ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 6, June 2015

Aodv and Olsr Based Routing Algorithm for Highway and City Scenarios

ShubhrantJibhkate[1], Smith Khare[1], Ashwin Kamble[1], Amutha Jeyakumar[2]

M.Tech Student, Department of Electrical Engineering, VJTI, Mumbai, India[1]

Associate Prof., Department of Electrical Engineering, VJTI, Mumbai, India[2]

Abstract: The paper proposes routing algorithm for VANET (Vehicular Ad- Hoc Network) based on Ad-hoc on Demand Distance Vector (AODV) and Optimize Link State Routing Algorithm (OLSR) protocol. The algorithm implemented enables the way for optimization of the routing parameters. The algorithm takes into account the merits and demerits of both the protocols in the city and highway scenarios to implement an effective routing algorithm. The algorithm aims at improving the performance parameter of the routing such as end to end delay, throughput and packets delivery ratio for city and highway scenarios are calculated.

Keywords: VANET, AODV, OLSR, Routing Protocol.

I. INTRODUCTION

Vehicular communication [1] is the dominant mode of information transfer between vehicles. The most promising applications of vehicular communications is the VANET, an approach to the intelligent transportation system (ITS) [2]. VANET is a sub class of mobile ad hoc networks, which does not depend on fixed infrastructure, in which the nodes are highly mobile. Therefore, the network topology changes rapidly [3]. VANET provides wireless communication among vehicles and vehicle to road side equipment's. The boom in wireless communication technologies and need of new wireless devices have tends the researchers for research on self-organizing, self-healing networks without centralized or pre-established infrastructure or authority. The networks without [4] any centralized or pre-established infrastructure are called Ad hoc networks. The performance of VANET communication depends on routing process in the network and the routing process depends on routing protocols used in the network. The implementation of routing protocols in VANET is decisive in supporting the ITS. As a prerequisite, VANET routing protocols must establish an efficient route [5] between networks. The network nodes should adjust efficiently to the dynamic topology of moving vehicles.

Awaking drivers about the state of traffic, roads and related aspects are crucial and to the regulation of vehicle flow. To incorporate this timely, accurate information is essential. As shown in Fig. 1, VANET typically addresses this problem. Emergencies can be avoided by the facilities [6] provided by VANET technologies i.e. all information related to traffic mobility on the road, such as traffic density, speed, and directions of the vehicles as well as the weather, are gathered by using inter vehicle and vehicle to roadside communication technologies. This information helps consolidate road traffic and prevent accidents.

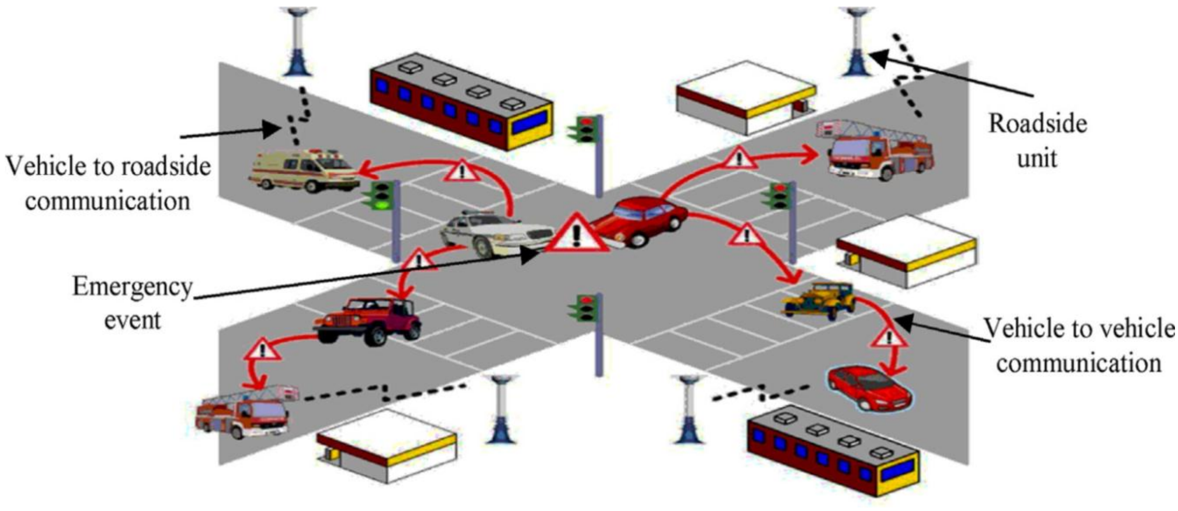

Fig1VehicularAdhocNetworkOverview

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 6, June 2015

II. RELATED WORK

The main task was to design [7] ad hoc routing method which has better performance in highly mobile environment of VANET. In this work the investigation was about to measure the performance of routing protocols in VANET in two different scenarios [8] i.e. city and highway scenarios. First of all various routing protocols were investigated through literature review [9] and two protocols AODV and OLSR have been selected for the implementation. The selected protocols were then evaluated through simulation in terms of performance metrics i.e. end to end delay, throughput and packets delivery ratio.
AODV [10] is ad hoc routing protocol where routes are established on demand. However, once routes are established it will be maintained in the network as long as it is neededfor routing. Source node discovers the routing path in the network. When a node wants to transmit data it initiates the route discovery process i.e. source node broadcast Route Request (RREQ) packets to its neighbours. The RREQ saved in the intermediate nodes between the source and destination establishes the reverse path. If the intermediate node knows the path to the destination it sends the route reply packets directly to the source node. The OLSR [11] protocol is based on the routing table inside every node in the network. The routing table is determined by knowledge of topology information which is exchanged by topology control packets. OLSR broadcasts hello messages to find its one hop and two hop neighbours. To avoid flooding in the network it uses multi point relays technique which broadcast the message in the selected group.

The AODV protocol is suitable [12] for a node with high speed i.e. it is applicable for highway scenarios where node density is low and OLSR protocol is suitable [13] for a node with low speed i.e. it is applicable for city scenarios where node density is high. Highway and city scenarios are modelled in NS2 taking into account the real time situation. Here while designing the city and highway scenarios actual situation was taken into consideration whereas previous work in the literature gives random movement with constant speed. Highway scenario was modelled with variable speed where no lane is specified i.e. node can move with variable speed.
The problem of node sticking was also taken into highway scenario and its effect on routing performance also evaluated. The algorithm designed for routing in highway was taken into consideration the direction of movement of nodes in only one direction. The city scenario was modelled with traffic signals and all possible movement of nodes was taken into consideration i.e. crossroad scenario and crossing along signal whereas previous work in city scenarios was based either on crossroad scenarios or crossing along signal. The comparison of AODV and OLSR protocol in table 1 for various parameters using AODV protocol.

- Source node initiates routing to its Cluster Head.
- The Cluster Head is selected as MPR node.
- The Cluster Head checks whether destination node is in its routing table. If so, it will forward the packet to the member.
- Otherwise, it will forward packet to cluster head of different group.
- When an intermediate node initiates routing request, it checks whether it is the destination node or is the re any path to destination.
- Packet forwarding mechanism in highway scenario using AODV protocol uses the following mechanism
- The routing request is initiated by source node by broadcasting an RREQ.
- TheneighboringnodecheckswhethertheRREQisnot aduplicatepacket.Ifitis a duplicate packed, it is dropped by node and if it is not so it forwards it to its neighbor.
- The source node receives RREP packet indicating that the path is chosen to obtain information.
- Beginning of routing process
- Initial checking of scenario is based on the speed of node with respect to the predefined threshold speed (S_{th}) and this threshold speed is scalable based on the given geographical location.
- If the node speed (S_N) is greater than S_{th} it is assumed that node is in highway and the routing process is initiated. The frame structure shown below will be assigned to every node in order to communicate in highway and to find the direction of node.

Table 1. Protocol Comparisons

Parameters	**AODV**	**OLSR**
Mobility (Speed)	High	Low
Packet Flow	Flooding	MPR
Network Type	Large Scale	Dense
Delay	High	Small

III. PROPOSED ALGORITHM

The proposed algorithm consists of following steps to be executed to perform effective routing

System Initialization

Destination Address	Sequence Number	Hop Count	Next Hop	Time Out	Speed

A new route discovery is initiated prior to the link expiry in order to reduce the delay in network.
But if the congestion in the network is more (which is determined by measuring overhead) then cluster based approach is used for routing in the network.

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 6, June 2015

The following procedure illustrates the cluster based routing approach:

The comparison for highway and city scenarios based the different parameter is shown in table 2

Table 2. Scenarios Comparison

Parameters	Highway scenario	City Scenario
Obstacles	Few	Many
Speed	High	Low
Speed Variance	High	Low
Node Density	Low	High

IV. SYSTEM IMPLEMENTATION AND RESULTS

The highway and city scenarios are modeled in NS2. The highway scenario with variable speed and square in city scenario with variable speed are modeled. Fig 2 shows the highway scenario with variable speed. These types of scenario generally occur in the metro cities of India and other abroad countries where infrastructure is not much developed. In this scenario the speed of node varies from 10 km/h to 120 km/h. The upper nodes move in the forward direction and lower nodes move in the reverse direction. In this scenario, problem of node stucking is also considered i.e. if some node becames faulty then the other nodes in that lane should get the intimation to change the there lane and move to different lane. The communication between the upper nodes and lower nodes occurs only when there is emergency situation like node stuck and there is emergency situation like any mishap. Otherwise, there is no communication between them as there is need to improve the performance parameter. In this scenario routing occurs only in one direction i.e. nodes moving in forward direction will only communicate with those moving in their direction only.

The simulation parameter set up for routing process is givenin table 3. The results shown in fig 3, fig 4 and fig 5 are calculated based on the parameters considered in table 3.

Table 3. Simulation parameter for highway scenario with variable speed

Parameter	Value
Channel data rate	1Mbps
Number Of Vehicles	50
Vehicle Speed	40 Km/s to 120 Km/s
Packet size	512 bytes
Routing Protocol	AODV
X-Y (meters)	1500 x 700

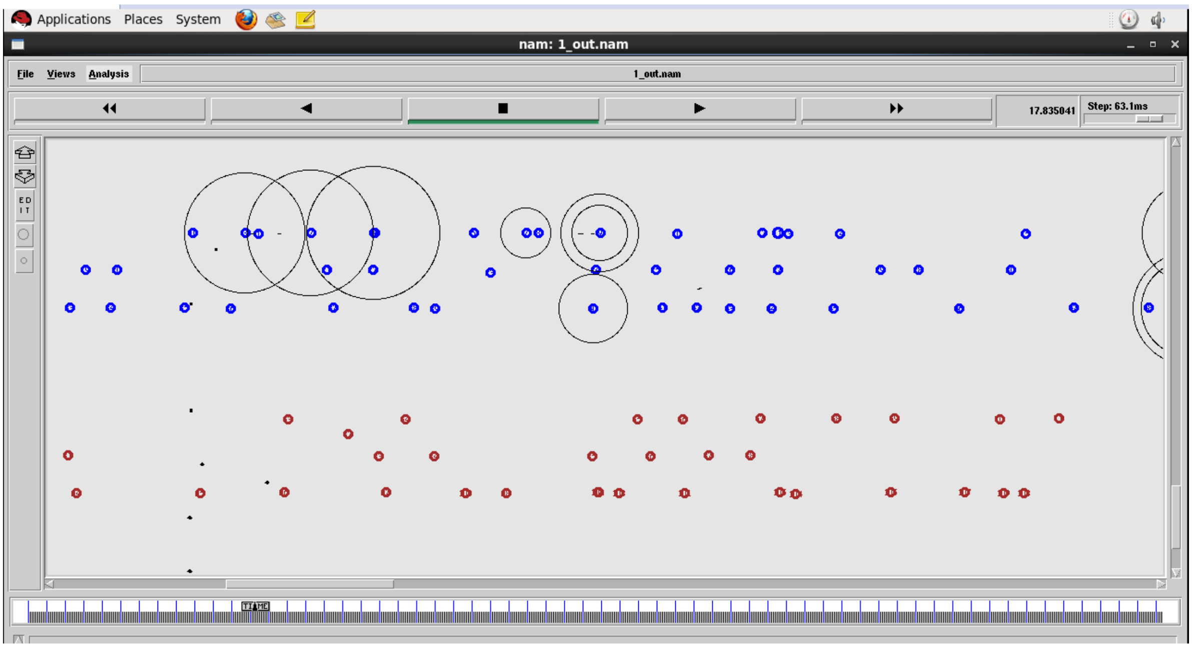

Fig 2 Highway scenario with variable speed and routing process

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 6, June 2015

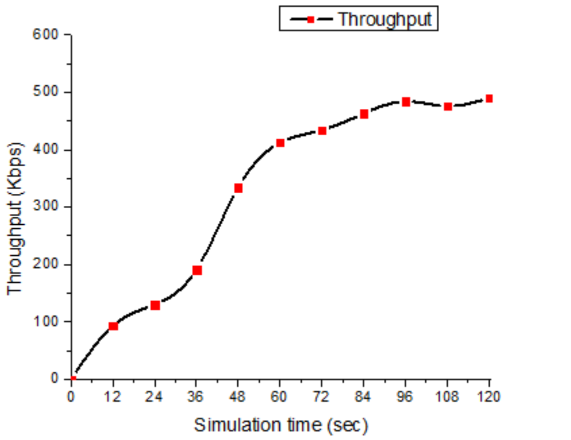

Fig 3 Throughput for highway scenariowith variable speed

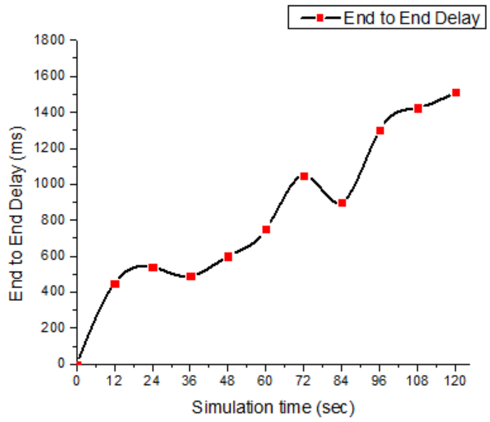

Fig 5 End to End Delay for highway scenario with variable speed

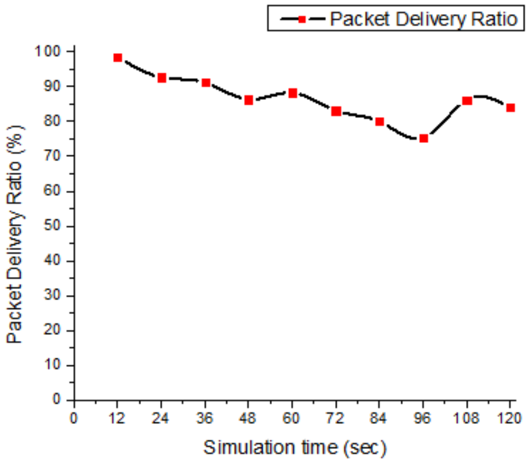

Fig 4.Packet Delivery Ratio forhighway scenario with variable speed

Fig 6 shows a city scenario with square and routing process. In these scenario square is defined with traffic lights. Two directions are defined in each way. The nodes will stop at signal and will move when traffic lights are ON. The speed of the node will vary from 10 km/h to 80 km/h. The nodes will move in all possible ways as happen in real time scenario.The OLSR protocol is used for routing. The routing process initiated so as to optimize the routing performance by taking into account the routing direction. The simulation parameter set up for routing process are given in table The results shown in fig 7, fig 8 and fig 9 are calculated based on the parameters considered in table 4.

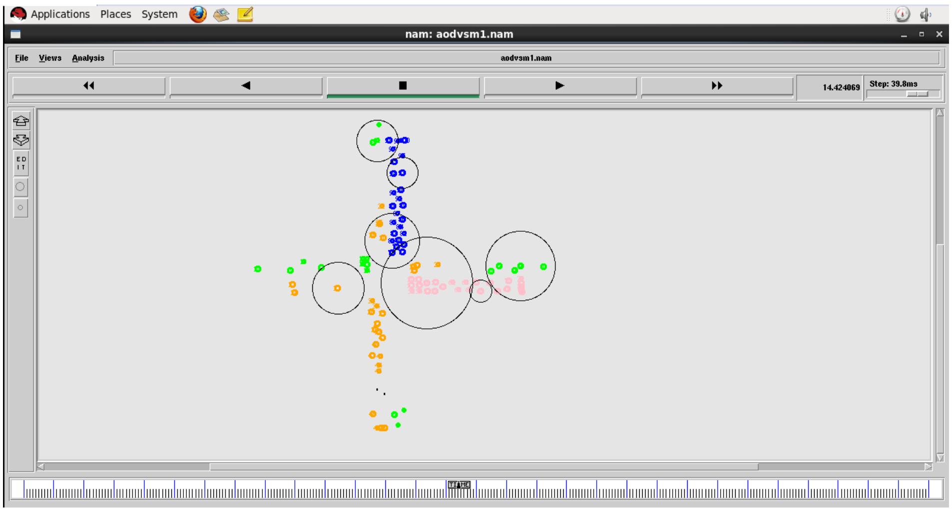

Fig 6 City scenario with variable speed and routing process

The results obtained were for routing parameter such as throughput, packet delivery ratio and end to end delay for each three different scenarios. Results for city scenario, highway scenario with constant speed and highway approximately theoretical and end to end delay is negligible as OLSR gives better end to end delay. The routing performance parameter in highway scenario with scenario with variable speed were obtained. Routingperformance parameter in city scenario for throughput is approximately constant, packet delivery is

constant speed has throughput increases as time increases, packet delivery ratio is good and end to end delay is

 DOI 10.17148/IJARCCE.2015.4660

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 6, June 2015

significant as distance between the nodes is high. The performance parameter highway scenario with variable speed has throughput, packet delivery ratio and end to end delay fluctuates with the distance between nodes increases or decreases.

Table 4. Simulation parameter for city scenario with variable speed

Parameter	Value
Channel data rate	1Mbps
Number Of Vehicles	50
Vehicle Speed	40 Km/s to 120 Km/s
Packet size	512 bytes
Routing Protocol	OLSR
X-Y (meters)	260 x 260

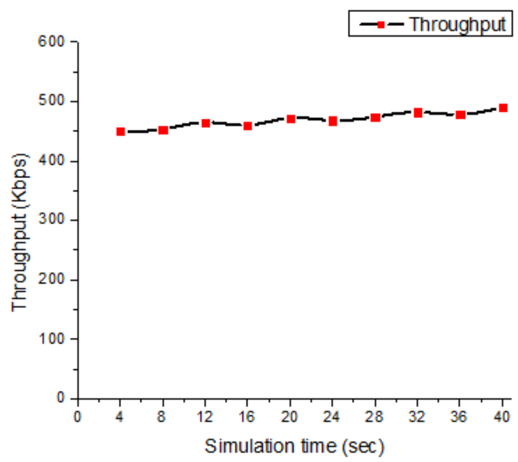

Fig 7 Throughput for city scenario with speed

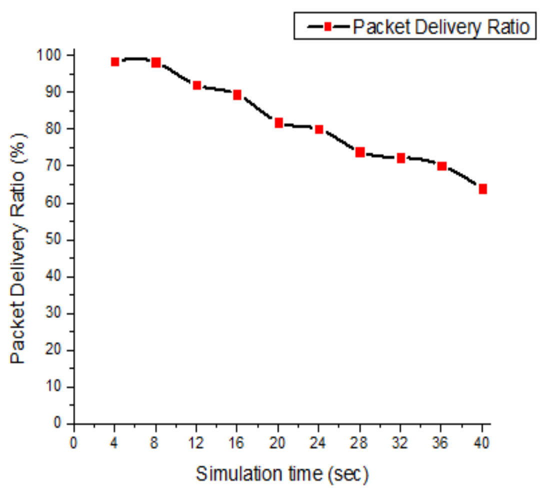

Fig 8 Packet Delivery Ratio forcity scenario with variable speed

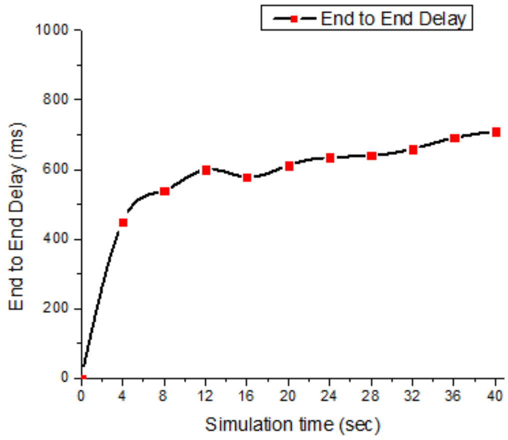

Fig 9 End to End Delay for city scenario with variable speed

IV. CONCLUSION

The paper implements an efficient routing based on the proposed algorithm in NS2. In this paper we focused on topology based routing protocols. Performance of the proposed scheme is illustrated with numerical results obtained from simulations which show that better results are achieved. The routing algorithm for highway and city scenarios was implemented in NS2 by using routing protocols AODV and OLSR. The results are satisfactory for city scenario and highway scenario with variable speed. The results for highway scenario are depending upon the distance between the nodes.

The future work lies in the implementation of the dynamic protocol which accepts the speed of node directly from the NS2. Also, different radio propagation models should be taken into account and different parameters such as routing overhead, topology change and traffic quantity.

REFERENCES

1) Yousefi S, Mahmood M, and Mahmood F. "Vehicular ad hoc networks (VANETs): challenges and perspectives." 6th International Conference on ITS Telecommunications Proceedings, pp. 761-766. IEEE, 2006.
2) Singh, Surmukh, and Sunil Agrawal. "VANET routing protocols: Issues and challenges." In Engineering and Computational Sciences (RAECS), 2014 Recent Advances in, pp. 1-5. IEEE, March 2014.
3) PauL.B, Md Ibrahim, MdBikasNaser. "VANET Routing Protocols: Pros and Cons." International Journal of Computer Applications, pp 28-34 vol 20 April 2011.
4) E. Spaho, Gj. Mino, L. Barolli and F. Xhafa, "Goodput and PDR Analysis of AODV, OLSR and DYMO Protocols for Vehicular Networks using CAVENET", International Journal of Grid and Utility Computing (IJGUC), Vol. 2, No. 2, pp. 130-138, 2011.
5) Boukhalkhal A, Yagoubi M.B., Djoudi D, Ouinten Y and Benmohammed M, "Simulation of Mobile Adhoc Routing Strategies" , IEEE, 2008, pp.128-132.
6) Baraa S., Raed A., Mahamod I., " Vehicular communication ad hoc routing protocols: A survey, "Journal of Network and Computer Applications, vol. 40, pp. 363-396, April 2014.
7) J. C. Zhao, G., "VADD: Vehicle-Assisted Data Delivery in Vehicular Ad Hoc Networks" INFOCOM 2006. 25th IEEE International Conference on Computer Communications. Proceedings, pp. 1 - 12, April 2006.

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 6, June 2015

8) Zhang, M.; Wolff, R., "Routing protocols for vehicular Ad Hoc networks in rural areas", Communications Magazine, IEEE, vol.46, no.11, pp.126-131, November 2008.
9) Ranjan, Prabhakar, and Kamal Kant Ahirwar. "Comparative study of VANET and MANET routing protocols." In Proc. of the International Conference on Advanced Computing and Communication Technologies (ACCT 2011), pp. 517-523, January 2014.
10) Perkins C., Belding E., and Das S., "Ad hoc On-Demand Distance Vector (AODV) Routing," IETF RFC 3561 , 2003.
11) Clausen T., and Jacquet P., "Optimized Link State RoutingProtocol (OLSR)," IETF RFC , October 2003.
12) O. Abedi, R. Berangi, and M. A. Azgomi, "Improving Route Stability and Overhead on AODVRouting Protocol and Make it Usable for VANET," Distributed Computing Systems Workshops, 2009. ICDCS Workshops '09. 29th IEEE International Conference on pp. 464 - 467, 22-26 June 2009.
13) Karp, B. and Kung, H. T., "GPSR: greedy perimeter stateless routing for wireless networks", In Proceedings of the 6th Annual internationalConference on Mobile Computing and Networking (Boston, Massachusetts, United States, August 06 - 11, 2000). MobiCom '00. ACM, New York, NY, pp. 243-254.

BIOGRAPHIES

Shubhrant Jibhkate is M.Tech Student in the Department of Electrical Engineering, Veermata Jija bai Technological Institute, Mumbai, India.

Smith Khare is M.Tech Student in the Department of Electrical Engineering, Veermata Jija bai Technological Institute, Mumbai, India.

Ashwin Kamble is M.Tech Student in the Department of Electrical Engineering, VeermataJijabai Technological Institute, Mumbai, India.

Prof.AmuthaJeyakumar is Associate Professor in the Department of Electrical Engineering, Veermata Jijabai Technological Institute, Mumbai, India.