International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 02 | Feb-2018 www.irjet.net p-ISSN: 2395-0072

Routing Protocol (Tree based) for Moving Base Station (Sink Node) in Wireless Sensor Network

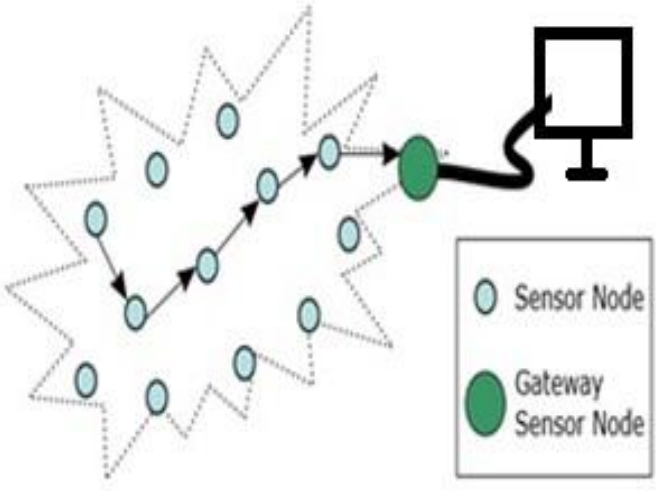
Jitendra Bahadur Singh[1], R.C.Tripathi[2]

[1]Electronics Engineering Dept, NGBU, Allahabad, India
[2]Dean Research, NGBU, Allahabad, India

Abstract- In the wireless sensor network the proposed protocol make the tree with two types of nodes i.e. relay and non-relay node. The relay node transfers the data from one relay node to next node while non-relay nodes only link through RN only. The topology changes with the change of activity of node from Non-RN to RN and vice-versa. The data is transfer through gateway node (RN or Non-RN) from source nodes to moving base station based on criteria discuss further. For the connection alive with gateway, base station sends a beacon regularly after certain period of time.

I. Introduction

A wireless sensor network has thousands of small, low-power sensor nodes. The main focus with nodes of wireless sensor network is energy because every node of wireless sensing network is powered with battery, so the main concern with how minimizes the power consumption, the nodes are operated with duty cycle as low as possible and transfer data with low data rates from source node to final node over short distances. Sensor nodes generally have sensing, processing, transceiver and power section. Some nodes have location finding section. In a wireless sensor network the communication of data mainly between individual sensor nodes and sink nodes (base stations) with a simple star network to an advanced multi-hop network. A sensor node varies in size from a shoebox down to a grain of dust. The cost of sensor nodes is variable, depending on the unit of the every sensor nodes[16-20].

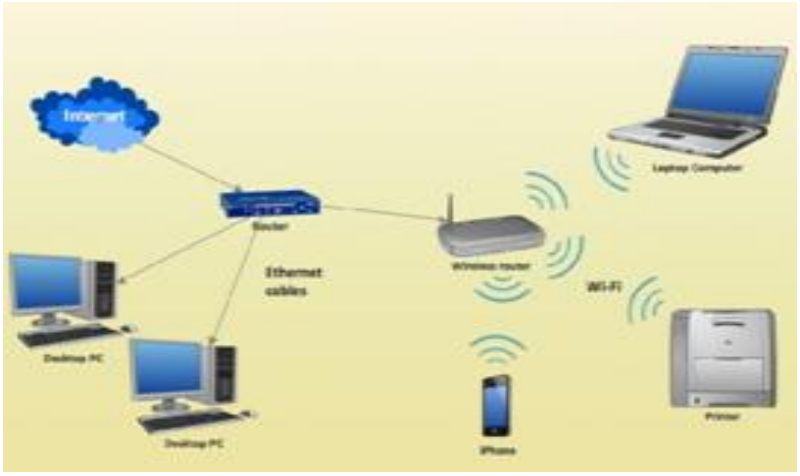


Application areas of wireless sensor network are**,** Area monitoring, Health care monitoring, Environmental/Earth sensing, Air pollution monitoring, Forest fire detection, Landslide detection, Water quality monitoring, Natural disaster prevention, Industrial monitoring, Machine health monitoring, Data center monitoring, Data logging, Water/waste water monitoring, Structural health monitoring, Wine production.

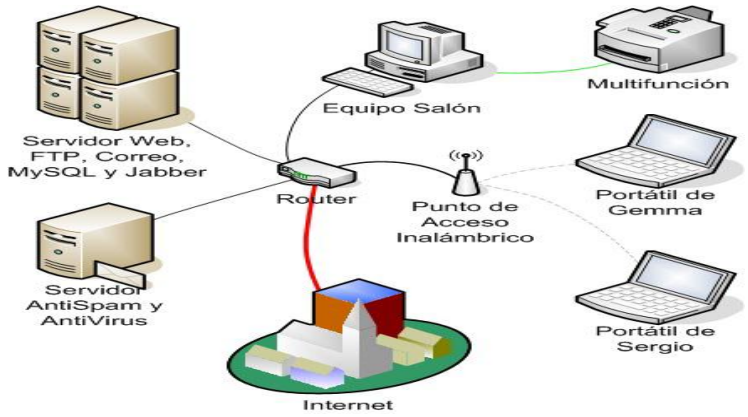
Wireless sensor network has included important characteristics as Consumption of power constraints for nodes using batteries or energy harvesting, cope with node failures, Nodes mobility, Nodes Heterogeneity, Nodes Homogeneity, Scalability, Withstand harsh environmental conditions, Ease of use.

II. Types of wireless network other than wireless sensor network

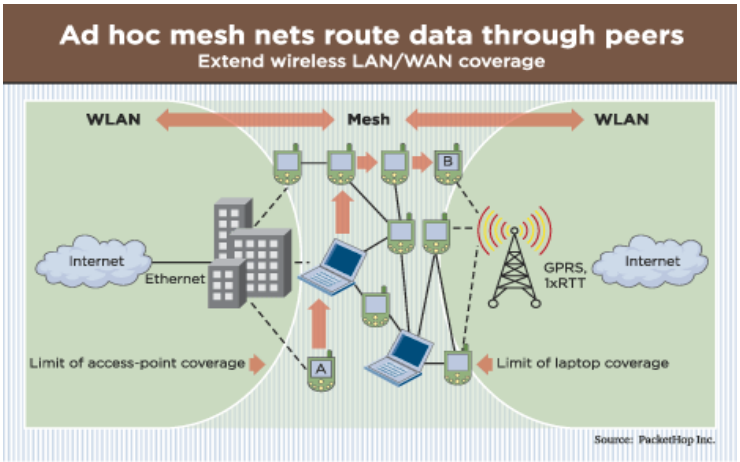
- WPANs (wireless personal area networks)



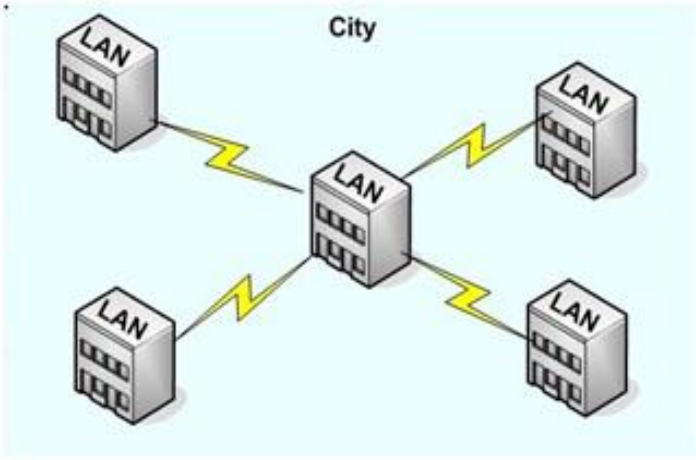
- WLAN (wireless local area network)



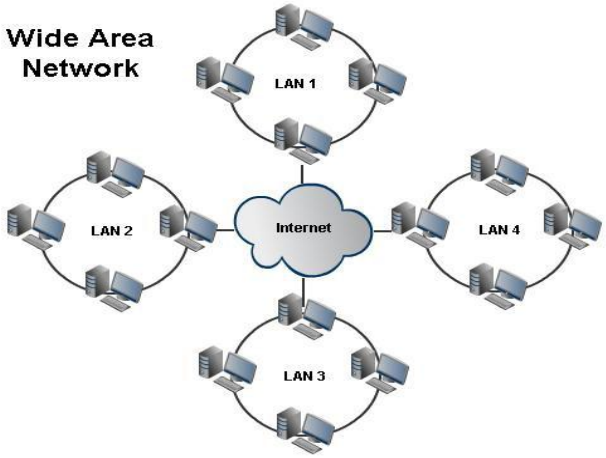
- Wireless ad hoc network **(**Wireless mesh network or mobile ad hoc network**)**



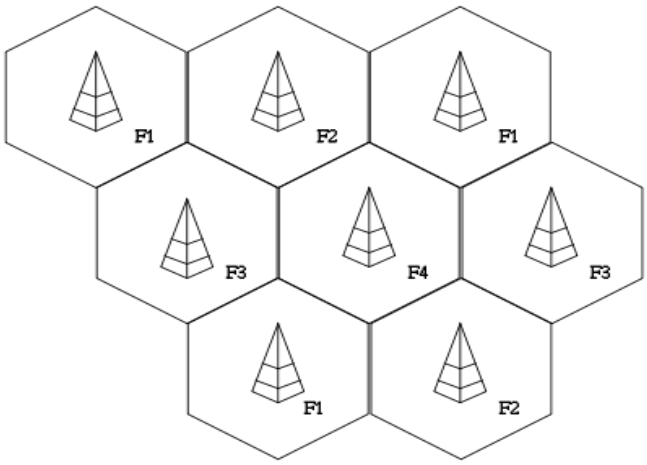
- Wireless metropolitan area networks (WMAN)



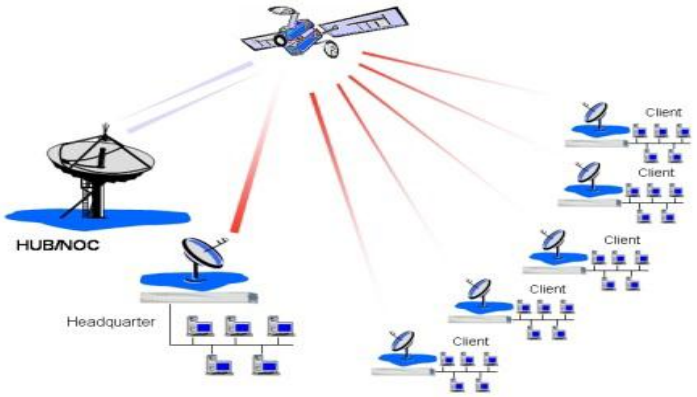
- Wireless wide area networks (WWAN)



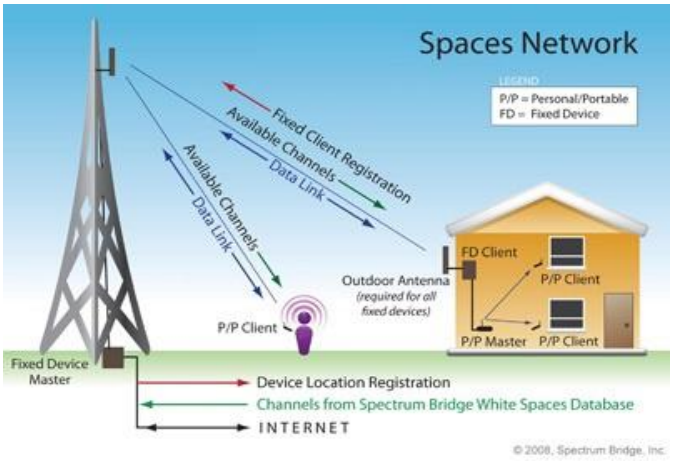
- Wireless Cellular network



- Wireless Global area network (GAN)



- Wireless Space networks



The above wireless networks are dissent from wireless sensing network as in this energy consumption by the network is secondary because we can recharge the battery as needed, also the main focus on quality of services (QoS) with high bandwidth efficiency.

III. Related Work

In a multi-hop network optimal location finding for the base station (sink nodes) is a difficult issue, as authors have proposed in [10] also propose moving the sink (assumed to find the geographical location) to the relay nodes. Result proposed an ideal path for a sink node that will ensure usage of every node. In [11] with mobile base station the power consumption is considerable as compare to no dynamic network. The authors have proposed that an optimum path within the area is obtained with one or more moving base station. In[12] authors have considered the moving node sensors in a wireless network, in this when path breakages in the channel is occur the author aim on the improvement of the robustness of routing with assumption that among the source and sink intended route already identify. In[13] to obtained power efficient and reliable communication, moving data collectors use. To improve network reliability and lifetime, they focus on minimizing the data sent by nodes and received by nodes nearest to sink nodes. In[13] authors use the algorithm (partitioning-based) to schedule moving sinks movement to minimize the message loss. In [15] moving sinks change position when power becomes low of nearby nodes and search new area where nodes have more power. In [7, 8] as per authors nodes near to base station (sink) behave as a RN in static sink areas. It need more energy other than sensor nodes because it deliver data to base station and then die and also creates hotspots. In [1] apart from RN other nodes have energy and operative. In [9] continuous change

nodes (neighbor node), the network is balance. Small message dissemination path has increased lifetime with increase throughput and reduce consumptions of energy. In [3, 4-6] The higher routing overhead and shorter lifetime are the disadvantages with present routing protocols with moving sink node.

IV. Proposed work

An improved TEDD protocol with moving sink is proposed to resolve the problem arises with higher routing overhead and shorter lifetime. The proposed protocol tracks the mobility (base station) and balances the nodes to increase the lifetime with some consideration of mobility, links with symmetry, power consumption.

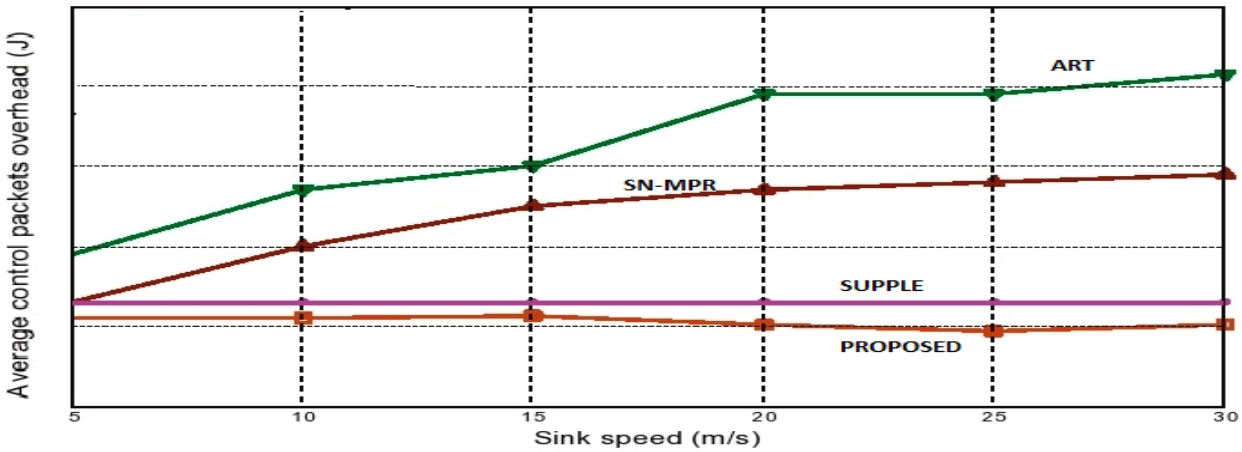
V. Simulation Result

The simulation is performed for the proposed Improved TEDD and probabilistic data dissemination protocol (SUPPLE), Multi-Point Relay based routing and Adaptive Reversal Tree (ART) to study the energy consumption, end-to-end latency, data delivery ratio and network lifetime of the network The performance of the proposed protocol is evaluated and compared the result with the existing tree-based protocols. Parameters are same as existing protocol.

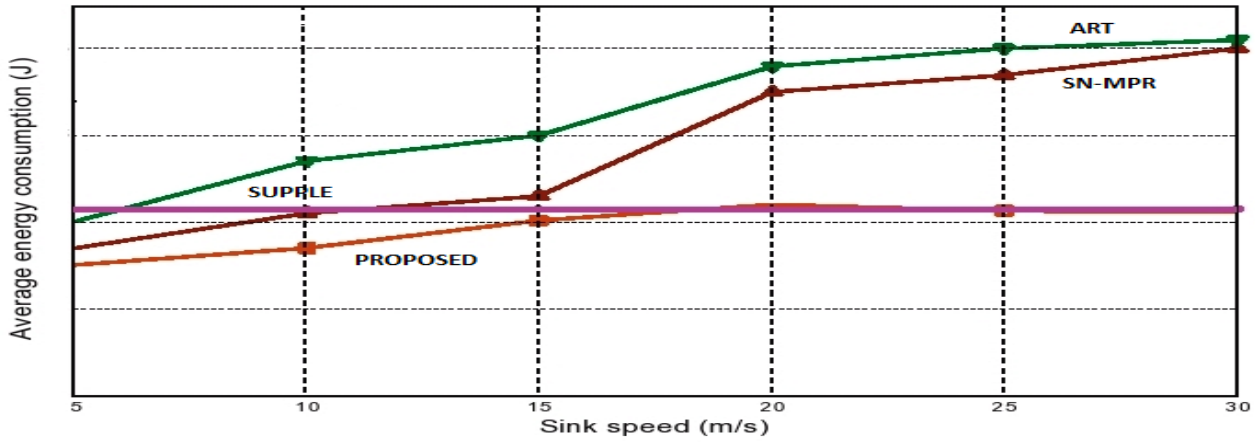
Result	Parameter
300 × 300 sq meter	Network area
200	Number of sensor nodes
512 bytes	Data packet size
32 bytes	Control packet size
1J	Initial energy
5 sec	δ
(5, 10, 15, 20, 25, 30) m/sec	Sink speed
Random Waypoint	Mobility Model
50 nJ/bit	E_{elec}
10 pJ/bit/m2	ε_{fs}
0.0013 pJ/bit/m4	ε_{mp}
87 meters	d_0
0.2 nJ/sec	E_{low}
400 sec	Simulation time
TMAC	MAC protocol

4

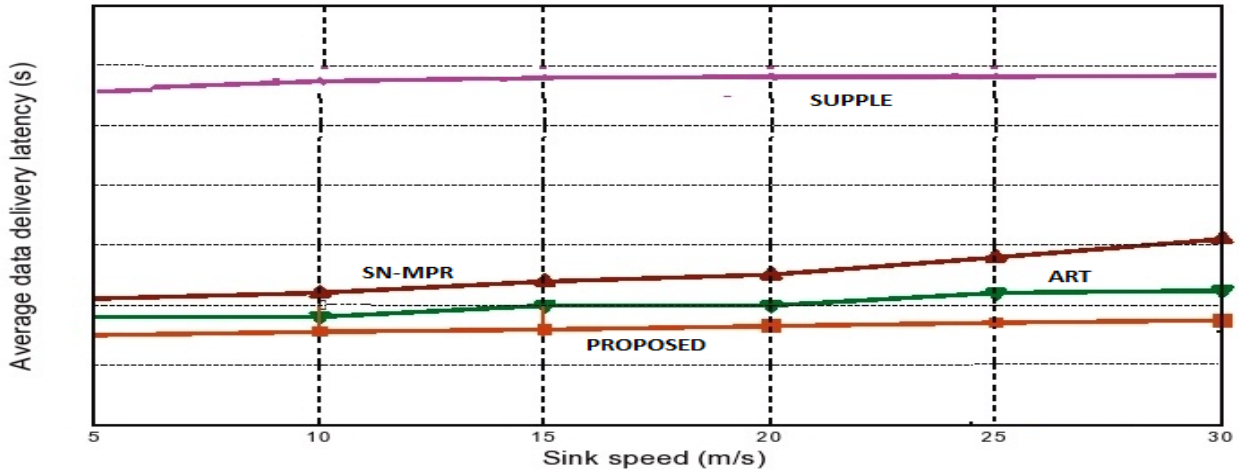
✓ **Average Control Packet Overhead**



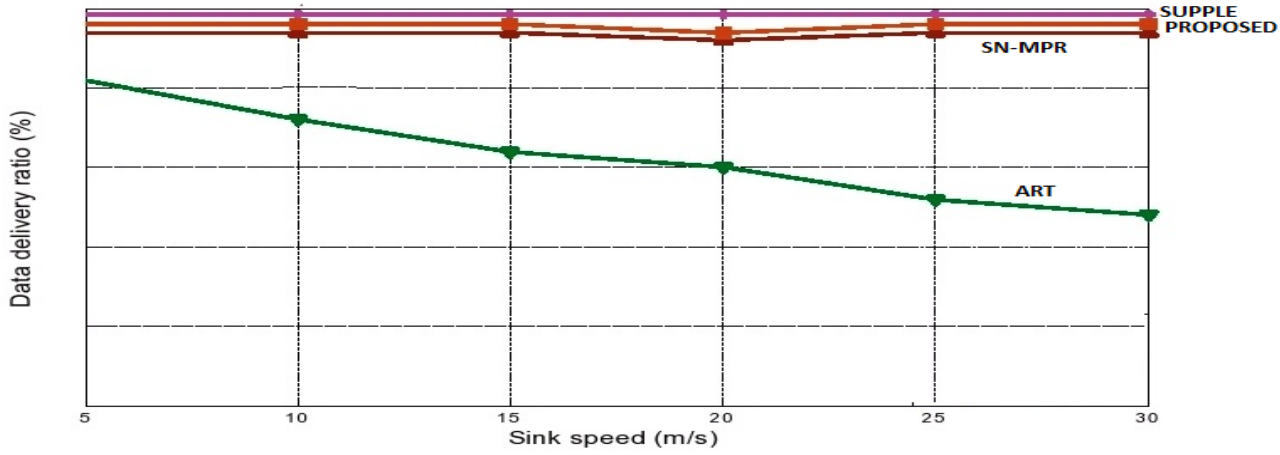
✓ **Average Energy Consumption**



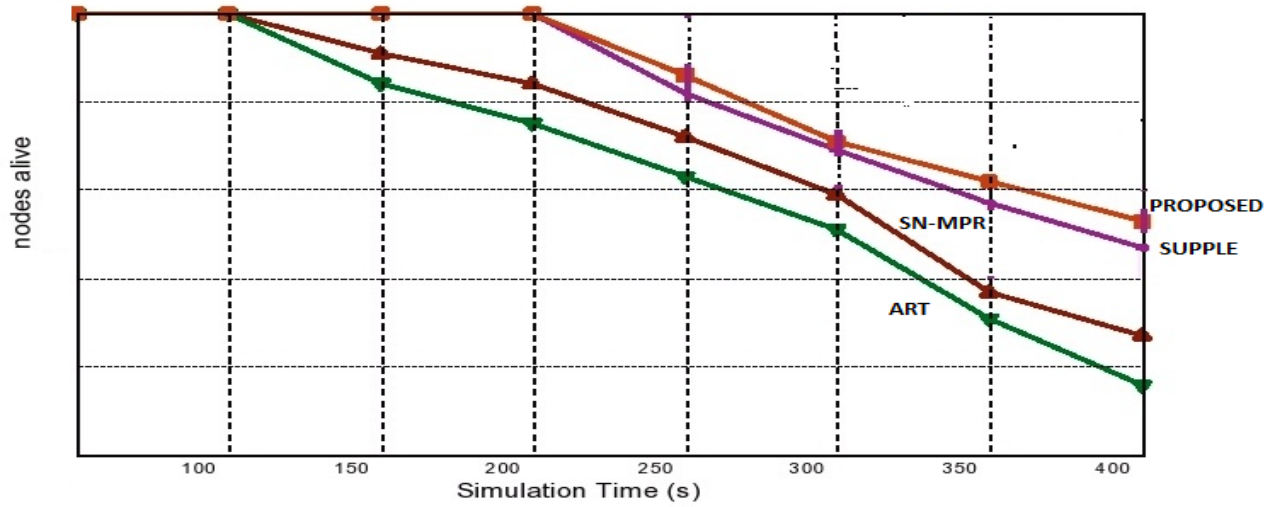
✓ **Average End-to-End Latency**



✓ **Packet Delivery Ratio**



✓ **Network Lifetime**



VI. Conclusion

The proposed improved tree based data dissemination protocol called Improved TEDD protocol may efficiently manage the moving sink. Improved TEDD results compared with ART, SUPPLE and SN-MPR and overall performance for moving sink improved as compare to existing protocol.

References-

[1] L. Popa, A. Rostamizadeh, R. M. Karp, C. Papadimitriou, and I. Stoica, "Balancing Traffic Load in Wireless Networks with Curveball Routing," In 8th ACM International Symposium on Mobile Ad Hoc Networking and Computing, Pages 170– 179, September 2007.

[2] J. Li and P. Mohapatra, "Analytical modeling and mitigation techniques for The Energy Hole Problem in Sensor Networks," Pervasive Mobile Computing, Vol. 3, No. 3, Pages 233-254, June 2007.

[3] K. I. Hwang and D. seop Eom, "Adaptive Sink Mobility Management Scheme for Wireless Sensor Networks," In 3rd international conference on Ubiquitous Intelligence and Computing, Pages 478 – 487, 2006.

[4] K. I. Hwang, J. In, and D. seop Eom, "Distributed Dynamic Shared Tree for Minimum Energy Data Aggregation of Multiple Mobile Sinks in Wireless Sensor Networks," In 3rd European conference on Wireless Sensor Networks, Pages 132 – 147, 2006.

[5] C. Viana, T. Herault, T. Largillier, S. Peyronnet, and F. Zaidi, "SUPPLE: A Flexible Probabilistic Data Dissemination Protocol for Wireless Sensor Networks," In 13th ACM International Conference on Modeling, Analysis, and Simulation of Wireless and Mobile Systems, Pages 385 – 392, 2010.

[6] Y. Faheem and S. Boudjit, "SN-MPR: A Multi-Point Relay Based Routing Protocol for Wireless Sensor Networks," In IEEE/ACM International Conference on Green Computing and Communications & International Conference on Cyber, Physical and Social Computing, Pages 761 – 767, 2010.

[7] M. Perillo, Z. Cheng, and W. Heinzelman, "On the problem of unbalanced load distribution in wireless sensor networks," In IEEE Global Telecommunications Conference Workshops (GlobeCom '04), Pages 74 – 79, December 2004.

[8] M. Perillo and Z. Cheng, "An analysis of Strategies for Mitigating the Sensor Network Hot Spot Problem," In 2nd Annual International Conference on Mobile and Ubiquitous Systems: Networking and Services (MobiQuitous '05), Pages 474 – 478, July 2005.

[9] E. B. Hamidaand and G. Chelius, "Strategies for Data Dissemination to Mobile Sinks in Wireless Sensor Networks," IEEE Tranactions on Wireless Communications, Vol. 15, No. 6, Pages 31 – 37, December 2008.

[10] K. Akkaya, M. Younis and M. Bangad, "Sink repositioning for enhanced performance in wireless sensor networks," Computer Networks, vol. 49, pp. 512-534, 2005.

[11] A. Somasundara, A. Kansal, D. Jea and D. Estrin, "Controllably mobile infrastructure for low energy embedded networks," IEEE Transactions on Mobile Computing, vol. 5, no.8, pp. 958-973, Aug. 2006.

[12] X. Huang, H. Zhai and Y. Fang, "Robust Cooperative Routing Protocol in Mobile Wireless Sensor Networks," IEEE Transactions on Wireless Communications, vol. 7, no. 12, pp. 5278- 5285, Dec. 2008.

[13] S. Vupputuri, K. Rachuri and C. S. Ram Murthy, "Using mobile data collectors to mprove network lifetime of wireless sensor networks with reliability constraints," Journal of Parallel and Distributed Computing, vol. 70, no. 7, pp. 767-778, July 2010.

[14] Y. Gu, D. Bozdag, R. Brewer and E. Ekici, "Data harvesting with mobile elements in wireless sensor networks," Computer Networks, vol. 50, no. 17, p. 3449–3465, 2006.

[15] M. Marta and M. Cardei, "Using sink mobility to increase wireless sensor networks lifetime," in Proceedings of the 9th IEEE International Symposium on a World of Wireless,Mobile and Multimedia Networks (WoWMoM'08), 23-26 June 2008.

[16] A. Bernstein. Maintaining shortest paths under deletions in weighted directed graphs. STOC, page 725, 2013.

[17] A. Bernstein and L. Roditty. Improved dynamic algorithms for maintaining approximate shortest paths under deletions. ACM-SIAM Symposium on Discrete Algorithms, pages 1355–1365, 2011.

[18] S. Cabello. Many distances in planar graphs. Algorithmica, pages 361–381, 2012.

[19] L. Chang, J. X. Yu, L. Qin, H. Cheng, and M. Qiao. The exact distance to destination in undirected world. The VLDB Journal, 21(6):869–888, 2012.

[20] L. Foschini, J. Hershberger, and S. Suri. On the complexity of time-dependent shortest paths. Algorithmica, 2014.