a new location to move towards with a new speed which is randomly selected from the interval [Vmin, Vmax], where min represents minimum velocity of the each node, and max represent the max velocity of each node. After reaching the destination, the node stops for a duration defined by the 'pause time' parameter. After pause time, node again chooses a random destination and repeats the whole process until the simulation ends. The simplicity of "Random Waypoint Model" (RWM) may have been one reason for its widespread use in simulations.

The multicast 'Constant Bit Rate (CBR)'traffic model is simulated using NS-2.32., each group has one sender for every time. Here for our simplification the number of receivers is 2 for 50 nodes. The sender transmits traffic at a rate of 100 Packets/sec, the senders and receivers are select among multicast group members randomly. depends on the node mobility speed ,whenever a member wants join or leave from the group .Once particular node joining the multicast group, the source starts transmit data for 200s simulation time with the mobility speed of " 5, 10, 15, 20, 25" m/s .The packet size is 1024 bytes. The length of the queue at every nose is 10Mbps and pause time is 25m/s.

The paper is organized as follows. Section 2, discuss the problem in previously developed multicast routing protocols and also proposed Section 3, Section discuss the proposed energy efficient multicast routing protocol for MANETs with less power consumption and high %PDR. .In section 4 the performance analysis of the multicast O-CORMAN in comparison with other Sub optimal algorithms and Non-cooperative Finally, section 5, discuss the future scope and Conclusions

2. Work Done

In [1], author considered, multi-antenna systems intensively. It achieve considerable transmission energy savings compared to single-antenna systems by taking advantages of spatial diversity. In [2] considered only research on energy efficient routing, where as in [3],[4],[5] considered both network layer routing and physical layer cooperation problems.,[3], where the authors study energy efficient cooperative routing, in a static wireless network. In [4], the cooperative routing in multi-source multi-destination network is considered, which gives that significant energy savings, this is theextension of [3]. Distributed cooperative routing is studied in [5].S. Biswas and R. Morriset al., [6],ExOR is the seminal opportunistic proactive routing protocol. In ExOR a batch of packets are broadcast, by a sender (for example 10-100 packets per batch). Each packet contains, a list of forwardednodes. In order to maximize the progresseachtransmissionmakes,theforwardingnodesrelaydatapacketsin the order of their proximitytothedestinationasmeasuredusing ETX [7].In [8] proposed a new routing protocol is known as a'Simple Opportunistic Adaptive Routing protocol' (SOAR) .In [9] author takes the transmission, based on nodes instead of next hop method called priority-based forwarding. Furthermore, ExOR is quite suitable for unicast, but in multicast, it may not perform well,Chachulski et al. [10]. At last, piggybacked ACKs may lose, so' duplicated transmission may happen. The authors Zehua Wang and Yuanzhu Chen et al., in [11]proposed a new algorithm ,thus avoid the duplicated transmission in mobile Ad Hoc networks, is called "Cooperative Opportunistic Routing in Mobile Ad Hoc Networks" (CORMAN).

In a highly dynamic environment of mobile Ad Hoc networks, the multicast transmission, simultaneously a same data packet has send to receivers in the MANET.

In general broadcast the data packets, it consumes power and bandwidth. Which should be avoided[12],[13] by using multicasting in MANETs with dynamic topology, i.e., a node in the MANET, at any time , may join or disjoin the group. Xiao Chen and Jie Wn et al [14] reviewed multicast protocols in mobile adhoc network .After find out the limitations of two wired multicast tree routing protocol ,author discussed four Ad Hoc multicast protocol and also discussed two issues i.e., QoS multicast and reliable multicast . C.-C. Chiang,M.Gerla, and L.Zhang et al[15] author applied 'Forwarding Group Multicast Protocol'(FGMP), when packets forwarding this protocol keeps in track with groups of nodes not of links. To avoid, duplicate date packet the forwarding Nodes in FG set only receives the data packets, and it will broadcast. But in FGMP the major issue is selectionand maintain the set FG of forwarding nodes. Devarapalli, and D.Sidhu et al [16], the multicast routing protocol is proposed by Zone based. To avoid the above issues, here source initiated on-demand protocol. In which a multicast delivery tree is created by using zone routing scheme, hence it is a source tree based protocol. In this protocol topology changes can be restricted, instead propagate it through the whole of thenetwork. In [17], ODMRP (On Demand Multicast Routing Protocol) finds the forwarding node among the received data packet node in the network, to performmulticasting.Only forwarding node will transmit the multicast messages to a group member, then creates a joint table message, and broadcast to its neighboring nodes. This neighbor node establish forwarding path. In [18] MAODV ,(Multicast On-demand Distance Vector Routing Protocol) broadcast the route request ,on demand basics only the path is found and constucts a routing tree.

3. Proposed Technque

The proposed multicast O-CORMAN is an extension of unicastO-CORMAN.Multicast,(point-to-multipoint) is the term refers to depict correspondence between nodes, where a snippet of data is sent from source node to an arrangement of receiver nodes. Despite the fact that, this should be possible by sending distinctive unicast (point-to-direct) messages toward each of the receiver has, there are many reasons which make having the multicasting ability alluring. The primary real preferred standpoint of utilizing multicasting is the lessening of the system stack. There are numerous information which are required to transmit set of information to many nodes. Since multicasting requires the transmission of a bundle by a solitary source to numerous receivers, organize data transfer capacity is used where it is straightforwardly corresponding to the receiver nodes and it can be helpful for asset revelation. The critical element of multicast steering is its help for datacasting applications. Lately, sight and sound transmission with high determination and bit rates has turned out to be increasingly well known, Instead of utilizing an arrangement of point-to-point associations between the taking an interest nodes, multicasting can be utilized for circulation of the mixed media information to a gathering of beneficiaries. In true, nodes may join or leave a sound cast or a video-cast whenever, this adaptability to join and leave a group whenever is given by multicast steering convention which makes its dynamic system enrollment significantly less demanding to deal with. Nodes in the system utilize a lightweight multicast proactive source directing (MPSR) convention to decide a rundown of middle of the nodes that the information parcels ought to take after on the way to the receiver. In conventional unicast transmission can be grabbed by various hubs, yet just a single of them is the planned beneficiary (goal hub or transfer). In the event this hub has neglected to get the transmission, the bundle must be dislike once more. As a result, all nodes that have gotten the transmission that are nearer to the goal than the transmitter could be transfers, so it is not important to depend on a particular node to forward the information on a fundamental level. This strategy can spare a lot of assets contrasted with customary strategies and considered in organize convention configuration, known as multicast agreeable directing methods for Opportunistic information exchange amongst source and receiver nodes. This is augmentation of 'unicast Opportunistic Cooperative Routing in Mobile Ad hoc Network '(O-CORMAN) scheme. The proposed work demonstrate that a superior execution as far as throughput, vitality utilization, when contrasted and unicast o-corman and furthermore than existing non helpful plan.

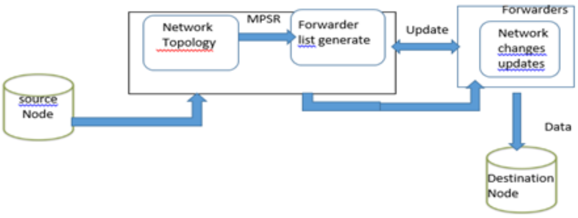

Figure3.1: Design modules of Multicast O-CORMAN

3.1 Sub Optimal Algoritms

As the network diameter become larger, finding optimal cooperative routes become computationally problematic. Hence to solve, here developed two sub optimal algorithms, and achieve significant energy savings.

3.1.1 Progressive Cooperative (PC-L)

This is a MISO cooperative routing algorithm, where in every time-slot, the next node is selected with optimal non-cooperative route towards the destination is selected. Progressive cooperation PC-L: In this algorithm, the best path is selected after each transmission by using non cooperative shortest path Dijkstra's algorithm. It combines last three nodes into a single node because here L= 3 along with the source node ie super node. The single node having minimum transmission power and higher SNR value. This algorithm turns out to have a complexity of O(n3) since the main loop is repeated O(n) times and each repetition has a complexity of O(n2). Where 'n 'is the total number of nodes in the network.

3.1.2 Cooperation Along Non Cooperative Path (CANCP-m)

This is a MISO cooperative routing algorithm, where in every time-slot, the next node is selected with optimal non-cooperative shortest route, and nodes that have zero outage towards destination node. In each transmission of the cooperative routing, the last m= 3 nodes along the optimal non cooperative route cooperatively send the information to the next node along the optimal non cooperative route. This suboptimal scheme has a complexity ofO(n2)and m=3. Where 'n'is total number of nodes in the network.

3.2 Non Cooperative Communication

Point-to-point communication from source node to destination-node. Originate messages as a source and destined for them as a receiver, but do not share resources. Using shortest path algorithm, packets are transmitted from source node to destination node.

4. Simulation Results

In this section, analysis the performance of Multicast O-CORMAN by using Network Simulator ns-2 (version 2.34).

4.1 PERFORMANCE PARAMETERS

To evaluate the performance of routing protocols, considered different kinds of parameters in network. The parameters are End-to-End Delay, % Packet Delivery Ratio, and Average Consumed Energy, . To check protocol performance in finding a optimal routing towards destination.. The efficiency of protocol is determined by end to end delay, if delay is low then the protocol works efficiently otherwise protocol will not work efficiently. The throughput determines successful packet deliver in simulation time. High throughput shows, the routing protocol is suit for data transformation. Thehigh PDR gives protocol performance is better than low PDR. The same way whiletransmit and receive the dataconsumes less energy, then the protocol is called efficient routing protocol in any communication.

4.1.1 End-to-End Delay

End-to-End Delay refers the average time, it takes a data packet to reach the destination. It consists of queuing delay at interface, transmission delay in the MAC layer, processing delay, and propagation delay, transfer through channel and delay in buffering at route discovery process. The higher End-to-End delay indicates, the performance of protocol is bad due to network congestion. This metric is calculated by finding the difference of time at which first packet was transmitted by source from, time at which first data packet arrived to destination.

Delay of each packet = transmission delay (dt) +queuing delay (dq) + contention delay (dc)

dt = Packet Size / Band Width

$dq + dc = k/\mu$ (k Max queuing size μ is service time)

$\sum$Delay = $\sum$(receiving time - sending time)

4.1.2 Packet Delivery Ratio (%PDR):

PDR is the ratio of the number of received packetssuccessfully to, the total number of packets transmitted.

Packet Delivery Ratio = (Total Packets received by the destination node)/(Toal packets sent to destionation node)*100

4.1.3Average Energy Consumption:

Energy consumption of the network is the sum of energy consumption of eachnodes in the network. Energy consumption of every node is the subtraction between initial energy of the node at the start of the communication and the energy of the node at the end of the communication. Measured in 'Joules'.

Average Energy Consumption (Joules) = ∑_(i=1)^n▒(Inital Energy(i)-Residual Energy(i))/(Total No.of Nodes)

4.2 Comparison, and Performance Analysis of Cooperative multicast Dynamic channel using Multicast Proactive Source Routing O-CORMAN, with non cooperative, PC-3, CANCP-3 algorithms:

The mobility model uses RWModel in an area of (1000 * 1000) m2 , with fixed 50 nodes. Here each packet moves with random speed and random selection of source and destination node pair is done.

Table1: performance of multicast routing algorithm values with density offixed number (50) nodes.

				Mcast O-CORMAN
	Mobility m/s	%PDR	Delay	Avg.Consumed Energy
	5	87.8922	1.58808	0.411256
	10	79.9967	1.39285	0.407248
	15	52.5763	2.7461	0.433823
	20	38.2692	3.54517	0.446456
	25	32.6357	4.40712	0.428437
				Non-cooperative
	Mobility m/s	%PDR	Delay	Avg.Consumed Energy
	5	43.1929	4.79189	0.533477
	10	33.021	4.45403	0.468947
	15	47.1958	3.60644	0.454409
	20	38.4856	3.67706	0.442773
	25	27.3128	5.0645	0.432484
				PC-3
	Mobility m/s	%PDR	Delay	Avg.Consumed Energy
	5	21.117	11.0968	0.404095
	10	21.1601	6.78816	0.439792
	15	28.5926	4.40343	0.438195
	20	32.6721	8.15761	0.507975
	25	21.0147	7.46575	0.488721
				CANCP-3
	Mobility m/s	%PDR	Delay	Avg.Consumed Energy
	5	29.8117	6.32335	0.496661
	10	63.5144	2.82949	0.397392
	15	14.2927	5.70761	0.46507
	20	52.6864	2.17949	0.447932
	25	29.2794	4.40226	0.601471

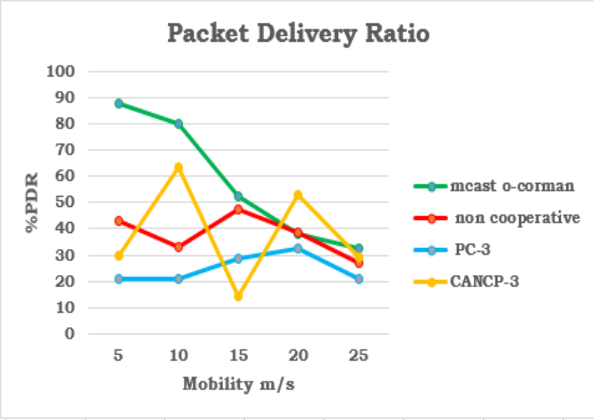

Figure 1: %Packet Delivery Ratio Vs speed m/s for PC-3,CANCP-3,O-CORMAN and Non-Cooperative routing algorithms for 50 node

The above figure 1 shows the % Packet Delivery Ratio Vs Speed scenario for 50 nodes in network, deployed in anarea of (1000 * 1000) m2 . From the figure, as the speed is increases from 5 m/s to 25m/s the O-CORMAN gives better performance than other non –cooperative , PC-3 and CANCP .The O-CORMAN PDR varies between 32% to 87%, whereas non cooperative varies between 27% to 47%,while PC-3 is low PDR between 21% to 32% and CANCP 14 % to 63%.Becuse in O-CORMAN the number of packet dropped is less, due to here drop tail queuing algorithm is used for congestion control.

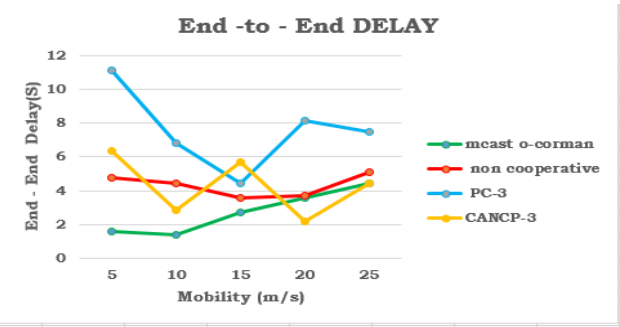

Figure 2: End-to-End Delay Vs speed m/s for PC-3,CANCP-3,O-CORMAN, and Non-Cooperative routing algorithms for 50 node

The above figure 2 shows the End – to –End Delay Vs Speed scenario for50 nodes in network,deployed in an area of (1000 * 1000)m2 . From the figure as the speed increases from 5 m/s to 25m/s observed that O-CORMAN gives better performance than other non –cooperative ,PC-3 and CANCP-3.This is because RSSI is used , to determine the signal strength of received node , it allows only strong signals nodes for further processing of data forward .By keen observation at speed 20m/s the O-CORMAN delay is more than CANCP-3 ,it means that packet drops more in O-CORMAN ,hence it needs more retransmission .By further keen observation from the graph,the PC-3 delay is higher than CANCP-3,Non cooperative and O-CORMAN. In O-CORMAN as the mobility increases the delay is more when compared with less speed, because link failure in less hence less route discovery.

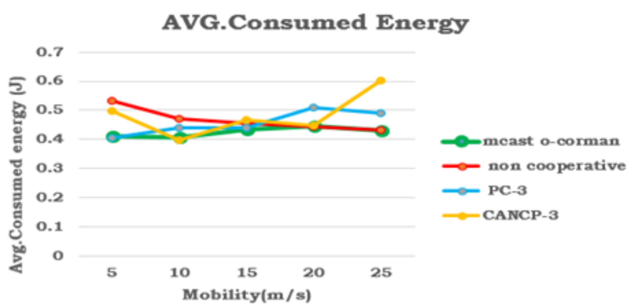

Figure3: Avg. Consumed Energy Vs speed m/s for PC-3,CANCP-3,O-CORMAN, and Non-Cooperative routing algorithms for 50 node

The above figure 3 shows that Avg. consumed Energy Vs Speed scenario for 50 nodes in network , deployed inan areaof (1000 * 1000) m2 . From the figure as the speed increases from 5 m/s to 25m/s observed that O-CORMAN consumes 4.5% to 22.9% less energy than Non – cooperative. Whereas compared with PC-3 consumes 0 .9% to 12% less energy, and further compared with CANCP-3 consumes 6% to 52% less energy. Because, the data packet forward from one cluster to another cluster by consider the metrics are maximum residual energy, minimum Link Cost, 0 outage . otherwise data packets is not forwarded further .Hence O-CORMAN protocol is ,most suitable for an energy efficient routing for multicast cooperative routing in MANET.

5. Conclusion

In this article develop a proposed algorithm Multicast O-CORMAN for MANETs. It has three components. ‘Multicast Proactive Source Routing Protocol(MPSR)’,‘Large scale-live update (Finding frontier node of forwarder list update)’, ‘Small scale Re-transmission’ for missing packets. The efficient routing performance metrics of Multicast O-CORMAN are % PDR , End -to- End delay , and Average power consumption. In future, this algorithm can be extended by increasing the number of receivers and added with, change the pause time and analysis the performance.

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