Novel Technique Using Fuzzy Logic for Reliable Data Transfer Using Congestion Control in Mobile ADHOC Networ

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ABSTRACT:
In this article, a modern method focused on fuzzy logic was developed in order to resolve the topic of congestion in the Mobile ADHOC Network. In order to approximate the degree of congestion in deployed nodes and find out the optimal transmission rate for deployed nodes, our framework consists of two key distinct components. Then, it can change the propagation rate in the immediate nodes. In terms of packet loss and even energy usage, the efficiency of this strategy correlates with PCCP, which is a non-fuzzy algorithm, and FCC. The suggested methodology has been shown to increase network efficiency. It is attributed to the comparatively high density of nodes and connectivity pattern of source-to-sink. Not only does congestion cause packet failure, it often contributes to unnecessary use of resources as well as delay. It is therefore necessary to suggest designing a novel approach for congestion estimation and control in order to prolong network existence and enhance justice and have better service quality. We are proposing a fuzzy logic dependent algorithm to identify and monitor the amount of congestion in the Mobile ADHOC Network to resolve this problem. Local knowledge such as packet loss rate and delay to manage congestion in the network is treated by the proposed algorithm. Simulation findings indicate that in prolonging network lifetime as well as decreasing packet loss, our protocol performs better than a recently established protocol.

Keywords
MANETs,ADHOC Network,QOS,RREP
Article Received: 18 October 2020, Revised: 3 November 2020, Accepted: 24 December 2020

INTRODUCTION

Mobile ad hoc networks (MANETs) are a collection of mobile nodes connected together without any infrastructure and central management. The nodes in these networks, due to the limitations in their transceivers, cannot directly communicate with each other. In this case, the data will be sent by other nodes. Indeed, nodes play the roles of router and host. Using their mobility feature, nodes make the network change constantly and cause different paths between two nodes to be created. Dynamic topology and other factors such as the size of large networks, heterogeneity of hosts, and various structures plus the limitations of batteries has resulted in routing protocols specifically designed for this kind of networks. Using their mobility feature, nodes make the network change constantly and cause different paths between two nodes to be created. Dynamic topology and other factors such as the size of large networks, heterogeneity of hosts, and various structures plus the limitations of batteries has resulted in routing protocols specifically designed for this kind of networks. It is essential to have QoS in mobile networks because of the increasing demand for quality of service (QoS) applications. As shown in Figure 1, without any infrastructure, mobile nodes communicate with each other. In these networks, in order to have a safe communication, different mechanisms are provided. These mechanisms such as congestion control and routing prevent packet loss during congestion and they will increase the efficiency of communication. According to the properties of ad hoc networks, each network protocol faces many problems. In other words, designing routing protocols for these networks due to their dynamic structure, the limited bandwidth of wireless communications, and the limited energy of nodes is not simple. The main problems faced by the protocol in ad hoc networks can be summarized as follows: There are loops in routing, high overhead and wasted network bandwidth, long convergence time, great memory requirements in each of the nodes, high computational complexity, and excessive delays in routing and sending data packets. for link bandwidth so that the data rate used by each sender would be adjusted. Thus, the network would not be overloaded. Packets that arrive on a router and cannot be sent are discarded. As a result, a large amount of incoming packets in the network bottleneck causes a lot of packets to be discarded. These packets may have traveled a long way in the network and consumed adequate resources. In addition, packet loss often causes retransmission of packets.

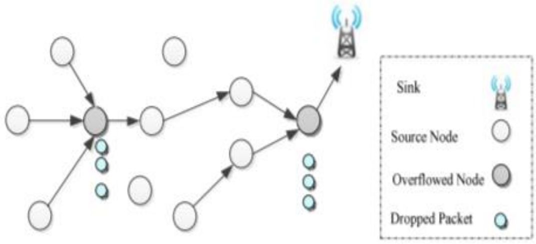

Fig. 1. Simple Schema for Node-level Congestion [2]

This means even more packets sent into the network. Therefore, network congestion can severely degrade the throughput. If a proper congestion control mechanism is not applied, it can cause the network to collapse resulting in no data being delivered successfully. In order to address the issue of congestion in MANET, several methods have used a fuzzy logic principle that has been implemented to date. Fuzzy logic strategy is a framework for the construction of stable structures that can deal with complexity, noise estimation and imprecision due to real-world environments. As surveyed in [3], a variety of fuzzy-based methods have been established to solve congestion problems in MANET.

RELATED WORK

In MANET a node works as a host just as a router as there is no central head to disperse the coming traffic, some middle of the road node get overwhelming traffic and the circumstance emerge that the node isn't capable or to store the coming data packet. In such condition node begin to drop the data packet. In the event that these occasions happen much of the time, at that point it is called congestion. It is essential to stay away from congestion breakdown in remote multibounce arranges so as to perform productive congestion control. For this reason numerous creators have proposed different congestion control algorithms trying to stay away from bundle misfortunes and to guarantee solid conveyance of packets from source to goal. This part reviews past work in which congestion control strategy has been applied to improve the exhibition in MANET.

D. Neznik et al [1] in this article, fuzzy logic is often defined in the wireless network as channel rank. Such data is necessary for smart channel selection based on fuzzy logic and its influence on the selection of channels for CR MANET devices. The point is to illustrate the probability that wireless contact between devices will signal parameters to us. Additional measurements and estimates are not required. The option of the channel selected is dependent on spectrum characteristics obtained from radio range instruments. The goal is to explain how channel rank and atmosphere interference can affect the selection of channels in CR MANET based on information obtained. This effect has contributed to the selection of multiple channels for contact between devices.

N. Sirisala et al [2] the proposed model selects the nodes that are competent and cooperative (Uncertain Rule-based Fuzzy Logic QoS Confidence Model in MANETs -FQTM). The QoS parameters (such as capacity, bandwidth, connexion stability) test node capability and assess cooperativeness in terms of reliability. Fuzzy reasoning is implemented by considering the consistency and efficiency measures to measure the node confidence benefit. In order to construct a route from source to destination, FQTM selects nodes with higher confidence values. The efficiency of the approach suggested is presented in principle (complexities of time and space) and experimentally.

A. Chaudhary et al[3]This paper stressed the usage of fuzzy Logic to build an intrusion prevention method to identify the packet falling assault from ad hoc mobile networks and also delete the malicious nodes in order to conserve mobile node energy. Qualnet simulator 6.1 and the Mamdani fuzzy inference framework are used to evaluate the effects from the point of view of execution. The findings of the simulation indicate that our device is more capable of detecting falling attacks with a strong positive and low false positive score.

M. Wahengbam et al [4] a modern paradigm of the wireless transition is the Mobile Ad Hoc Network (MANET), which is a self-configured wireless mobile network. It is gaining recognition and prominence due to the proliferation of miniature but efficient mobile computing devices. Due to its inherent features, such as complex topology, lack of a centralised coordinator and accessible wireless channel, MANET is, however, susceptible to security attacks. In this article, we discuss some MANET protection threats and suggest utilizing an Intrusion Detection Method (IDS) to classify the threat. In order to identify suspicious activity and understand threats, the proposed IDS utilize fuzzy logic.

W. Romsaiyud et al[5] It is used to reduce the repeated questioning of almost static details. It is possible to query the data once and store it in a cache, and the mobile node accesses the data cache repeatedly, or maybe the cache is changed to get new data. There are a lot of research work going on to solve the problems of how to decrease mobile side latency for clients, how to preserve cache compatibility between different caches and servers, and how to encourage multiple peer caches to cooperate, etc. In this article, a model is introduced to forecast data in cache activity on the mobile side by implementing a fuzzy logic approach to avoid transaction failures that interact through cellular networks during execution in the mobile device.

K. Thangadurai et al [6] the traditional routing algorithm has been shown to be unsuitable for routing multimedia traffic or real-time applications that need many service parameters to be optimized. They do not consider associations between multiple parameters for route selection. In the idea, an method named a routing protocol focused on fuzzy ant colony utilizing fuzzy logic and SI of various targets while maintaining the merits of the information algorithm focused on swarm. The simulation results indicate that the current SI-based routing protocols for MANET routing have been significantly enhanced.

CONGESTION APPROACH

Four congestion levels are assumed, namely low congestion, high congestion, moderate congestion, and critical congestion. The nodes will behave as described below according to which level they belong to: Low mode: In fact, in this state there is no congestion in the network and the intermediate node sends packets normally. Low congestion in the proposed method was introduced in order to consider all situations in the model. Nothing will happen for controlling congestion. Moderate mode: In this state, the nodes experience a small congestion. To avoid congestion in the network, the

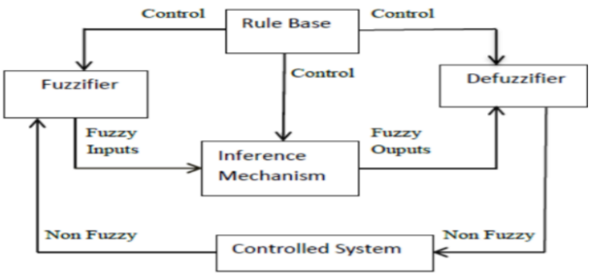

Figure 2:Fuzzy Logic based approach [4]

Congested node: announces a warning message to 1/2 its upstream nodes to find a new alternative route for packet transmission.

High mode: In this state, the intermediate nodes suffer high congestion and the congested node announces a warning message to 2/3 its upstream nodes to find a new alternative route in order to transmit packets.

Critical mode: In this state, the congestion level is too high and the intermediate node that suffers from congestion announces to the source node to find a new alternative route and reduces its transmission rate.

The congestion problem lacks a clear solution. Diagnosis and management of congestion leads to increased network performance. If nodes are considered in terms of their behavior, the congestion problem can be solved as a behavioral problem. A behavioral model of congestion at the nodes helps to modify the behavior of nodes. Whenever congestion occurs in the network, nodes change their attitude towards other neighbor nodes and network nodes and in the event of severe congestion situations, they have distinct behaviors from the past. The proposed method consists of two phases to detect and prevent congestion. At the diagnosis step, the behavioral model and the fuzzy system are used. At the prevention step, the behavioral model and cross-layer variable are used. This is shown in Figure 4. The main reason of using the behavioral model is to have an abstract view of the congestion control problem. This view leads to solving the problem from the perspective of different layers. For example, sometimes TCP and UDP packets are required to exhibit distinct behaviors. Although in video or voice transmission applications a slight delay may cause no problems, for delay-sensitive applications it may lead to adverse effects. Therefore, the behaviorist view can solve the problem from a behavioral perspective.

Proposed Methodology

In the recent research of mobile ad-hoc network dramatically change the communication scenario because dynamic routing provide flexible to move communicator device anywhere in any time with the help of intermediate nodes. However some challenges occur (congestion or collision) due to nature of unstructured behavior of the network topology, which increase unreliability of communication network. In this paper we proposed efficient congestion aware and control mechanism that improve the all aspects of network performance of mobile ad-hoc network. In this proposed work divided into three sub module and collaboratively provides efficient approach of congestion minimization with minimum overhead. These modules are route established, route reliability and Collision/Congestion resolves and link reliability. A. Route Established In this section describe about how the route initially established and resolve the route brake problem while the node continues change their topology. In this algorithm initial step to define the input parameter i.e. number of mobile nodes, sender receiver nodes, step time etc. than the execute algorithm with some constraint. In the next stage check the route table for established link are update or not if found that link are updated then we check the new link from lk to lm. If the link is break than local route repair technique is call and established the new path from lk, to lk+2 with efficient manner and minimized reroute broadcasting by sender node.

Working of Proposed Methodology

The proposed MLLR (Modified Local Link Repair) multi-charge approach was suggested in order to set the path locally without creating much overhead and vitality. This estimate reflects a modification to the current EOD-LLR steering agreement. In the present convention, the uplink hub transmits RREQ parcel in the network to form a specific path for multi-distribution collection when a connection is broken up. In any case, the proposed MLLR convention does not include a full route, but only fixes the part of the course broken.

The proposed Convention operates in the following style: MLLR Multicast Routing Protocol:

(a)Route revelation arrange: if the source gadget has details foreseen for any multicast segment or for its founder, it searches its reservation memory for any accessible route. If the path is not found, it sends a broadcasting mechanism to find a narrow route to multi-cast gatherings at that stage, like AODV or DSR. The RREQ parcels now advance to its neighboring hubs from the source node. Following a similar process, the adjacent hubs must retransmit the package before the end of the meeting or the pioneer stage is reached. The RREQ pack is approved and retransmitted.

b) Route Reply organize: Once the RREQ parcel comes to a multicast gathering, the gadgets respond with the Route Reply (RREP) message unicasting to the Source Gadget. Any section of the multi-cast bunch or the leader of the community will unify this post.

c) Data transmission: When the RREP message is accepted by the source gadget, the shortest route is taken and information is forwarded to the intended destination hub.

d) Modified Local Route Repair Mechanism: if a hub discovers that the connection to the downlink hub is damaged, a course fix instrument starts during information transmission. In order to explore the path of the uplink gadget, the Uplink gadget again transmits the RREQ bundle to a gadget in the direction. If a way involves a source-a-b-c-d-goal, for example. If the link a-b breaks apart, then the hub 'a' communicates the RREQ bundle in order to find a path towards the hub 'c' instead of transmitting it until the target node.

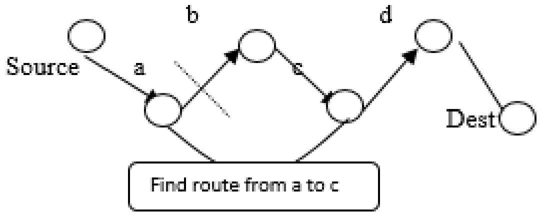

Figure 3 Route Repair mechanisms

In the above figure 5.3, it is shown that the node 'a' finds a route to node 'c' in case the link 'a-b' breaks. Thus, the broadcasting all the way to the destination node reduces the overhead as well as energy consumption of the nodes.

Proposed Algorithm

Step:1 Suppose N is the total number of devices in the system.

Step:2 M is the number of multicast members

Step:3 Nei is the nodes in the neighbour set

Step:4 Proc: Route Discovery

a) Route found =0
b) While (Route found = = 0).
c) for i=1:N
d) Source 'S' finds neighbours in the communication range.
e) For j=1: Nei
f) For k=1: M
g) If Neighbour(j) == Multicast member(k)
h) Route found = = 1
i) Execute RREP()
j) Else
k) Broadcast Route Request to the neighbours
l) End if
m) End for
n) End for
o) End for
p) End While

Step:5 Proc: Route Reply

a) Formulate all the routes from multicast group to the source device
b) Unicast RREP to the source device

Step:6 Proc: Data Transmission

Suppose P is the set of paths formulated

a) For i=1:P
b) If Path (i) == shortest
c) Transfer data to the multicast group
d) End if
e) End for
f) Check for Link Breakage
g) If Link Breakage found
h) Execute Route Repair
i) Else
j) Continue Data Transmission
k) End if

Step:7 Proc: Route Repair

a) Node = uplink node
b) Route found =0
c) While (Route found = = 0)
d) for i=1:N
e) Uplink Node finds neighbours in the communication range.
f) For j=1: Nei
g) If Neighbour(j) == Node next to downlink node
h) Route found = = 1
i) Execute RREP()
j) Else
k) Broadcast Route Request to the neighbours
l) End if
m) End for
n) End for

Conclusion

This research identifies and describes abnormal network events during data transmission as one of four potential mistakes including loss of the link, channel failure, buffer overload and conflict of link rates. The data is then transferred by alternative paths when the error type is formed. The additional fuzzy logic to the three parameters such as network access, channel loss, buffer overload, and bridge layer containment would pick the new alternative routes. Through choosing the optimum value path the optimum output path is selected and the three input parameters are taken into account in compliance with fuzzy legislation.

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