# Minimizing the excess computations in Mobile ad-hoc networks using Neighbor Coverage

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***Abstract:*** **Neighbor Coverage based data routing is a widely researched problem in recent years. Many researchers have proposed techniques for data routing and compared their results with the existing techniques on the basis of various performance parameters. The important parameters for the comparison are considered as packet delivery delay, packet delivery ratio, residual energy, throughput etc. In the proposed approach a novel trust based social impact theory optimization technique is implemented for data routing. In future other bio inspired and nature inspired algorithm must be implemented and used for the same problem description and their results are compared with the existing techniques.**

***Keyword:*** **MANET, NCPR**

## I. INTRODUCTION

MANET is type of wireless network which generally has a routable networking environment on top of a link layer ad hoc network. Mobile ad-hoc network comprise of self forming, peer to peer network and this network is one of those networks in which it can change its location and configure itself on the fly. This is due to the reason that the MANET networks are the mobile networks which uses wireless connection to connect to several network. It may be standard Wi-Fi connection like cellular communication, satellite transmission. Also some mobile networks are limited to local area of wireless devices while some are connected to internet. For example, VANET is one of the types of MANET network which permits vehicle to communicate with roadside equipment. As we know that the vehicle does not have direct internet connection, then the roadside equipment provide the wireless connection which allows the data from the vehicles to be sent over internet. The data of vehicle can be utilized to measure the traffic conditions. MANETs are generally not secure due to its dynamical nature, thus it is important to be careful what data is sent over MANET.

MANET network provides limited bandwidth. This is one of the major concerns in ad-hoc network. Wireless connection have less capacity as compared to other networks such as infra- structured network. Moreover, the realized throughput of wireless communication is lower than the radio's maximum transmission rate. Dynamic topology is main challenge of MANET network which is required to be resolved. This may disturb the trust relation between the nodes. The trust can also be broke if any node is found to be compromised. Higher packet loss is one of the major challenges in mobile ad-hoc networks. This packet loss occurs due to several factors such as transmission error, interference, path breaking, due to collision between hidden terminals and also because of mobility of nodes. The network topology in MANET is dynamic in nature because of the nodes movement. Thus, continuing session may suffer frequent path breaks. This circumstance frequently guide to route changes. Battery constraint is also one of the significant challenges. As the devices utilized in these ad-hoc network have some limitations on the power source to sustain the size, weight and portability of the device. This type of ad-hoc networks carries new security challenges to the network design. As the wireless medium is vulnerable, the wireless networks are fundamentally showing to several security attacks.


Fig.1 MANET architecture

Rebroadcasting of data in Mobile Ad-hoc Network is an important issue of concern in recent years. Various neighbor coverage techniques have been proposed and probabilistic scenarios have been computed in order to take the decisions of rebroadcasting of data. In the proposed work social rank of a node is calculated using the various performance parameters like packet delivery ratio, residual energy. Trust of a node is computed using the social impact theory optimizer algorithm which is based on the previous interactions of the node. The data is transferred to the neighbors for further transfer of data to the destination. The problem of rebroadcasting in Mobile Adhoc Network is an important issue of concern in recent years. Rebroadcasting of data in the network is often considered as the memory consuming issue as it increases the network overhead. The number of times a message or a packet is rebroadcasted it takes an increase amount of energy also. So an optimal solution must be considered which not only secure the data and reduce the overhead but can also rebroadcast it with minimal energy required. The overhead can sometimes also be increased if a node is trying to encrypt the data in order to make it secure from various attacks. So for security also some optimal technique must be used which will not require any encryption or decryption technique to work. For this issue few node associated parameters must be used which will be considered to calculate fitness value. These parameters often considered are residual energy of the node which is the energy remains at the node after transmitting or receiving of data, distance between the neighbors of the node within the network. Some benefits of MANET network is given as following:

1. These network gives access to the data and services despite of geographic location
2. These networks are independent network from the central network administration.
3. MANET network are less expensive in comparison with wired network.
4. These are Self-configuring network.
5. These networks are scalable, which can contain the addition of more nodes.
6. MANETs have improved flexibility and robust nature because of decentralize administration.
7. MANET networks may be set up any time and at any location.

## II. RELATED WORK

To minimize the routing overhead request, probability mechanism is developed using a distributive and systematic algorithm. This helps to deal with flooding mechanism in routing. If there will be requirement of maximum bandwidth and minimum delay is available then a route is chosen for transmitting data for an application. The algorithm is to provide service support to AODV protocol in the form of reduced control overhead. The simulation result is done by using NS-2 tool. The performance of the proposed approach indicates that it is very efficient and provides high performance. [1]

Because of less redundant rebroadcast, the NCPR protocol moderates the network collision and contention, which increases the packet delivery ratio and decreases the average end-to-end delay. [2]

In DPR, the packets are forwarded to the neighbor node with dynamically computed probability called as forwarding probability (FP). The probability function is calculated based on the density of the local neighbors and cumulative amount of neighbor mobile nodes. The performance of the several protocol of routing has been compared by some QoS parameters of MANET, namely, overhead, average collision rate, end-to-end delay, and network throughput. [3]

In Dynamic Node Recovery genetic algorithmic operations ensure optimal recovery of node failures reduces the recovery time considerably and improves the throughput of the network. It also enhances the network lifetime as the proposed approach leads to lower energy level drops in the nodes. [4]

To minimize the control overhead of request packets of probability mechanism is employed.. The simulation results indicates that the presented method performs better as compared with already existing schemes in terms of delivery ratio, routing overhead and specially in average end to end delay. [5]

Enhancement to the Ad-hoc on Demand distance vector (AODU) protocol adds quality of service and load balancing features to AODV by adding two extension and QOS flag to the route request (RRE) and Route Reply (RREP). [6]

Rebroadcasting Neighbor Coverage protocol (RBNC) helps in reducing the high channel contention and routing overhead by retransmission. It is simulated in NS2 and the result is verified and the rebroadcasting is analytically discussed. [7]
Adaptive forwarding strategy uses the data of 1-hop neighboring radios. In this strategy nodes does not requires a positioning system to find their location. The node which receives the message from separate groups is taken as gateway nodes. This gateway node helps in forwarding RREQ packets and also unessential re broadcast is avoided. [8]
Retransmission delay is used to evaluate the retransmission order. Thus, it's getting precise coverage ratio by sensing coverage and connectivity factor. NCP protocol is used to analyze these two parameters and this parameter helps to avoiding the irrelevant data. [9]

## III. **APPROACH**

### *A. Neighbor Coverage Based Probabilistic Rebroadcast (NCPR)*

NCPR protocol scheme is used to reduces the routing overhead. To obtain the neighbor coverage information the protocol employs rebroadcast delay and rebroadcast probability approaches. The rebroadcast delay is used to obtain the forwarding order. The rebroadcast probability is determined to minimize the number of transmissions, thereby improving the routing performance. Neighbor coverage-based probabilistic routing protocol is suggested by Xin Ming Zhang et al. to develop the understanding about the neighbor coverage, requirement of rebroadcast delay is arises which helps to discover the rebroadcast order and using accurate ratio of coverage may be obtained. In order to evaluate the forwarding order, the rebroadcast delay is used. If any node having more common nodes as compared to previous node then that node having less delay. The connectivity factor metric is required to calculate the amount of neighbor who receives the route request packet. By adding the connectivity factor and coverage ratio, there will be rebroadcast probability that may be utilized to organize the number of rebroadcast of RREQ packet. This protocol helps to enhance the performance. The rebroadcast probability determined using two factors i.e. coverage ratio and connectivity factor.
This approach produces less rebroadcast traffic as compared to above mentioned protocols and some other traditional protocol. It helps to avoid collision in network and hence improve the packet delivery ratio. Also it reduces the average packet end to end delay due to its less redundant broadcast feature. The main advantage of this protocol is that it provides high performance even in high density networks or in high load traffic.
The rebroadcast delay is developed to determine the forwarding order and the node that contains more common neighbors have the lower delay. The uncovered neighbor set U (Xi) of a node is determined as follows:

$$UXi = NXi - NXi \cap NS - S$$

Where, Xi and S are the node and upstream node respectively. And N(S) and N (Xi) are the neighbors of node S and Xi respectively. The additional coverage ratio is defined as

$$ACR\ X_i = \frac{U\ X_i}{N\ X_i}$$

This shows the ratio of the additional neighbors that are covered by this rebroadcast. As ACR becomes larger, more nodes would be covered by this rebroadcast and hence the rebroadcast probability must be set to high. The connectivity factor may defined as

$$CF = \frac{N_c}{N\ X_i}$$

Where Nc is the connectivity metric. When is greater than Nc , then CF is less than 1. This means the node Xi is in the dense network area; only portion of the neighbors of Xi that forwarded the RREQ packet maintains the network connectivity. When is less than Nc , then CF is greater than 1, meaning that the node Xi is in the sparse network area and should rebroadcast RREQ to approach network connectivity.

### *B. Broadcasting In MANET*

Broadcasting is a basic framework for unicast routing protocols such as DSR, Ad hoc On-Demand Distance Vector (AODV) ,Zone Routing Protocol(ZRP), and Location Aided Routing(LAR), use broadcasting to establish routes for delivery of packets. Each host is equipped with a CSMA/CA transceiver. In such an environment, a host may communicate with another directly or indirectly. Thus it is significant to design an effective method for broadcasting so as to avoid redundancy in the dissemination process for discovering the route in the multi-hop network. Further, broadcasting is frequently used to discover and advertise resources. A simple example of resource discovery is the route discovery in many reactive routing protocols. Broadcasting is also frequently used to distribute content to all network participants, such as alarm signals or announcements. The packets are forwarded to the neighbor node with dynamically computed probability called as forwarding probability (FP) in dynamic based routing. The probability function is calculated based on the density of the local neighbors and cumulative amount of neighbor mobile nodes. Hence, it is vital to identify the dense and sparse regions.
A typical application for broadcasting in MANETs is news spreading. Examples are the broadcasting of aid information in a disaster area to coordinate relief actions, the dissemination of parking availability information in a city scenario, dissemination of accident information in Vehicle Ad hoc Network (VANET) and the dissemination of alarms and announcements. Further content distribution applications are publish-subscribe applications, where some nodes are subscribers to content providers. These applications typically run in the background for a few hours or even a few days.
Further typical broadcast scenarios are resource (or service) discovery and advertisement. MANET nodes may have capabilities and services offered by each other. An example of resources is a multi-hop routing path to a given destination. For highly dynamic topologies the route is continuously changing and the resource is so highly dynamic that maintaining a route to all nodes at every time is very costly. However, most of the time, it is not necessary to have an up-to-date route to all other nodes. Hence, a novel class of reactive routing protocols, such as DSR and AODV has been developed. This is realized by a route discovery mechanism, which uses broadcasting strategies to distribute control messages for route discovery. Another significant purpose of

broadcasting is the sensor data dissemination. Real-time sensor information can be spread to other nodes. This helps to realize the complete replicated data base in which each database node has constant view of event. Data consistency algorithms act on disseminated observation data and chronologically order observed events in MANETs.
A brief overview of the paper is as follows: section II summarizes some of the related works in the topic of Probabilistic Rebroadcast for Reducing Routing Overhead in MANET and the primary research issues. The recently developed methods are described with a brief explanation, analyzing their advantages and limitations and future scope. Finally section III represents the conclusions.

## III. CONCLUSION

In order to reduce the excessive computations and to decrease the heavy load of data traffic neighbour coverage knowledge of mobile nodes in a network is used to accurately determine the different performance parameters of a network in order to recreate a broadcasting order so as to improve the results of the coverage ratio. Because of a less inessential broadcast it diminishes the network collisions and the variance of the data and therefore increases the delivery ratio of the data packets thereby reducing the end to end delay. The Social Impact theory optimization technique is implemented in the software NS-2.

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