Designing of Low Energy Sensor Networks by using Energy Aware Routing Protocol

Payal P.Badole , Riya A.Qureshi
Student, Guide
Computer Science and Engineering
Ballarpur Institute of Technology, Ballarpur,India

_____

Abstract - **As per the system optimization in terms of speed, area and power effectively taken all the things into consideration created Low Energy Sensor Networks using Ad-hoc On Demand Multipath Distance Vector Routing Protocol (AOMDV). A routing protocol specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network. Routing algorithms determine the specific choice of route. Each router has a prior knowledge only of networks attached to it directly. WSNs have great potential for many applications in scenarios such as military target tracking and surveillance, natural disaster relief, biomedical health monitoring and hazardous environment exploration and seismic sensing. In this project, we propose an energy efficient data forwarding protocol called Ad-hoc On Multipath Demand Distance Vector Routing Protocol (AOMDV) for wireless sensor networks to extend the life time of the network. Ad hoc On-Demand Multipath Distance Vector (AOMDV) Routing is a routing protocol for** mobile ad hoc networks **(MANETs) and other** wireless ad hoc networks. **The AOMDV (Ad-Hoc On-Demand Multipath Distance Vector) routing protocol is a reactive routing protocol that uses some characteristics of proactive routing protocols. Routes are established on-demand, as they are needed. However, once established a route is maintained as long as it is needed. Reactive (or on-demand) routing protocols find a path between the source and the destination only when the path is needed (i.e., if there are data to be exchanged between the source and the destination). In AOMDV, both position information and energy are available at nodes used to route packets from sources to destination. The routing design of AOMDV is based on two parameters: location and energy levels of nodes. Each node knows the location and energy level of its neighbors. The performance measures have been analyzed with variable number of nodes. The simulations were carried out for different number of nodes.**

Keywords - **Routing protocol, Wireless Sensor Networks, AOMDV, Position information..**

_____

1. INTRODUCTION

It is based on assumption that the node knows the geographical position of the destination node. This approach to routing involves relaying the message to one of its neighbors that is geographically closest to the destination node of all neighbors, and is geographically closer to the destination. This approach attempts to find a short path to the destination, in terms of either distance or number of hops. It is based on the geographical distances between the nodes. A node that requires sending a message acquires the address of the destination. After preparing the message, it calculates the distance from self to the destination. Next, it calculates distance from each of its neighbors to the destination. The greedy approach always tries to shorten the distance to be traveled to the destination to the maximum possible extent. Therefore, the node considers only those neighbors that are closer to the destination than itself. The sending node then chooses the node closest to the destination and relays the message onto the neighbor. A node receiving a message may either be the final destination, or it may be one of the intermediate nodes on the route to the destination.

- **Sensor Node:** These nodes produce sensed data by interacting with the environment and collecting a specified data such as temperature, humidity, pressure, movement etc.

A wireless sensor network (WSN) is a network that is the collection of hundreds or thousands of homogenous nodes which are deployed in a harsh environment with the capabilities of sensing, embedding, wireless communications and computation techniques. WSNs have great potential for many applications in scenarios such   as military target tracking and surveillance, natural disaster relief, biomedical health monitoring and hazardous environment exploration and seismic sensing.

1.1 Motivation

Geographic routing in sensor networks has been a challenging issue for researchers considering the energy constraints in these networks. Deployment methodology also poses challenges in design of routing strategy. Sensors may be deployed deterministically or randomly based on the application for which they are used. For random applications, these sensors should be self-configuring. These random deployments might result in irregular topologies which in turn affect the routing strategy. Sensors perform both data sending and data routing. Inter-sensor communication is usually short ranged. The nodes in the network cooperate in forwarding other nodes' packets from source to destination. Hence, certain amount of energy of each node is spent in forwarding the messages of other nodes. Lots of work has been done in this respect but still energy depletion of sensor nodes is a big challenge in sensor networks. The motivation behind this research work is to present such geographic algorithm for sensor networks which will be simple, easy to implement and efficient in terms of energy consumptions which will help us for creating the convenience communication between the node.

1.2 Abbreviation

AOMDV:- Ad-Hoc On-Demand Multipath Distance Vector

2. AOMDV

Wireless Sensor Networks (WSNs) consist of small nodes with sensing, computation, and wireless communications capabilities. Many routing, power management, and data dissemination protocols have been specifically designed for WSNs where energy awareness is an essential design issue. The focus, however, has been given to the routing protocols which might differ depending on the application and network architecture.

In this project, we will use the multipath routing and if any node is fail then we will choose another alternative path which is having the shortest distance for sending the data. Due to which we will get the enhance result. With the help of this we can save the energy. It means that we can save the data packet from loss and if the packets will not loss then we will get the correct data and enhance result.

In this energy aware routing protocol, we will use the AOMDV routing protocol. With the help of this protocol we will use the multipath routing and it will help for sending the data to the destination node having maximum energy. By selecting the shortest path,we will provide the convenient communication between the nodes and save the packet from loss.

The key concept in AOMDV is computing multiple loop-free paths per route discovery. With multiple redundant paths available, the protocol switches routes to a different path when an earlier path fails. Thus a new route discovery is avoided. Route discovery is initiated only when all paths to a specific destination fail. For efficiency, only link disjoint paths are computed so that the paths fail independently of each other. Note that link disjoint paths are sufficient for our purpose, as we use multipath routing for reducing routing overheads rather than for load balancing. For the latter, node disjoint paths are more useful, as switching to an alternate route is guaranteed to avoid any congested node. Link disjoint paths, on the other hand, may have common nodes. Since node disjointness is stricter than link disjointness, we use link disjointness in the hope to find more alternate routes in the network.
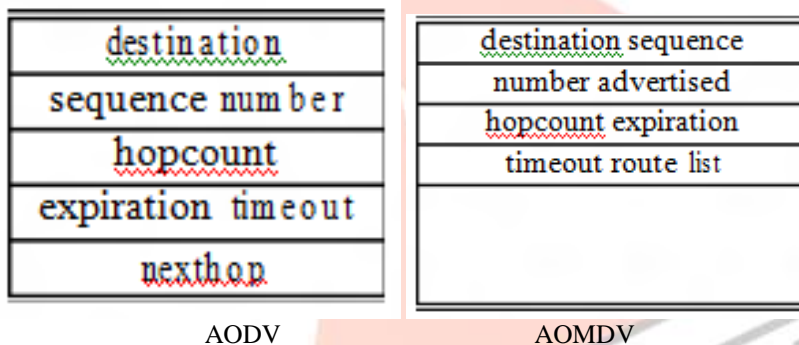
AODV   AOMDV
Figure 2: Structure of routing table entries for AODV and AOMDV

The basic structure of a routing table entry in the AOMDV in comparison with AODV is shown in Figure 2. There are two main differences: (i) the hop count is replaced by advertised hop count in the AOMEDV and (ii) the next hop is replaced by the route list. The route list is simply the list of next hops and hop counts corresponding to different paths to the destination. The advertised hop count represents the maximum of the hop counts of each of those multiple paths so long as a strict route update rule is followed.

3.   LITERATURE REVIEW OF DESIGNING OF LOW ENERGY SENSOR NETWORKS BY USING ENERGY AWARE ROUTING PROTOCOL

The position based routing protocols are mostly designed to choose the intermediate forwarding nodes that lie on the shortest path or close to the shortest path from the source to the destination. Greedy Perimeter Stateless Routing (GPSR) is a well-known and most commonly used position-based routing protocol for WSNs. GPSR works as follows: The source periodically uses a location service scheme to learn about the latest location information of the destination and includes it in the header of every data packet. If the destination is not directly reachable, the source node forwards the data packet to the neighbor node that lies closest to the destination (see Figure 1). Such a greedy procedure of forwarding the data packets is also repeated at the intermediate nodes.
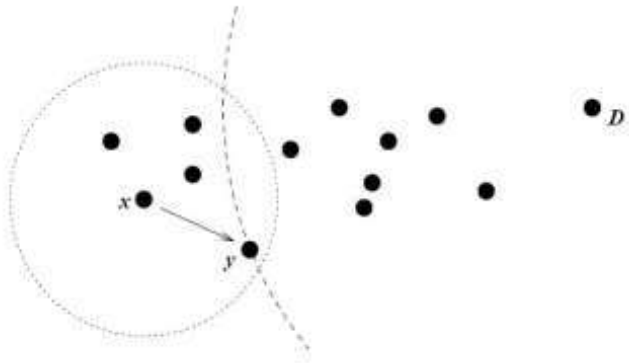
Figure. 1. Greedy routing example [10]

In case, a forwarding node could not find a neighbor that lies closer to the destination than itself, the node switches to perimeter forwarding. With perimeter forwarding, the data packet is forwarded to the first neighbor node that is come across, when the line connecting the forwarding node and the destination of the data packet is rotated in the anti-clockwise direction. The location of the forwarding node in which greedy forwarding failed (and perimeter forwarding began to be used) is recorded in the data packet. We switch back to greedy forwarding when the data packet reaches a forwarding node which can find a neighbor node that is away from the destination node by a distance smaller than the distance between the destination node and the node at which perimeter forwarding began.

3.1 Energy minimized by :-

➢ **Efficient Routing: -** Routing is the process of finding the path from the source node to the destination node. An efficient established path could save a large amount of network energy and increase its productivity.

➢ **Reliable communication among sensor node:** - In a network when sensor node collects the data, the collected data next to be send to a master collector. The source node sends the data to the master collector acting as a destination node either directly or through relay. Reliable communication will save the energy that can be consume in data resending and data checking.

4. PROPOSED WORK

- We propose an Ad-hoc On Demand Multipath Distance Vector Routing Protocol (AOMDV) that operates as follows:
- Source node first determines a candidate set of neighbor nodes; the nodes that lie closer to the destination than itself.
- The weight of each such candidate neighbor node is then computed to be the sum of the fraction of the initial energy currently available at the neighbor node and the progress (i.e., the fraction of the distance covered between the forwarding node and the destination) obtained with the selection of the neighbor node.
- The candidate neighbor node that has the largest weight value is the chosen next hop node to receive the data packet.
- In sensor networks, most of the routing algorithms require location information for sensor nodes. In most cases location information is needed in order to calculate the distance between two particular nodes so that energy consumption can be estimated.
- Geographic routing, that takes advantage of the location information of nodes, are very valuable for sensor networks.
- Most of the geographic algorithms are based on greedy algorithms to forward the packets to the destination.
- The no. of nodes is arranged in a network having different energy of each node. Some node is having the less energy and some of having the more energy. So we have to choose the node having the high amount of energy so that the energy/packets will not be loss.
- By using AOMDV protocol we will provide the multipath routing, so that if any node is fail to send the packet then it is always having the another alternative shortest path for sending the data.

5. PERFORMANCE EVALUATION

The proposed algorithm is implemented in NS2 and the performance is evaluated in terms of network throughput, packet delivery ratio, and packet energy

I.Simulation Parameters

The parameters used in our simulation are shown in Table1 A few nodes are selected and given multiple identities which act as Sybil nodes.

Table 1 Simulation Parameters

Area	500mX500m
Nodes	20
Packet size	200bytes

| Transmission protocol	UDP
Application Traffic	CBR
Simulation time	100 sec
Queue type	Drop tail
Propagation model	Two Ray Ground
Routing protocol	AODV
Initial energy	100 Joules
Type of attack	Sybil attack

II.Simulation Results

In this section, the performance is analyzed by comparison in between AODV and AOMDV. The result of comparison is analyzed by, energy, delay, PDR,and throughput as in **Figure 2**, **Figure 3**, **Figure 4** and **Figure 5** respectively.
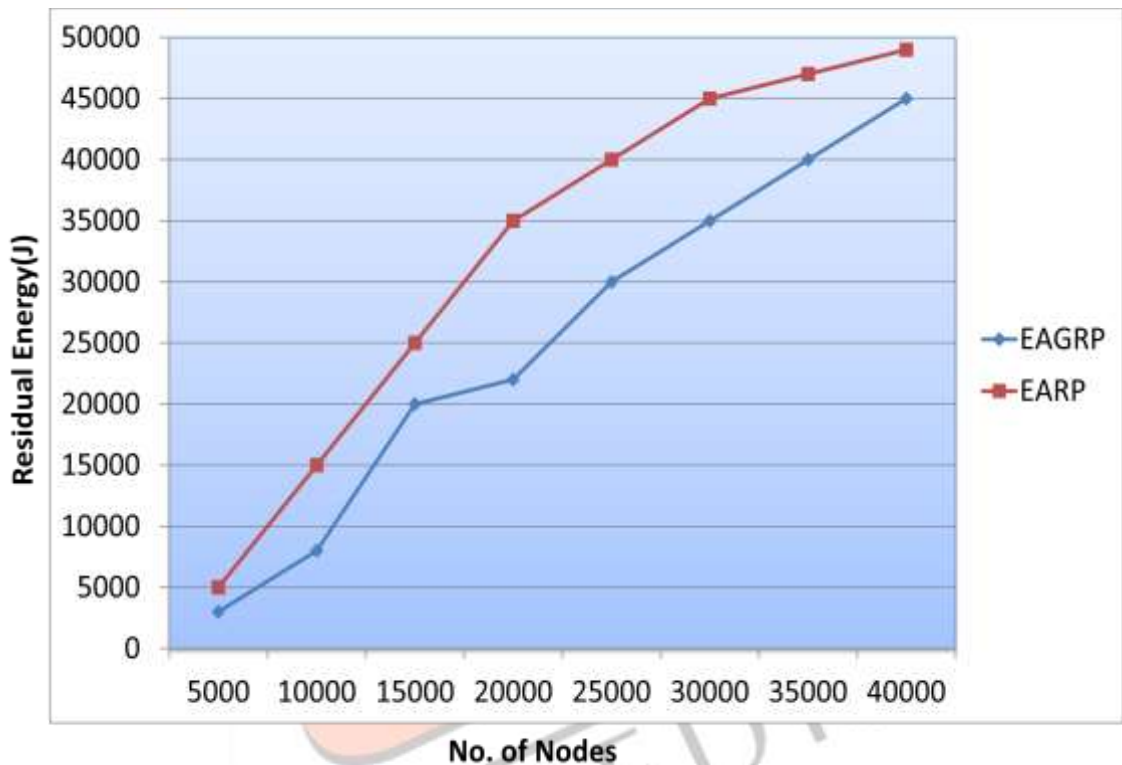

Figure2:- Energy of the node

The X-axis of the graph represents the number of connection and Y-axis represents the Energy consumption. As we know the AOMDV creates multiple paths and for this it has to maintain several tables to store route information thus AOMDV node uses more energy to find multiple path between source and destination as compared to AODV.
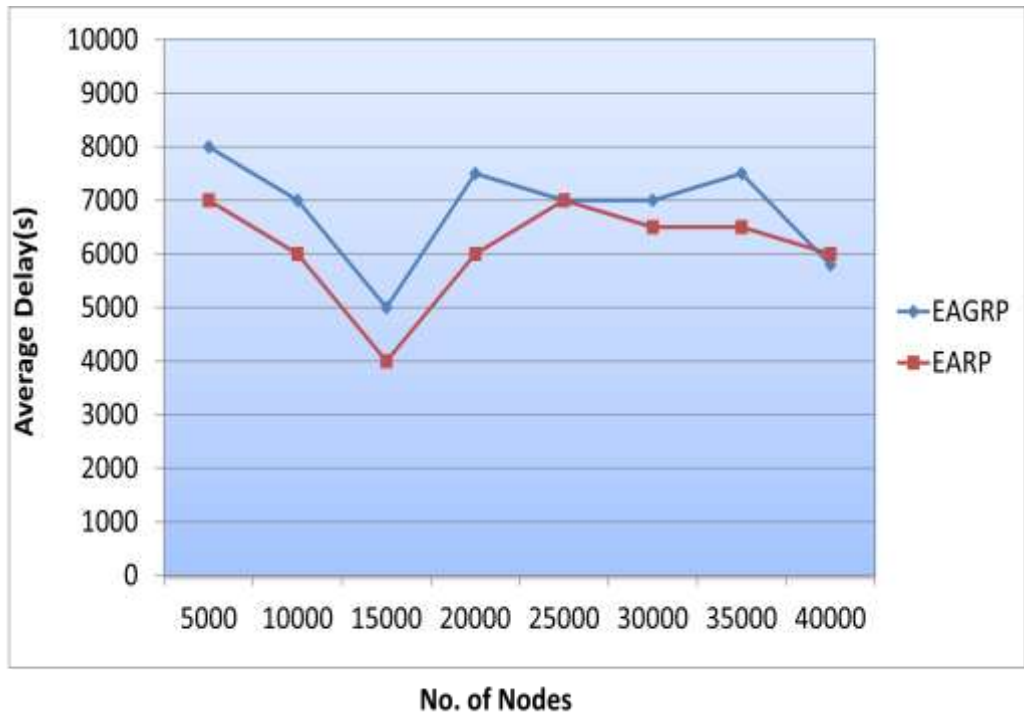
Fig. 3   No. of nodes Vs Average Delay

   The graph in **Figure3** shows The average time taken by a data packet to arrive in the destination node is called as delay. It also includes the delay caused by route discovery process and the queue in the data packet transmission.. Only the data packet that successfully delivered to the destination node that count in above graph.X- axis shows the no. of nodes and Y-axis shows Average delay.
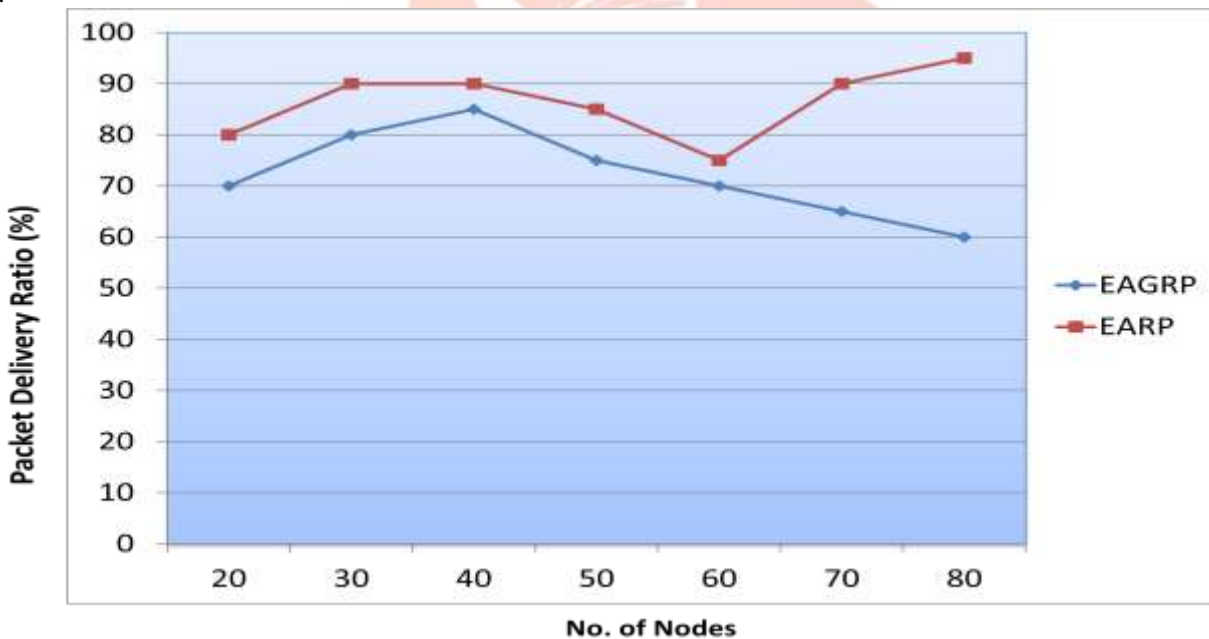
Figure4:- No. of nodes Vs PDR

 The graph in **Figure 4** shows The above graph we have concluded that EARP has better PDR. Measures the percentage of data packets generated by nodes that are successfully delivered in Network. X-axis shows the No.of nodes and Y-axis shows the packet delivery ratio
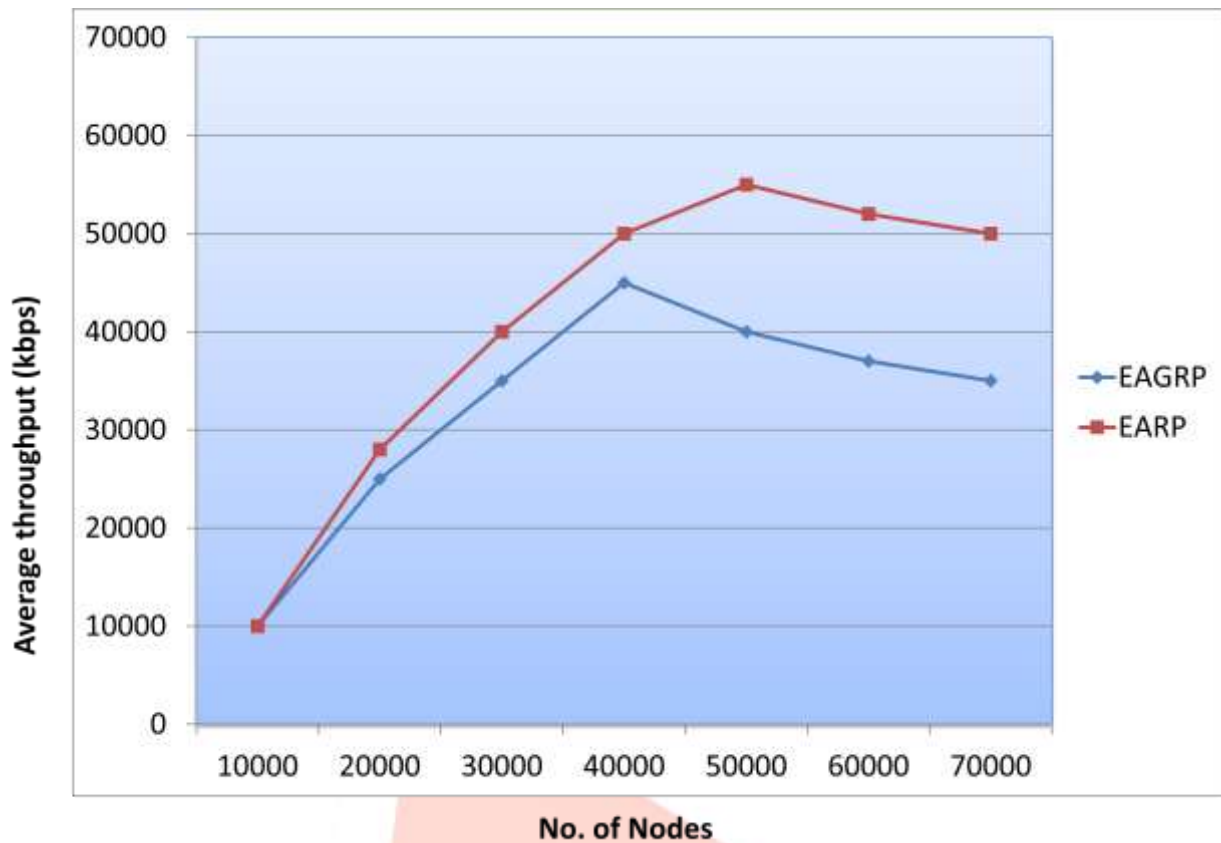
Fig. 5   No. of node Vs Average throughput

As shown in **Figure 5** shows The throughput is usually measured in bits per second or data packets per time slot.The throughput reflects the effective network capacity. It is defined as the total number of bits successfully delivered at the given destination in a given period of time.In the above graph X-axis shows No. of connections and Y-axis shows Average Throughput.
.

6. CONCLUSION

In this project, we used the multipath routing and if any node is fail then we choose another alternative path which is having the shortest distance for sending the data. Due to this, we get the enhance result. With the help of this we can save the energy. It means that we can save the packet from loss and if the packets would not loss then we get the correct data and enhance result.

In this energy aware routing protocol, we used the AOMDV routing protocol. With the help of this protocol, we used the multipath routing and it would help for sending the data to the destination node having maximum energy by selecting the shortest path. We also provide the convenient communication between the nodes and save the packet from loss.

The conclusion of my paper shows that as the number of nodes, number of connections and node speed is increases the chance of link failure is decreases. And thus AOMDV deliver better throughput, less number of packet loss and better average end to end delay. But the energy consumed to maintain multiple routes by each node in a path is high compared to AODV.

7. ACKNOWLEDGMENT

8. REFERENCES

[1] Kazi C. R., "A Survey on Sensor Network," Journal of Convergence Information Technology (JCIT) Journal, VOL.01, ISSUE 01, 2010.
[2] G. Simon, M. Maroti, A. Ledeczi, G. Balogh, B. Kusy, A. Nadas, G. Pap, and J. Sallai, K. Frampton, "Sensor networkbased counter sniper system," in: Proceedings of the Second International Conference on Embedded Networked Sensor Systems (Sensys), Baltimore, MD, 2004.
 [3] J. Yick, B. Mukherjee, D. Ghosal, "Analysis of a Predictionbased Mobility Adaptive Tracking Algorithm," in: Proceedings of the IEEE Second International Conference on Broadband Networks (BROADNETS), Boston, 2005.

[4] M. Castillo-Effen, D.H. Quintela, R. Jordan, W. Westhoff, and W. Moreno, "Wireless sensor networks for flash-flood alerting," in: Proceedings of the Fifth IEEE International Caracas Conference on Devices, Circuits, and Systems, Dominican Republic, 2004.

[5] Y. Xu, J. Heidemann, and D. Estrin, "Geography-informed energy conservation for ad hoc routing, " in the Proceedings of the 7th Annual ACM/IEEE International Conference on Mobile

Computing and Networking (MobiCom'01), Rome, Italy, July 2001.

[6] K. Kar, M. Kodialam, T. V. Lakshman, and L. Tassiulas, "Routing for network capacity maximization in energy constrained ad-hoc networks," in IEEE INFOCOM, Sanfrancisco, March 2003.

[7] C. Savarese, J. Rabaey, and K. Langendoen, "Robust positioning algorithms for distributed ad-hoc wireless sensor networks," In USENIX Technical Annual Conference, June 2002.

[8] Haojun Huang, Guangmin Hu, and Fucai Yu, "Energy-aware geographic routing in wireless sensor networks with anchor nodes," International Journal of Communication System (IJCS),September 2011.

[9] Haixia Zhao, Yaowei Li, Jincheng Shen, Mingchuan Zhang, and Ruijuan Zheng1, "A New Secure Geographical Routing Protocol Based on Location Pairwise Keys in Wireless Sensor

Networks," International Journal of Computer Science Issues (IJCSI), Vol. 10, Issue 2, No 2,March 2013.

[10] B. Karp, H. T. Kung, "GPSR: Greedy Perimeter Stateless Routing for Wireless Networks," Proceedings of the 6th Annual International Conference on Mobile Computing and Networking, pp. 243-254, Boston, MA, USA, August 2000.

[11] W. Keiss, H. Fuessler and J. Widmer, "Hierarchical Location Service for Mobile Ad hoc Networks," ACM SIGMOBILE Mobile Computing and Communications Review, vol. 8, no. 4,

pp. 47-58, 2004.

[12] Yuen, W. H., C. W. Sung, "On Energy Efficiency and Network Connectivity of Mobile Ad Hoc Networks," Proceedings of the 23rd International Conference on Distributed Computing Systems, Providence, Rhode Island, USA, 2003.