Congestion Prevention in Vanets using Pollination based Optimization

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Abstract- Communication means to ensure that data from sender must reach the receiver correctly and completely. But in many cases due to some reasons this objective of the communication is not achieved to its best, one of the reason among them is congestion The technique or algorithm to overcome this problem is suggested in this paper is pollination based optimization(PBO) – a congestion preventive mechanism.. It helps to change the route if necessary , and there is no need to follow the same path or route if that path is congested or there are chances of congestion. This algorithm is implemented in the VANET scenario and performance parameters like packet delivery ratio, end to end delay and node overhead ratio are evaluated. Further the results obtained are compared to the results obtained by implementing the previous congestion control technique ie. dynamic distributed fair transmit power adjustments **(DD-FPAV)**

Keywords- Pollination , Congestion, Optimization etc

I. INTRODUCTION

Vehicular ad hoc network (VANETS) is one of the variety of MANETS. The main purpose of VANET is to allow wireless communication between the vehicles on the road including the roadside wireless sensors, enabling the transfer of information to ensure driving safety and planning for dynamic routing,[1] allowing mobile sensing as well as providing in-car entertainment.[3] As VANETs have unique characteristics which include dynamic topology, frequent disconnection of the networks, and varying environments for communication, the routing protocols for traditional MANET such as Ad hoc On-demand Distance Vector (AODV) (Perkins and Royer, 1999) are not directly usable for VANETs . VANETs have attracted increasing attention from both research and industry communities within recent years [5]There are many different ways to find the route by nodes or there are many other algorithms like DSDV, DSR, AODV. In orbit to the avert scoop of MANETS like absence of the settled infrastructure, wireless links or multi-hop broadcast the communications, VANET carry the new defy to catch safe communication architecture inflowing of the environment. There are three types of communication i.e vehicle to vehicle communication , vehicle to infrastructure and infrastructure to infrastructure.

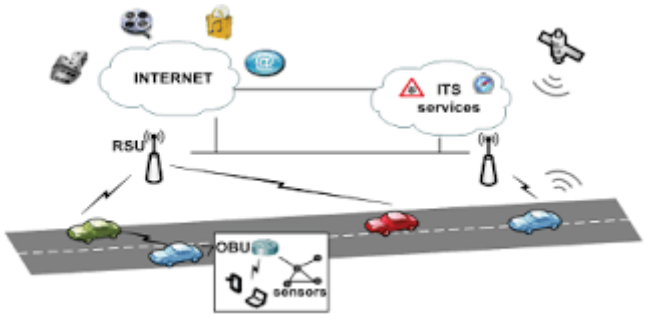


Fig 1: VANET[5]

II. CHARACTERSTICS OF VANETs

- High dynamic topology
- Frequent disconnected network
- Mobility modeling
- Mobility prediction
- Communication environment

III. CONGESTION IN VANETs

In modern world the one of the biggest problem is congestion through vehicles[2]. Technology always find new ways to control traffic problem. There are some congestion handling techniques one is prevention and other is detection and recovery. In previous studies congestion is controlled after an event has occurred but this research work has based on congestion prevention. Proposed technique suggests the unique and effective ways to get rid from congestion problem.[8]

(a)Congestion Control Mechanism-DD-FPAV

In the base paper congestion has been controlled by two ways one is beacon messages and second is event driven messages. The beacon messages are continous messages which are sent by nodes to neighbour nodes and the second message is event driven messages this message has sent when an event has occurred.[4] The technique which has used in this paper is DD-FPAV. It means dynamic distributed fair transmit power adjustments ,

Algorithm 1. DD-FPAV Algorithm: (algorithm for node ni)

INPUT: all nodes information in CSMAX(i);

OUTPUT: assigning a power, Pa(i), Beacon Generation Rate, BGR (i) for node n, in a way that the lowest level of congestion occurs; BMMTxP solution;

1. Using the nodes' information in CSMAX(i);

1.1. Procedure: find Traffic (for node ni);

According to the status of the nodes in CSMAX(i) and Neighbor table of ni;

Compute the number of neighbor vehicles and their speed;;

if 80% of neighbor vehicles' speed o¼30 km=h and number of neighbor vehicles 4 ¼150 then j

there is high traffic in street and return true; else j return false;

end

1.2. Procedure: Event-driven-Existence (for node ni); According to event-driven flag of sent message by ni; if event-driven flag=1 then j there is event-driven message and return true; else j return false;

End

1.3. Procedure: dynamic MBL (for node ni);

if findTraffic¼true and Event-driven-Existence¼true then BGR(i)=5 messages per second;

Return MBL=Bandwidth=3;

End

if findTraffic¼false and Event-driven-Existence¼false then BGR(i)= 10 messages per second;

Return MBL=Bandwidth;

End

if find Traffic=false and Event-driven-Existence=true

then BGR(i)= 10 messages per second;

Return MBL=2*BandwidthÞ=3;

End

2.The maximum transmit power value Pa(i) is computed in a way that the MBL threshold is not exceeded at any node in CSMAX(i)

3. Broadcast Pa(i) to all surrounding vehicles in CSMAX(i)

4. Receive the transmit power value from neighboring nodes like nj, where niACSMAX(j) and save it as Pa(j)

5. Calculate the final transmit power value by following expression: PaðiÞ¼minimum Pa(i)=;minj:niACSMAXðjÞ PaðjÞ

The limitation of this work is that it only controls congestion not prevent and there is more chances of data loss in that case so it is important to find the way which have less data loss and give good results.[8]

IV. PROPOSED APPROACH

(a)Pollination Based Optimization

Basically pollination is a mechanism that is followed in flowers. As flowers cannot move from one place to another so they transfer pollen from one flower to another through insects that comes to them. Insects play important role as the pollens stuck to them from one flower(sender) and is transferred by them to another flower(receiver).[9] There are two types of pollination one is self pollination and other is cross pollination[10]. Similarly the proposed scheme mimics the pollination process that occurs in flowers. In this paper pollination based mechanism is used for message broadcasting[11]. Location plays a vital role in pollination. With the help of this concept all the vehicles or nodes know that where is congestion based area for example if node 2 is going to some place and this node finds that there is congestion in this area then it informs previous vehicle that is congested area.[12] Every node has some area or range to broadcast the messages. The messages are move to another path or slow down the speed so that area have freed from congestion.[13]

Algorithm of Pollination based optimization

1. Objective min = count or max= energy

2. Initialize a population of n nodes with random energy values

3. Find the best solution i.e. highest energy route value

4. Define a switch probability p ∈ [0, 1]

5. while (t < MaxGeneration)

6 if random energy< higest energy

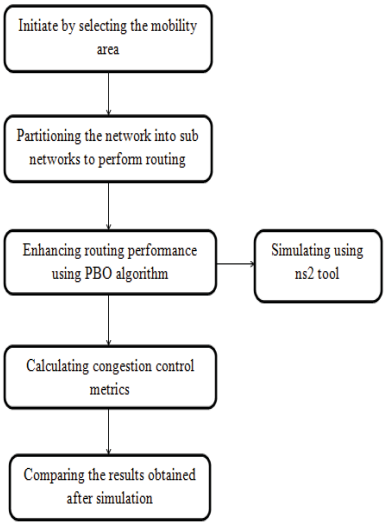
7. if count1<count-high

8. else

9. follow alternative path

A series of simulations were conducted, with the experimental results verifying the effectiveness and feasibility of the previous work[14]. This work has used with intelligence. The main problem is congestion does occur when multiple nodes has followed same path[15]. In previous work congestion has been controlled after it occurs. The main focus of this work is to prevent from congestion before it occurs. [16]

FLOW CHART OF THIS MODEL



This flow chart represents the proposed model of congestion prevention using the technique pollination[17]

- Firstly initiate by selecting any mobility area in which nodes can move or vehicles can move
- After this divide the network into sub networks to perform routing
- Now the turn is to broadcast messages about any congested area which is possible through pollination
- Node 2 can give the message to previous node 1 in the range of that node 2
- Enhance routing performance by pollination use simulating NS2 tool
- After that calculate the congestion control matrices
- At last compare the result

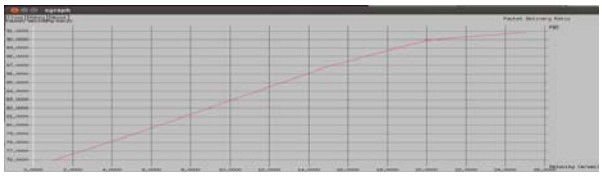
V. SIMULATION RESULTS

Both the algorithms (DD-FPAV and PBO) has been implemented in NS2 simulator taking 50 nodes Further the comparison is driven between the two algorithms on the basis of parameters like packet delivery ratio, End to End delay and normalized overload ratio. [19]

A.Packet Delivery Ratio

Formulae of packet delivery ratio

∑ Number of packet receive / ∑ Number of packet send

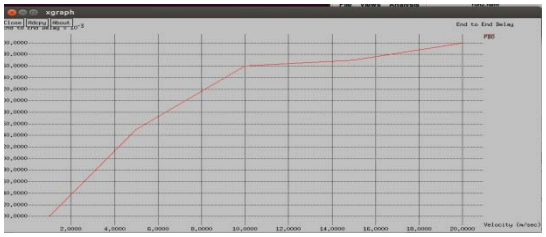


Packet delivery ratio for 50 nodes

In this graph within enhance technique PBO when the time has increased then more packets have been transferred. Almost 90% packets have been transferred in this graph. The greater value of packet delivery ratio means the better performance of the protocol

B. End to End delay- This is the second parameter in this paper the graph show that with the increasing of time the less will be delayed. These graphs shows 50 nodes. The data packets which are successfully reached the destination has counted.

Formulae of End to End delay is
∑ (arrive time – send time) / ∑ Number of connections



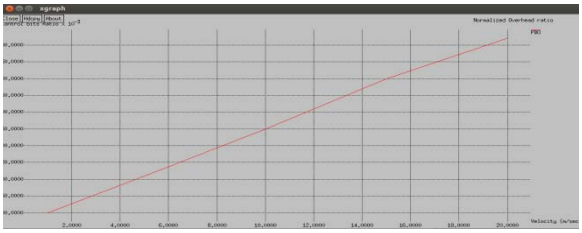
End to End Delay for 50 Nodes

With the help of PBO The lower value of end to end delay means the better performance of the protocol.

C Node overhead ratio- In this graph the fact is the packets should not be overloaded so there is less chances of congestion

Formulae of node overhead ratio

Number of packet send – Number of packet received



With the help of PBO as the velpcity increased so the packets are less overloaded

VI. CONCLUSION

This paper dealt with the congestion, one of the major challenges in VANETs. In this paper the performance of preventing congestion has been established in better way. Pollination technique has been used to enhance the performance like PBO(pollination based optimization). The work has been carried out for 50 nodes. With the help of the evaluation of parameters like Packet delivery ratio, End to End delay and node overhead ratio the performance of PBO has been compared to DD-FPA.The results show the significant improvement in the performance parameters in case of PBO than DD-FPAV technique.

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