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AN IMPROVED EGPSR ROUTING PROTOCOL FOR THE CONGESTION CONTROL IN VANET

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Abstract: *Vehicular ad hoc network is a subcategory of MANET. VANET provide ad hoc network topology for vehicles communication. Vehicle communication is important in recent research area. The main objective of the VANET is to provide the accident free environment, driving safety and traffic management. For communication VANET use intelligent transport system (ITS), V2V AND V2I. ITS provide many application such as safety , route planning, frequent data exchange. This paper includes the study of the congestion problem in GPSR protocol. This paper purpose a new improved EGPSR for the congestion control using a border node technique. Three parameters throughput, end to end delay and packet delivery ratio are used to analyze the results. Ns2 simulation tool is used to check the performance results and SUMO is used to create the city map and launch the vehicles. In this paper I-EGPSR shows the better results than E-GPSR.*

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Keywords:: *E-GPSR, I-EGPSR, VANET, border node.*

I. INTRODUCTION

In wireless ad-hoc network MANET and VANET play an important role for communication. VANET is a sub category of MANET which is formed to share the information between vehicles [1]. The main purpose of the VANET is to reduce the road accident and congestion problems. It improves the driving safety and traffic management. VANET uses the rapid changing network topology, it can frequently change of nodes and information from other vehicles and transfer the information within a specific time period [4].GPS is used in vehicles to track the location of vehicles. It provides inter vehicle communication which pass the alert message to other vehicles. [3] ITS (intelligence transport system) is the main part of the VANET which is used for the broadcast information and provide frequent data exchange and safety. To send the broadcast information vehicles itself act as a sender and receiver. V2V and V2I communication is used in ITS. V2V is a inter vehicles communication used for multicast and broadcast data transmission. In V2V vehicles can directly communicate with other vehicles. In V2V message are generated either at regular interval or on demand. Messages which are generated on demand is useful to reduce the congestion problem. V2I (vehicle to infrastructure) is a single hop communication. Vehicles can communicate only to road side units.

Routing in VANET

Routing protocol in VANET is classified into following categories:-

- Position based routing protocol
- Topology based routing protocol
- Broadcast routing protocol
- Geocast routing protocol
- Cluster based routing protocol

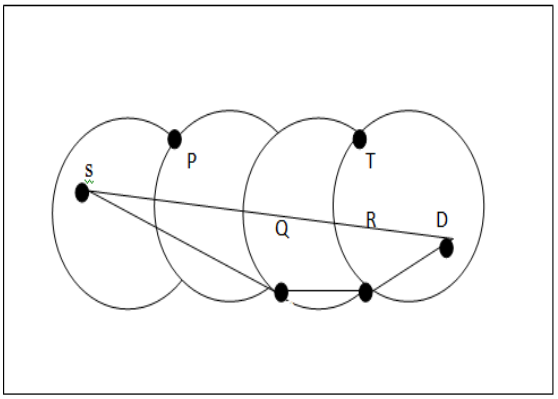
Position based routing protocol: Position based routing protocol are classified into :

- GPSR
- SAR
- DREAM

Greedy Perimeter Stateless Routing:- . GPSR is a geographic position based routing protocol. In ad hoc network to find the geographic position of nodes it uses the native system like GPS, sender nodes which having the destination address. GPSR is used for dynamic network. It only obtains the information about neighbour node in network topology. It keeps the information about next hop neighbours position and nodes which is immediately added in network. If sender

forward some data packet, but these packets directly not send to the destination so it use the GPSR protocol. GPSR forward these data packet to nearest node to the destination. All these data packets works on FIFO (first in first out), stored in FIFO queue after that data packets are forward to destination. Sometimes network congestion will occur when multiple data packets are forward over same forwarding node. In this paper we study the GPSR protocol and implement an improved GPSR protocol to control the congestion problem based on the border node.

Border node approach for GPSR : GPS is used in vehicles so all the nodes know the position and speed to transmit the packet to other nodes. All the sender nodes know their neighbour which are in the transmission range. Border node is the best way for the transmission in GPSR. GPSR use the next hop neighbour to transfer the packet to destination. The border node is selected as the nextforwarding node since the border node is the only neighbour node which is maximum away from sender and nearest to destination.



Source node (s) will select the node Q for next forwarding node, because it is nearest to destination as compared to P. Similarly Q will select R for next forwarding node rather than T and transfer the packet of information to destination, process will terminate.

II. RELATED WORK

MingliuZhang , Richard S. Wolff(2008) ,conveys that mostly all the routing protocol are designed for the urban area. But this paper purposes the challenge of vanet in sparse network condition that occur in the rural area. In this paper two techniques are used for the result evaluation which is epidemic routing and border node based routing protocol. Akhtar Hussain, S.C.Sharma(2016),conveys that performance is analysis between location aided routing (LAR) and distance effect routing algorithm for mobility (DREAM). Three parameters are used for the evaluation of results which are packet delivery ratio, throughput and delay in city and highway scenarios. In DREAM proactive scheme is used and location of all the nodes is stored in the location table. LAR is used to lower the overhead caused by the routing process. Tianli Hu, MinghuiLiwang(2015) purpose an enhanced GPSR for the congestion control in VANET based on the buffer length. E-GPSR shows the better results than GPSR as high packet delivery ratio, less delay, high throughput.

III. WORK METHODOLOGY

a) E-GPSR Routing protocol

GPSR routing protocol forward the data packet in frequent way such as fast sending and receiving. When multiple nodes send the data packet on the same node, no of packets will be increase at source side which cause congestion. To overcome this problem E- GPSR is implement based on the buffer length. E- GPSR considers the available length of the next forwarding hop and distance between next forwarding node and destination node. Results of E- GPSR shows the low packet loss rate, less time delay. [7]

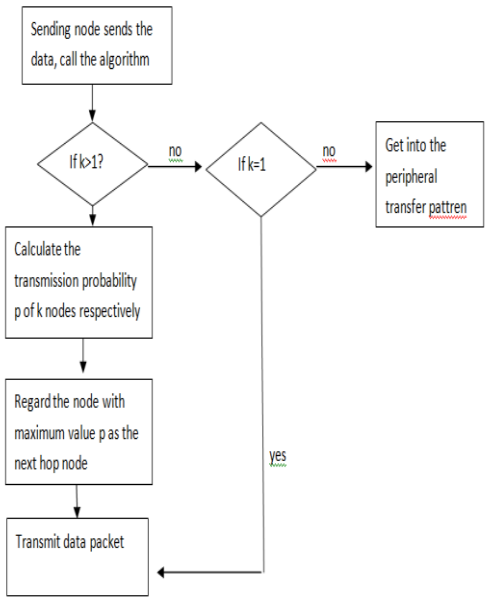


Figure 1: The congestion control strategy based on buffer length of nodes in E-GPSR. [7]

b) I-EGPSR Routing protocol

Improved EGPSR is based on the border node, transmission range and vehicles orientation. When data packet is send source to destination, it first checks the transmission range and selects only that next hop node which is in range. Working of I- EGPSR is similar to E-GPSR, but it have improved results than E-GPSR. High packet delivery ratio, less time delay, high throughput.

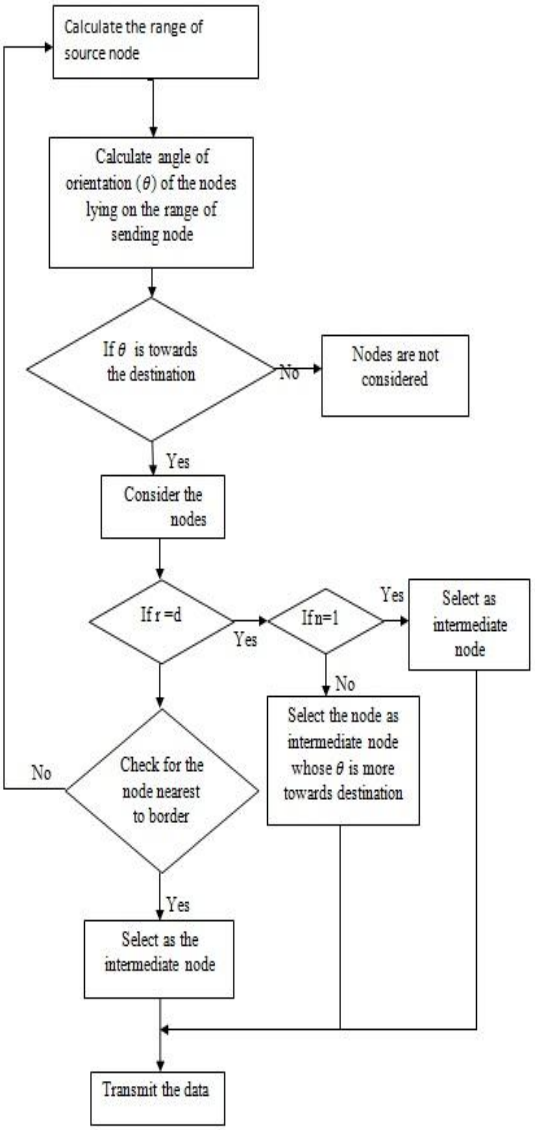


Figure 2: Flow chart of I-EGPSR

IV. SIMULATION AND PERFORMANCE ANALYSIS IN NS2 INTRODUCTION TO SIMULATOR

NS2 is used to analysis the performance results between the E-GPSR and I-EGPSR . SUMO is used to create the map of city. All the vehicles launch in SUMO and then configure to NS2 using .tcl scripts.

Table 1: The network simulation parameters in NS2

PARAMETER NAME	PARAMETER VALUE
Simulation time	100s
MAC Protocol	802.11DCF
Size of data packet	512 bytes
Packet transmission rate	5 packets/s
Application of the business layer	CBR
Number of nodes	60
Maximum speed of vehicle	20 40 60 80 100m/s
Network Bandwidth	2Mb/S

Table 2: Performance Analysis

	Throughput (Kbps)	End2End delay(ms)	Packet delivery ratio (%)
Speed 20m/s			
E-GPSR	652.87	3.08	98.951
I-GPSR	1524.55	1.977	99.361
Speed 40m/s			
E-GPSR	652.87	3.08	98.951
I-GPSR	1524.55	1.977	99.361
Speed 60m/s			
E-GPSR	652.87	3.08	98.951
I-GPSR	1524.55	1.977	99.361
Speed 80m/s			
E-GPSR	652.87	3.08	98.951
I-GPSR	1524.55	1.977	99.361
Speed 100m/s			
E-GPSR	652.87	3.08	98.951
I-GPSR	1524.55	1.977	99.361

1) **Throughput:** The throughput is interpreted as the number of successful data packets sent over the network. The Throughput is measured in bit/s. It is calculated as follows.

Throughput = (No Of Packets ∗Packet Size) / Total Time

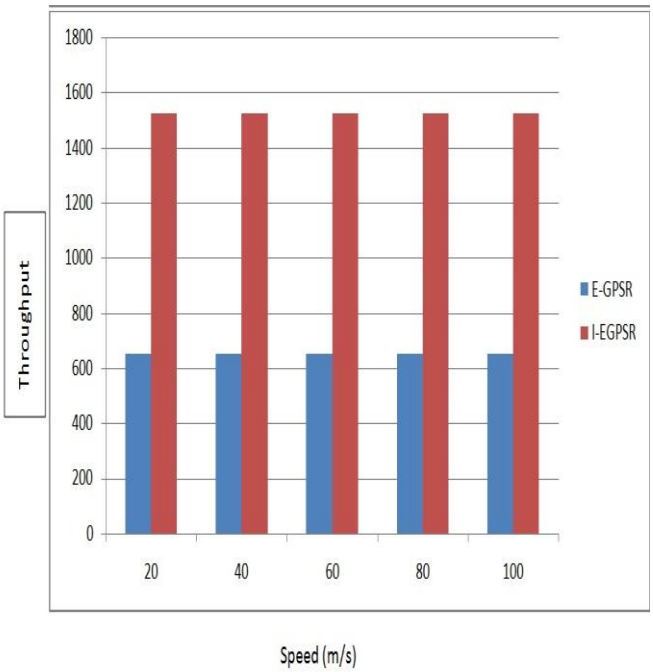


Figure 3: Graph shows the results of throughput for E-GPSR and I-GPSR.

2) **Delay:** It is the average time takes for a packet to arrive to a defined destination. It is calculated as follow:

Delay = Σ (Arrive time - Send time) / Σ Number of send message

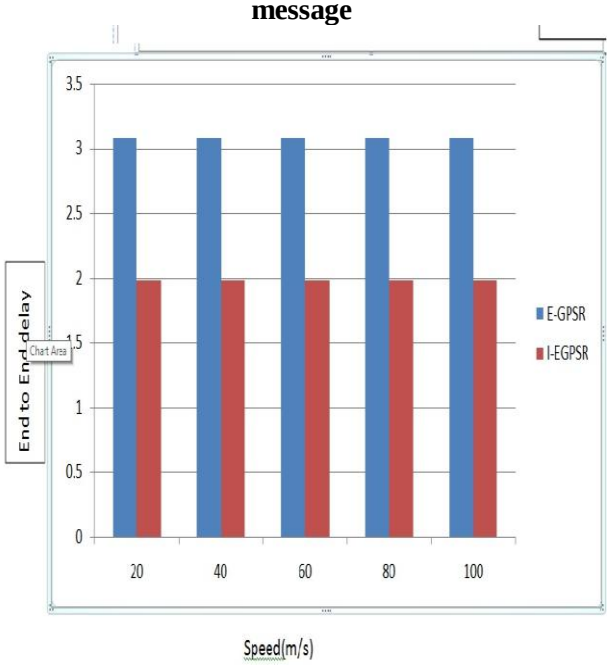


Figure 4: Graph shows the results of delay for E- GPSR and I-GPSR

3) **Packet delivery ratio:** Packet delivery ratio metric represents the percentage of delivered packets to destination that is the percentage of successful deliveries in the network is calculates as follow:

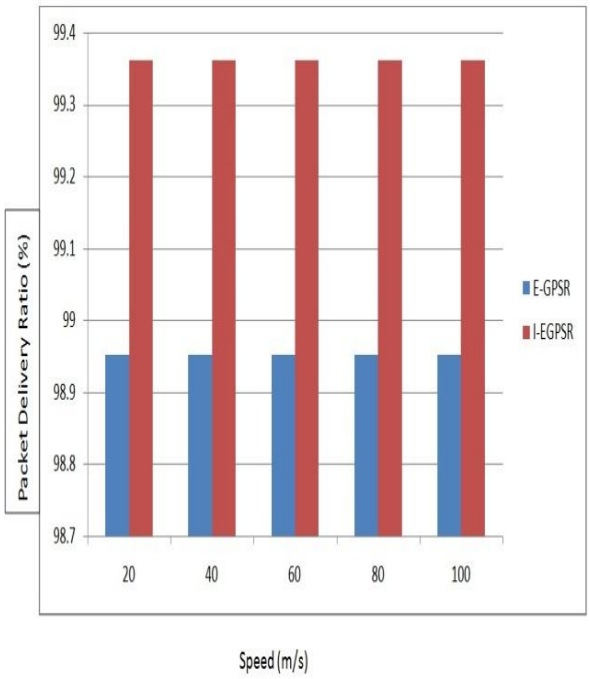


Figure 5: Results of packet delivery ratio for E-GPSR and I-EGPSR

V. CONCLUSION

In this paper, we purpose a new I-EGPSR (improved) to control the congestion problem. Congestion problem occur when multiple nodes send data packet at same time through same node. Improved EGPSR shows better result than enhanced GPSR. To analyze the results three parameters are used PDR, end to end delay and throughput. I-EGPSR has high packet delivery ratio, less delay, high throughput.

FUTURE SCOPE

In this thesis we compare the analysis between E-GPSR and I-EGPSR based on the three analysis parameters which are throughput, packet delivery ratio, end to end delay. In future we can implement more improved protocol than I-EGPSR. We can compare it with other topological routing protocol and we can also analyze the throughput, packet delivery ratio, end to end delay between the position based routing protocol and topology based routing protocol.

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