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Improving Performance of Routing Protocol in VANET - A Technical Research

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Abstract

Wireless networking is an emerging technology that will allow users to access information and services regardless of their geographic position. In contrast to infrastructure based networks, in wireless ad hoc networks, all nodes are mobile and can be connected dynamically in an arbitrary manner. All nodes of these networks behave as routers and take part in discovery and maintenance of routes to other nodes in the network. This feature presents a great challenge to the design of routing scheme since link bandwidth is very limited and the network topology changes as user's roam. This thesis investigates the behavior of existing traditional routing algorithms and proposes a new routing approach for ad hoc wireless networks. Proposed algorithm uses multiband alternate path concept on the basis of transmission and receiving power.
Keywords- VANET, Routing Protocols

I. Introduction

Be it in the field of hardware, in the field of software, or in the field of communication technologies many advances have occurred in recent years. Because of such advances different types of networks have been designed and implemented. Vehicular Ad-Hoc Network (VANET) is one such network. In the last couple of years, it has received a lot of interest. In the field of research, standardization, and development, VANET has become an active area. The reason being that it has great potential to improve vehicle and road safety. Other features include traffic efficiency, convenience and comfort to both drivers and passengers. We can thus say that there has been many VANET research work which has been focused on areas such as QoS, routing and also in areas like broadcasting and security.

Vehicular ad hoc network (VANET) is an ever blooming technology which is a combination of ad-hoc wireless network, cellular technology & WLAN. "Vehicular Ad Hoc Network" forms a wireless network where vehicles are connected to each other through an ad hoc formation. To achieve this, a wireless technology is implemented in vehicles. Each vehicle in the ad hoc formation acts as a mobile node. It then forwards data packets towards the destination. It includes V2V and VRC or V2I communications.

Wireless networking is one such blooming technology. Here, users can access information and services electronically. This is achieved in spite of their geographic position. Because of its blooming technology along with its popularity it has led to decrease in prices and increase in data rates. To achieve wireless communication between different nodes or host, there are two approaches.
1) Fixed Network Infrastructure.
2) An Ad-hoc network.

II. Objectives of Research

IRTIV selects the node using concept of shortest path. It calculates the traffic density for real scenario without adding any extra infrastructure or software and just by adding few bytes to hello packets. It also combines the algorithm of Dijkstra for calculating weight for each road segment.
- To study importance of VANET.
- To improve routing algorithm for V2V communications.
- To implement vehicle to vehicle communication using weight based algorithm.
- To check parameters such as Throughput, Delay, Packet Delivery Ratio and Energy consumption.
- Compare the results of the new algorithm with the already existing basic algorithm.

III. PROJECT DESIGN-MODULE

Two functions are used to handle routing. Those functions are DoWork () and DoConsume (). On the basis of event timers, the function DoWork () is called periodically. But when the interface receives a packet DoConsume () is invoked.

A. DoWork ()

The DoWork () function is called periodically based on four event timers:

1) UpdateownLSP: This is an event timer which controls the overall LSP mechanism. Each node would send its own LSP to neighbor nodes which is maintained by UpdateownLSP.
2) ScanLSPdb: This is an event timer which would scan its entire LSP database to check when to send a LSP which is received from another node.
3) DecrementAge: This is an event timer which would decrement the HELLO and LSP timeout timers. HELLO timeout timers are used to check if a node is a neighbor. The LSP timeout timers would decrement the AGE field of the LSP to insure LSP integrity.
4) SendHELLO: This is an event timer which would periodically send HELLO messages to neighboring nodes.

B. DoConsume ()

– If at the interface, a packet is received then DoConsume () is called. Packets might have reached either from the upper layers or from the lower layers. If it is received from the upper layer, then it would be either packet or debug packet whereas if it is from lower layer it would be routing packets or data packets. HandleData () would determine where the data packet should be sent which is on the basis of its routing table. In order to check if the LSP field is still valid or if the LSP field is accurate then HandleLSP () is invoked. However, HandleHELLO () would update the neighbor list. To calculate new routing table, ComputeRoutes () is invoked.

C. Flowchart of Proposed Work

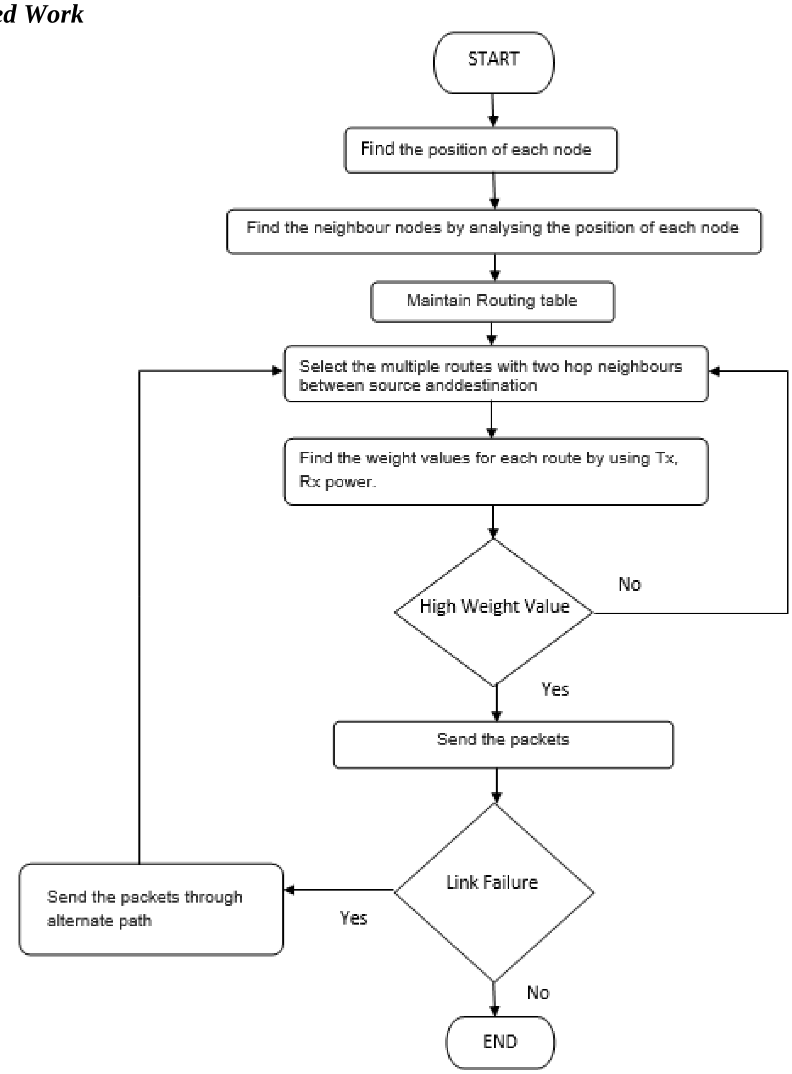

Fig. 3.3: Flowchart of Proposed Method

D. Selection of Nodes
Now, the node will be selected on the basis of weight. Weight is decided as per the traffic density, Dijkstra's weight and according to Tx and Rx power. The last factor is kept in order to check whether the node we are selecting has higher energy efficiency.

E. Simulation Model
A network of 30 mobile nodes which are migrating within a 20m x 20m spaces with a transmission radius of 5 meters is simulated. Every node in the network moves in a Random-waypoint fashion. In Random-waypoint, each node calculates a random destination and moves towards it at a fixed rate. Once the destination has been reached, it selects another random location and repeats the process. The raw channel wireless capacity is 2Mbits/sec. A traffic generator was developed to simulate constant bit rate sources between two nodes. Simulation runs of 200,000,000,000 simulation ticks (equal to 200 seconds of simulated time) were performed multiple times and the results averaged.

F. Simulation Parameters
The values of simulation parameters are:

Table 1: Simulation parameters

Parameters	*Value*
Number of nodes	*10-50 (in steps of 10)*
Initial energy	*100 J*
Data packet size	*512 bytes*
Transmission range	*250 m*
Transmission power	*0.05 J*
Receiving power	*0.04 J*
Simulation Time	*10 secs*

Network simulator (NS2) is used to simulate the network. Results are generated in the form of graph.

G. Performance Metrics

1) Energy Consumption
This can be defined as the amount of energy which is consumed by sensor nodes during the period of network lifetime in transmitting, receiving, computation, idle and sleep. The unit of energy consumption used in the simulation is Joule. Lower the energy consumption better is the performance of the network. The formula for energy of node:

Energy of node E= Initial energy – (Tx energy + Rx energy) * No. of packets

Where, Tx = transmission energy
Rx = receiving energy

2) Packet Delivery Ratio
"PDR can be defined as the percentage of ratio between the number of packets sent by sources and the number of received packets at the sink or destination." Higher the packet delivery ratio better is the performance of the network

Packet Delivery Ratio = (Total packets received / Total packets sent) * 100

3) Throughput
"It is the average rate of successful message delivery over a communication channel which is measured in bits per second i.e. bps."

Throughput = (Size of the packet / Transmission time)

4) End to End Delay
"It is a time required for packets to reach to destination node from source node." Lower the end-to-end delay better is the performance of the network.

D = (Receiving time – Sending time) * No. of packets

IV. SIMULATION RESULTS

The following graphs demonstrate the comparison of various performance metrics of AODV and proposed protocol.

A. Energy Consumption Over Speed of Nodes
Proposed protocol consumes less energy than AODV. This is achieved because proposed protocol is able to achieve equilibrium between the energy between paths. Thus, energy is balanced. Nodes with low energy is not selected. Hence, paths with higher energy are recognized and nominated for transmission.

B. Packet Delivery Ratio Over Speed of Node

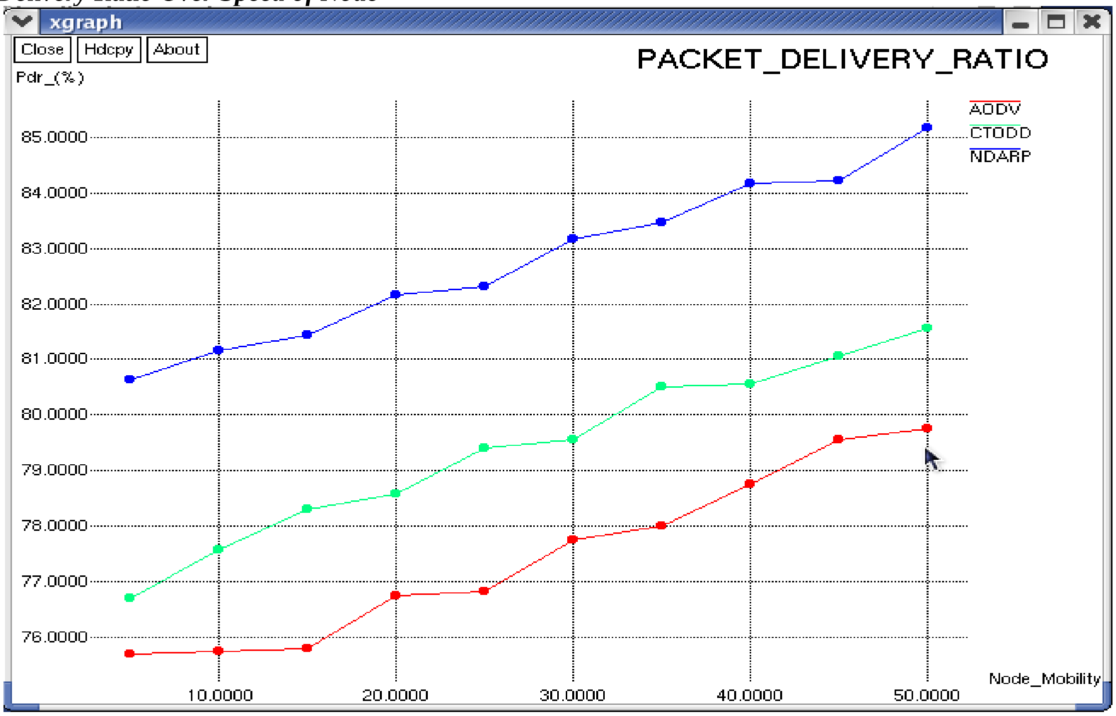

Fig. 3: Comparison graph of Packet Delivery Ratio over speed of node

Graph shows the comparison graph of packet delivery ratio over speed of nodes between AODV and proposed protocol. From the above graph it can be analyzed that the packet delivery ratio over time is much better in case of proposed protocol as compared to AODV. At some levels of speed, the packet delivery ratio is very high when using proposed protocol as compared to AODV. This shows the efficiency of proposed protocol.

C. End -To-End Delay Over Speed of Node

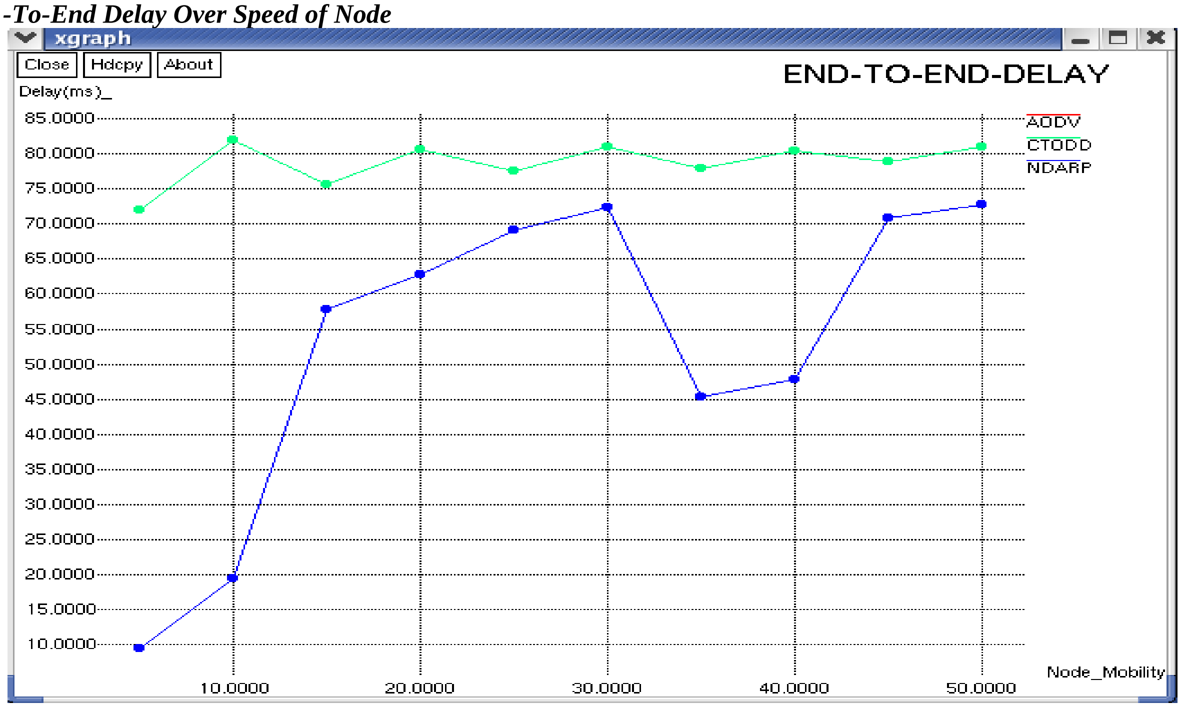

Fig. 4: Comparison graph of End-To-End Delay over speed of node

Figure 4 shows the end-to-end delay of the compared protocols. As the network size increases, the end-to-end delay increases. But as per the result we can derive that proposed protocol is better than AODV.

D. Throughput Over Speed of Nodes

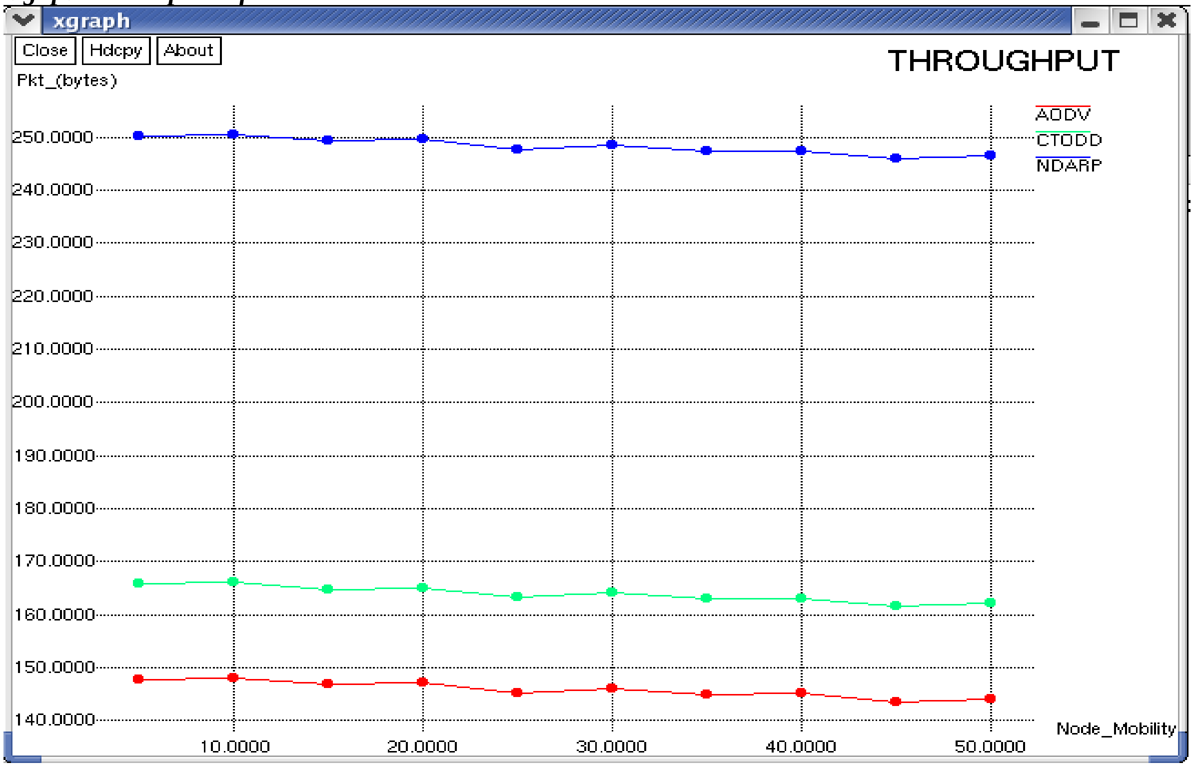

Fig. 5: Comparison graph of Throughput over Speed of nodes

Figure 5shows the throughput comparison for AODV and proposed protocol with respect to the speed of nodes. In high traffic load, the average throughput of proposed protocol is higher than AODV protocol. Proposed protocol increased the throughput to increase the quality of services in the network.

V. CONCLUSION

Several paradigms are proposed for vehicular communications. Another exploits V2I communications while some exploits V2V communication. The V2V communication forms a VANET where information is spread by hopping between the vehicles that make up the network.

Proposed algorithm selects the node using concept of shortest path. It combines the real time traffic density and the Dijkstra algorithm for calculating weight for each road segment. It also selects node on the basis of Tx and Rx power. IRTIV does not consider the effects of transmission power and receiving power.

This thesis presents the concept of the: Weight based routing protocol for VANETs and studies a network model based on the weight values for each route.

REFERENCES

[1] Chakkaphong Suthaputchakun and Zhili Sun,” Routing Protocol in Intervehicle Communication Systems: A Survey” IEEE Communications Magazine December 2011
[2] Ms. Bhagyashri Pete,” Continuous Connectivity Aware Routing in VANET Using Hybrid Protocol” IEEE sponsored 2ND international conference on electronics and communication system (ICECS 2015).
[3] Qing Yang and Alvin Lim,” Connectivity Aware Routing in Vehicular Networks”, WCNC 2008 proceedings.
[4] W.N. Wahidah Hashim,” A New Hop-Count and Node-Degree Based Routing Protocol for Vehicular ad-Hoc Networks(VANETs)”2013 IEEE 11th Malaysia International Conference on Communications,26th-28th November 2013, Kuala Lumpur, Malaysia.
[5] Yufeng Chen,”An Adaptive Cross-Layer Multi-Path Routing Protocol for Urban VANET”, Proceedings of the 2010 IEEE International Conference on Automation and Logistics August 16-20 2010, Hong Kong and Macau
[6] Omar Sami Oubbati, "IRTIV: Intelligent Routing protocol using real time Traffic Information in urban Vehicular environment," 2014 IEEE.