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Comparative Analysis of Throughput and Dropped rate for Location-Aided Routing Protocol

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Abstract— **A wireless LAN is one in which a mobile user can connect to a local area network (LAN) through a wireless (radio) connection. There are many routing protocol used in wireless network for transmission of message. In which, location aided routing protocol are used to find the location of destination. This may be possible using GPS in mobile. This paper proposed an approach to increase the throughput in wireless LAN. The proposed approach is suitable for high density and low density network. Besides calculating the throughput, proposed approach also enhance data dropped rate, load, and retransmission attempts in ad hoc network. This paper aims to achieve**

***Keywords*— Wireless LAN, GPS**

I. INTRODUCTION

There are two categories of ad hoc networks: Mobile ad hoc network and Wireless LAN. Mobile ad hoc network works as higher level while wireless LAN work as a low level.
WI-FI" protocol or wireless LAN is capable of providing ad-hoc network facilities at low level, when no access point is available. However in this case, the nodes are limited to send and receive information but do not route anything across the network. Mobile ad-hoc networks can operate in a standalone fashion or could possibly be connected to a larger network such as the Internet [1].
The Bluetooth technique is available in some mobile. This technique introduced a new type of wireless systems known as mobile ad-hoc networks. Mobile ad-hoc networks or "short live" networks operate in the absence of fixed infrastructure. Mobile ad-hoc network is an autonomous system of mobile nodes connected by wireless links. Nodes in mobile ad-hoc network are free to move and organize themselves in an arbitrary fashion. Each user is free to roam about while communication with others [1].
A mobile ad-hoc network is a collection of mobile nodes forming an ad-hoc network without the assistance of any centralized structures. These networks introduced a new art of network establishment and can be well suited for an environment where either the infrastructure is lost or where deploy an infrastructure is not very cost effective [2].
Wireless mobile ad hoc networks consist of mobile nodes which can communicate with each other in a peer-to-peer fashion (over single hop or multiple hops) without any fixed infrastructure such as access point or base station. In a multi-hop ad hoc wireless network, which changes its topology dynamically, efficient resource allocation, energy management, routing and end-to-end throughput performance can be achieved through adaptive clustering of the mobile nodes [3].
The remaining section of this paper is organized as follows. Previous Work of LAR and DSR are discussed in section 2, proposed work is discussed in section 3, simulation described in section 4, results discussed in section 5 and finally conclusion in section 6.

II. PREVIOUS WORK

A. *Location Aided Routing Protocol*

Young Bae. Ko and Nitin H. Vaidya [4] described how location information may be used to reduce the routing overhead in ad hoc networks. They present two LAR protocols, namely, LAR scheme 1 (LAR-1) and LAR scheme 2 (LAR-2). Results indicate that using location information results in significantly lower routing overhead, as compared to an algorithm, which does not use location information. They also suggested several optimizations on the basic LAR schemes that may improve performance.
Li et al. [5] presented a modified version of the LAR protocol; it was called LAKER (location aided knowledge extraction routing) protocol for MANETs. It was a combination of caching strategy in DSR and limited flooding in LAR protocols. LAKER gradually learns of the topological characteristics of the network, such as node density, during the route discovery process and uses this information to enhance the network performance. Simulations showed that LAKER can save up to 30% broadcast messages compared LAR, while achieving better delivery ratio and almost the same delay.
Vyas and Mahgoub [6] presented a location and mobility pattern based routing algorithm for MANET. The proposed algorithm was an enhancement of the LAR algorithm that utilizes both location information as well as mobility pattern of mobile hosts to further reduce route discovery overhead. The results showed reduction in the routing messages when the information of predictable mobility pattern of the mobile hosts is utilized.
H. Al-Bahadili [7] extended the work to accommodate a dynamic retransmission probability. The simulation results obtained demonstrated an excellent enhancement in the performance of the LAR-1P algorithm.
Bolena and Camp[8] combined location information and mobility feedback to create an innovative MANET routing protocol. They developed a hybrid MANET routing protocol which adapts between two MANET routing protocols in order to combine the strengths of both component protocols

while avoiding their weaknesses. This protocol achieved data packet delivery ratios above 80% in very demanding network mobility conditions.

In more stable networks, their protocol achieved data packet delivery ratios above 90%.

Zeng et. al [9] proposed geography based ad hoc on demand disjoint multipath (GAODM) routing protocol to be used instead of pure flooding in wireless ad hoc networks. In this protocol, an informed and independent unicast decision is made by each node so that the traffic flow for the route discovery is efficiently directed towards the destination. The simulation result showed that (1) GAODM has better ability of finding more disjoint paths than AOMDV, especially when nodes are further apart; (2) GAODM finds shorter paths, and incurs much less route discovery overhead, than AODV and AOMDV.

H. Al-Bahadili et. al [31] developed and evaluated the performance of a new flooding optimization algorithm, namely, the LAR-1P algorithm, which utilizes two well-known flooding optimization algorithms, the location- aided routing scheme 1 (LAR-1), and the probabilistic algorithms. In this algorithm, when receiving a broadcast route request (RREQ) message, a node within the requested zone rebroadcasts the request message with predefined transmission probability and each node is allowed to broadcast the received RREQ message only once.

B. Location Aided Routing Algorithm

LAR algorithms make use of location information to reduce routing overhead. Location information used in LAR protocols may be provided by a Global Positioning System (GPS) [4]. There are basically two LAR algorithms, namely, LAR- 1 and LAR-2. They differ in the manner they use to determine the request zone. However, in this work, we mainly concern with the LAR-1 scheme. The LAR-1 scheme uses a request zone that is rectangular in shape [4]. It is assumed that source node (S) knows that destination node (D) was at location (Xd, Yd) at time t0. At time t1, node S initiates a new route discovery for D. It is also assumed that node S knows the speed u with which D can move. Using this, node S defines the expected zone at time t1 to be the circle of radius Re=u(t1-t0) centered at location (Xd, Yd). Instead of the average node speed, u may be chosen to be the maximum speed or some other function of the speed distribution. In LAR-1, the request zone is defined as the smallest rectangle that includes current location of S and the expected zone (the circular region defined above), such that the sides of the rectangle are parallel to the X and Y axes. When the source node is outside the expected zone, the request zone is the rectangle whose corners are S, A, B and C, whereas when the source node is within the expected zone, the rectangle has corners at A, B, C and G. The current location of node S is denoted as (Xs, Ys). The source node S can determine the four corners of the request zone. S includes their coordinates with the RREQ packet transmitted when initiating route discovery. When a node receives a RREQ, it discards the request if the node is not within the rectangle specified by the four corners included in the RREQ. For instance, if node i receives the route request from another node, node i forwards the request to its neighbours, because i determines that it is within the rectangular request zone. However, when node j receives the RREQ, node j discards the request, as node j is not within the request zone.

C. Dynamic Source Routing

The Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. DSR allows the network to be completely self-organizing and self- configuring, without the need for any existing network infrastructure or administration [10].

The protocol is composed of the two main mechanisms of "Route Discovery" and "Route Maintenance", which work together to allow nodes to discover and maintain routes to arbitrary destinations in the ad hoc network. All aspects of the protocol operate entirely on-demand, allowing the routing packet overhead of DSR to scale automatically to only that needed to react to changes in the routes currently in use.

The protocol allows multiple routes to any destination and allows each sender to select and control the routes used in routing its packets, for example for use in load balancing or for increased robustness. Other advantages of the DSR protocol include easily guaranteed loop-free routing, support for use in networks containing unidirectional links, use of only "soft state" in routing, and very rapid recovery when routes in the network change. The DSR protocol is designed mainly for mobile ad hoc networks of up to about two hundred nodes, and is designed to work well with even very high rates of mobility [10].

III. PROPOSED WORK

The proposed algorithm increase probability to search node for one place. This work has proposed algorithm for expected zone of LAR protocol. The expected zone is circular region where destination may be move from the point of view source node. This region is divided into four segments because it does not cause interference.

In the proposed system

1) Each host still has a unique ID (such as IP address or MAC address).

2) To be location-aware, each mobile host is equipped with a positioning device such as a GPS receiver from which it can read its current location.

3) Each node knows their maximum distance for communication, according to their transmitter power.

Let a node S has to transmit the packet to destination D, now two possibilities arrives

1) The S knows the coordinates of D. or

2) The S doesn’t know the coordinates of D.

The S will transmit the RREQ packet with (source address, source location, destination address, destination location, Padd, Ploc) in above mentioned case 2 it will transmit the

zero filled data for destination location.
The following step is required for proposed work:
Step 1: Consider that source node S wants to transmit packet to the destination node D.
Step 2: The source node selects the destination which has to be transmitted the packet during transmission.
Step 3: If source node knows the location of destination, it sends the RREQ message with Address and Location of D, Otherwise.
Step 4: It sends the RREQ with Address of D.
Step 5: The intermediate node P receives this RREQ packet.
Step 6: If transmitting range of P is greater than distance between P and S it will drop the packet otherwise.
Step 7: The intermediate node P forwards the RREQ packet to the destination node with max PDF.
Step 8: The process is continued till the destination node D found.
The above step is repeated until destination node received the RREQ packet and then process is completed.

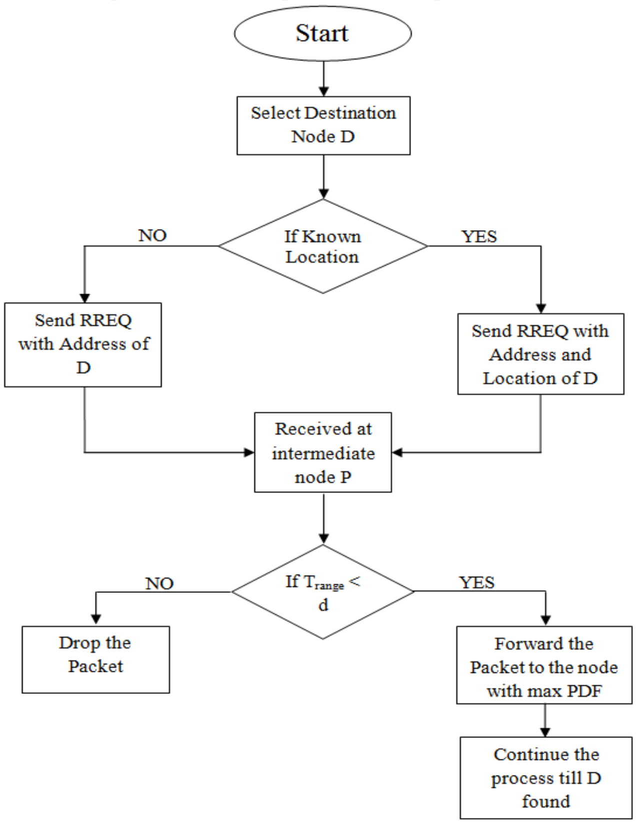

Fig.1. Showing the flow chart of proposed work.

IV. SIMULATION

Network simulation provides a means of testing proposed changes prior to placing them into effect, performing what-if analysis concerning the reliability of key components in a network and the effects of losing a component, planning for future growth, and initial design of a proposed network. The costs associated with the building and operating of a network make simulation a viable option in making choices in the building, modification, and performance analysis of a network.

To implement this paper, the most popular network simulation software OPNET Modeler is used to simulate LAR, DSR and LAR (using PDF) routing protocol of the mobile ad hoc network and compare performance.

The simulation environment setting used in experiment is shown in table I. The simulation duration is 30 minutes and the network area is 1 km x
1 km that includes variable number of mobile nodes ranging from 5 to 10. A Constant Bit Rate (CBR) is generated as a data traffic pattern at a rate of 1 packet per second, and 100% of the mobile nodes are selected randomly as CBR sources. The scenario of nodes mobility is generated randomly based on random way point model where a mobile node moves to a new position and pauses there for time period between 1 seconds, then it move to another position.

Parameter	***Setting Value***
Simulation duration	1 hr
Network area	1000 m x 1000 m
Number of mobile	9,18
Mobility model	Closed loop
Pause time	1 sec
Data packet size	1Kb
Number of CBR	100% of MNs
CBR rate	1 packet per second
Mobile node speed	10 km/h

Table 1 - OPNET simulation settings.

V. RESULTS

A. Load versus simulation time

It represents all control packets sent by the nodes in the network for the discovering and maintaining the route during the emulation. Loading ability can be used to compare the scalability, efficiency as well as the competence of adapting network congestion in different networks. Routing protocols with large loading capability have more probability of packet collision and delay.

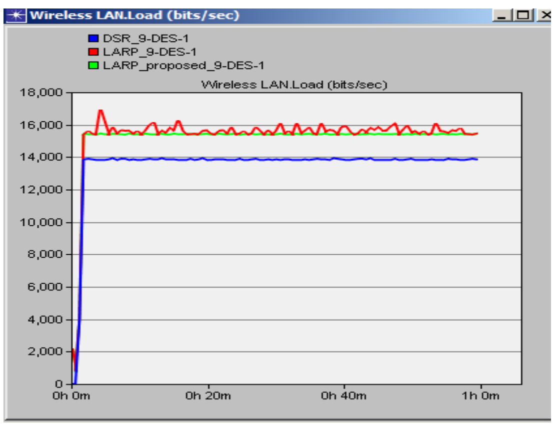

Fig. 2: Load in wireless LAN for 9 nodes.

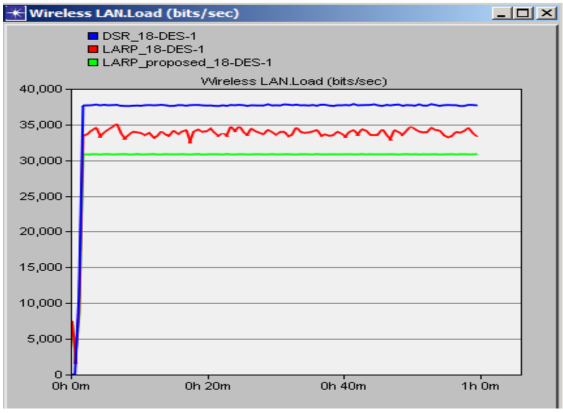

Fig. 3: Load in wireless LAN for 18 nodes.

Figure 2 and 3 illustrates that data packet load for each node is constant after a moment in DSR protocol. Data load is increasing in LAR protocol when numbers of node are less in wireless LAN. While nodes are increasing in network, data load is decreased in LAR protocol. LAR proposed Protocol has constant data load for both cases.

*B. **Retransmission Attempts versus Simulation time***

The source node sends the packet to the destination node if packets are lost or dropped during transmission. This graph shows the comparison for different scenarios.

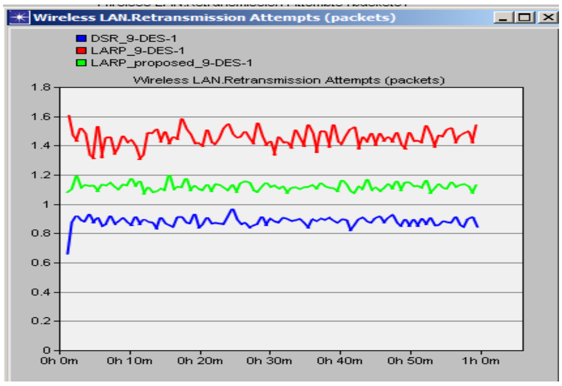

Figure 4: Throughput in wireless LAN for 9 nodes.

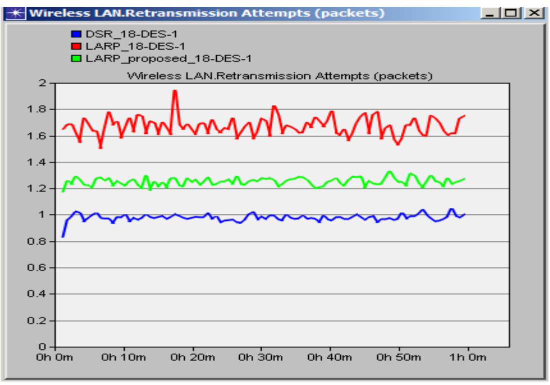

Figure 5: Throughput in wireless LAN for 18 nodes

A figure 4 and 5 show that packets retransmission attempt in DSR protocol is lower than LAR and LAR proposed protocol. Packets retransmission attempt is varying between from 1.2 to 1.4 in LAR proposed protocol. While packet retransmission attempt in LAR protocol is higher than both protocol i.e. DSR and LAR protocol. It means that DSR does not forward packets to neighbor node if transmission is failure.

C. Throughput versus Simulation time

Throughput is given as Actual amount of data is being transmitted in a given time.

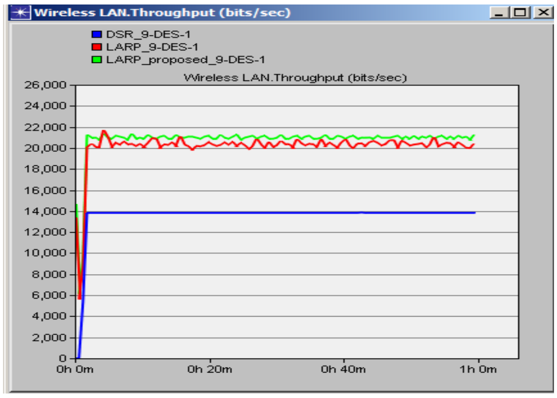

Fig. 6: Retransmission attempts for 9 nodes.

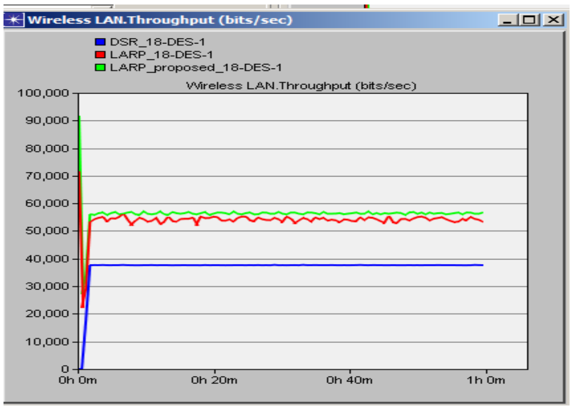

Fig. 7: Retransmission attempts for 18 nodes.

Figure 6 and 7 shows that while increasing the number of nodes in wireless LAN, throughput of LAR proposed protocol is also increased as compare to DSR and LAR protocol. The both figure 1 and 2 shows that DSR protocol has decreased throughput while number of nodes are increased in wireless LAN. Therefore, LAR proposed protocol is suitable for wireless LAN.

D. Data dropped versus simulation time

If the packet is received but the input buffer capacity has been exhausted, the frames may be dropped by the network. The OPNET has option of keeping track of this occurrence in the network operation.

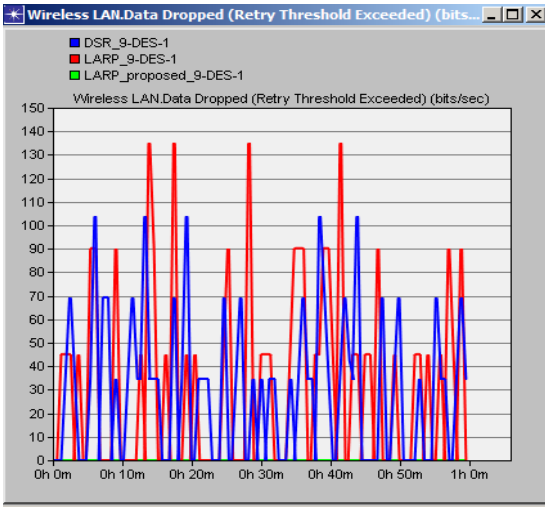

Fig. 8: Data dropped in wireless LAN for 9 nodes.

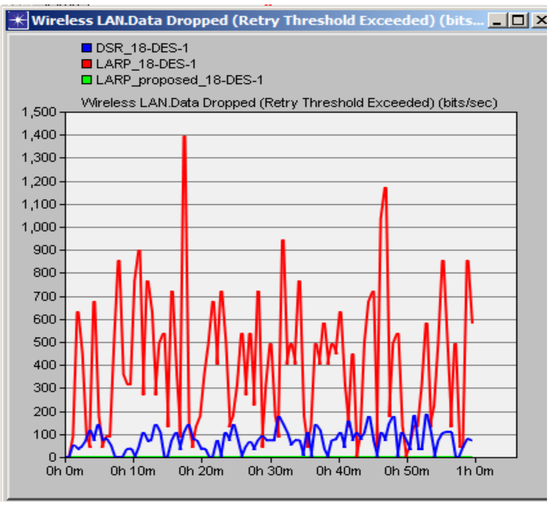

Fig. 9: Data dropped in wireless LAN for 18 nodes.

Figure 8 and 9 shows that data dropped rate for 9 nodes are rising and falling in DSR and LAR routing protocol. While increasing the number of node in wireless LAN Data dropped has maximum for LAR routing protocol as compare to DSR protocol. In both cases, number of nodes is increasing in Wireless LAN data never dropped in LAR proposed protocol. The blue line shows graph for DSR, the red line shows graph for LAR protocol and the green line shows the graph for LAR proposed protocol.

E. Performance Comparison for different scenarios in Wireless LAN

The thesis work has compared two different scenarios for Wireless LAN with DSR, LAR and Proposed LAR Protocol on basis of simulation parameter. The first table presents comparison of three protocols for 9 nodes. This table shows that number of nodes is less in Wireless LAN for changing effect.

Table 2: Performance comparison for 9 nodes in wireless LAN

Network	***Parameter***	***DSR***	***LAR***	***Proposed LAR***
Wireless LAN	Data Dropped (bits/sec)	Mediu m	Maximum	No
	Load (bits/sec)	less	more	constant
	Retransmission Attempts (packets)	less	high	medium
	Throughput (bits/sec)	Consta nt	increase	increase

Network	***Parameter***	***DSR***	***LAR***	***Proposed LAR***
Wireless LAN	Data dropped (bits/sec)	Mediu m	Maxi mum	no
	Load (bits/sec)	maximum	medium	minimum
	Retransmission Attempts (packets)	less	maximum	medium
	Throughput (bits/sec)	constant	increase	increase

The second table represents performance comparison for 18 nodes in wireless LAN.

VI. CONCLUSION

The paper has implemented three routing protocols, DSR, LAR and LAR proposed for different scenarios in for Wireless LAN using the OPNET simulator. It found that DSR, LAR is not better for high density network like Wireless LAN. While number of nodes is less in Wireless LAN, DSR and LAR are good for transmission of packet. Whenever increasing the number of nodes in Ad Hoc network, DSR and LAR protocol does not get well results. We have analyzed various parameters for DSR, LAR and proposed LAR protocol in wireless LAR. For all parameter proposed LAR protocol. In addition, simulation results show that data dropped rate is maximum in case of LAR protocol as compare to DSR because it does not search the location of destination node. Therefore, packet is always dropped during transmission. In DSR, data dropped rate is medium because it broadcasts the packet to all node which in network and it ensures that packets are reached to the destination. Likewise load will always maximum and medium in case of DSR and LAR. Retransmission of packets results show that DSR does not retransmit data while LAR has maximum possibility to retransmission. Actual amount of data is successfully transmitted by proposed LAR protocol i.e. throughput will increase in LAR and proposed LAR protocol.In overall performance of different scenarios in wireless LAN, proposed LAR protocol is achieved better results for all parameters which are used in simulation. The proposed LAR protocol is better for low and high density network.

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REFERENCES

1. D. Kim, J. Garcia and K. Obraczka, “Routing Mechanisms for Mobile Ad Hoc Networks based on the Energy Drain Rate”, IEEE Transactions on Mobile Computing Vol. 2 No. 2, pp.161-173, 2003.
2. Bikash Rath, “Implementing and Comparing DSR and DSDV Routing Protocol for Mobile Ad Hoc Networking”,B.Tech Thesis, NIT, Rourkela, 2009.
3. S. Mishra, S. M. Satpathy and A. Mishra. “Energy Efficient wireless Ad hoc Network”, B.Tech Thesis, NIT, Rourkela, 2010.
4. Y. Ko and N. Vaidya. “Location- Aided Routing (LAR) in Mobile Ad Hoc Networks”, Journal of Wireless Networks, Vol. 6, No. 4, pp. 307-321 2000.
5. J. Li, J. Jannotti, D. Couto, D. Karger and R. Morris, “A Scalable Location Service for Geographic Ad Hoc Routing”, Proceedings of the 6th International Conference on Mobile Computing and Networking (MOBICOM’00), 120-130, Boston, MA, USA, 2000.
6. N. Vyas, and I. Mahgoub. “Location and Mobility Pattern Based Routing Algorithm for Mobile Ad Hoc Wireless Networks”, Proceedings of the 2003 International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS ’03), Montreal, Canada, 2003.
7. H. Al-Bahadili. “LAR-1P: An Efficient Hybrid Route Discovery Algorithm for MANETs", Proceeding of the 5th International Workshop on Performance Evaluation for Wireless Ad Hoc, Sensor and Ubiquitous Networks (PE-WASUN 2008), 2008.
8. J. Boleng and T. Camp. “Adaptive Location Aided Mobile Ad Hoc Network Routing”, Department of Mathematics and Computer Science, Colorado School of Mines Golden, USA, 2004.
9. K. Zeng, K. Ren, and W. Luo. “Geographic on- demand Disjoint Multipath Routing in Wireless Ad hoc Networks”, Proceedings of IEEE Military Communication Conference (MILCOM ’05), Atlantic City, NJ, USA, 2005.
10. Johnson, Maltz, Hu, “The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)", Internet draft, Apr 2003.