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# Restricting Barrier and Finding the Shortest Path in Wireless Sensor Network Using Mobile Sink

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***Abstract:-*** Wireless Sensor Network (WSN) is a collection of spatially deployed in wireless sensors. In general, sensing field could contain various barriers which cause loss of information transferring towards the destination. As a remedy, this proposed work presents an energy-efficient routing mechanism based on cluster in mobile sink. The scope of this work is to provide a mobile sink in a single mobile node which begins data-gathering from starting stage, then immediately collects facts from cluster heads in single-hop range and subsequently, it returns to the starting stage. During the movement of the mobile sink if the barrier exists in the sensing field it can be detected using Spanning graph and Grid based techniques. The possible locations for the mobile sink movement can be reduced easily by Spanning graph. At last, Barrier avoidance-shortest route was established for mobile sink using Dijkstra algorithm. The Distributed location information is collected using a Timer Bloom Filter Aggregation (TBFA) scheme. In the TBFA scheme, the location information of Mobile node (MNs) is maintained by Bloom filters by each Mobile agent (MA). Since the propagation of the whole Bloom filter for every Mobile node (MN) movement leads to high signaling overhead, each Mobile agent (MA) only propagates changed indexes in the Bloom filter when a pre-defined timer expires. To verify the performance of the TBFA scheme, an analytical model is developed on the signaling overhead and the latency and devise an algorithm to select an appropriate timer value. Extensive simulation and Network Simulator 2(NS2) results are given to show the accuracy of analytical models and effectiveness of the proposed method.

***Keyword*** *:- Wireless sensor network, mobile sink, Spanning graph, Grid based techniques, Dijkstra algorithm, Timer Bloom Filter Aggregation (TBFA).*

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## I. INTRODUCTION

A Wi-Fi Sensor network (WSN) is a dispensed community and it incorporates a huge number of distributions, self-directed, and tiny, low powered devices called sensor nodes alias motes. Wireless sensor networking, micro-fabrication and integration and embedded microprocessor have enabled a new generation of massive-scale sensor networks suitable for a range of commercial and military applications. With such technological come new challenges for information processing in sensor network. [1] Motes are the small computers, which work collectively to form the networks. Motes are energy efficient, multi-functional wireless device. The requirements for motes in industrial applications are widespread. A group of motes collects the data from the surroundings to accomplish specific application objectives. The sensor nodes works to monitor environmental action like temperature, pressure, clamminess, sound, vibration etc. In several problem-solving time applications the sensor nodes are act unique tasks like nearest node discovery, smart sensing, statistics storage and processing, data aggregation, goal monitoring, control and trace , node localization, synchronization and efficient routing between nodes and base station. Basic structure of wireless sensor network is shows the Fig 1.1.

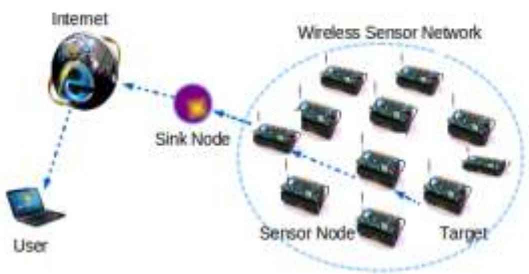


**Figure 1.1 Basic structure of Wireless Sensor Network**

Wireless sensor nodes have maintained basic building blocks. There are sensing unit, a processing unit, communication unit and power unit. For each node are capable to gather the data, to sensing, processing and communicate with the different nodes. The sensing unit to maintain the environment, the process unit computes the restricted variations of the sensed information, and the verbal exchange unit plays change of processed facts among neighboring sensor nodes. The basic building blocks of a sensor node is shows the Fig 1.2.

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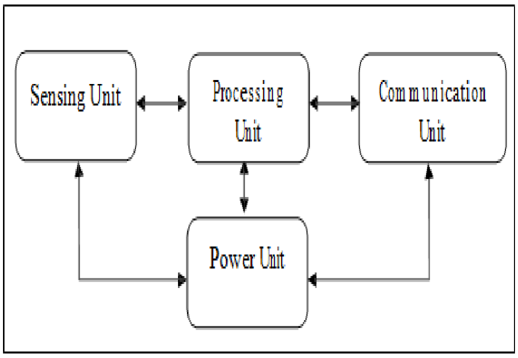


**Figure 1.2 Basic Building Blocks of Sensor Node**

The analog signals generated by the sensors are digitized by using analog to digital converter (ADC) and sent to controller for further processing. The process unit is that the major core unit of the sensor node. The processor executes different tasks and controls the practicality of alternative elements. The energy utilization rate of the processor varies staying upon the potential of the sensing element nodes.

The computations are completed in the processing unit and the exact result is transmitted to the base station through the communication unit. Furthermore, whilst content vendors location contents at the edge of the network by using content delivery network (CDN) technology, those troubles emerge as intense. Also, mobile records explosion exacerbates those troubles.

The local IP access (LIPA) and selected IP traffic offload (SIPTO) have been suggested in 3rd Generation Partnership Project (3GPP) to realize Domain Management Module (DMM) concepts. LIPA allows a direct connection to a cluster node (CN) in the same IP network through the local gateway instead of core networks (i.e., packet data network gateway (P-GW).

**WSN ORGANIZATION**

WSN can be explained as a five types of layered architecture

- The physical layer is capable for frequency selection, modulation and data encryption.
- The data link layer functions as a way of path for multiplexing, data frame detection, Medium Access control (MAC) and error control.
- The network layer is used to route the data distributes by the transport layer using multi-level wireless routing protocols between sensor nodes and node sink.
- The transport layer maintain it carries a data of the application layer requires it.
- The application layer makes the hardware and software of the lower layers overview to the end user.

**Security in WSN**

Sensor networks pretence different demanding situations, so conventional security strategies utilized in conventional networks cannot be carried out immediately for WSN. The sensor devices are inadequate in their strength, and intermediate capabilities. They are,

- An attacker can quickly inject malicious node inside the network.
- WSN includes a large numbers of nodes inside the network. Enforcing protection in all of the levels is crucial and additionally too complex.
- Sensor nodes are useful resource constraints in terms of memory, power, transmission range, processing energy. Therefore asymmetric cryptography is too highly-priced and symmetric cryptography is used as options.Cost of implementing the resistant software is very high.

**TIMER-BASED BLOOM FILTER AGGREGATION (TBFA)**

The Distributed location information is collected using a Timer Bloom Filter Aggregation (TBFA) scheme. In the TBFA scheme, the location information of Mobile node (MNs) is maintained by Bloom filters by each Mobile agent (MA). Since the propagation of the whole Bloom filter for every Mobile node (MN) movement leads to high signaling overhead, each Mobile agent (MA) only propagates changed indexes in the Bloom filter when a pre-defined timer expires. To verify the performance of the TBFA scheme, an analytical model is developed on the signaling overhead and the latency and devise an algorithm to select an appropriate timer value. Applying timer-based bloom filter aggregation based on time maintaining procedure works in mobile sink and nodes as follows

- **Location Update Procedure**
- **Packet Delivery Procedure**
- **Timer Selection Algorithm**

**Location Update Procedure**

To taken a Mobile Agent (MA) and Mobile Node (MN) used to update the procedure for location. Then, the timer expires are received this procedure work.

**Step 1** Location update procedure of Mobile Agent2 (MA2) when a Mobile Node (MN) moves from MA1 to MA2.

**Step 2** First of all, the MN sends a location update message to Mobile Agent 2 (MA2). Then Mobile Agent 2(MA2) has the Mobile Node (MN) identification and sets the bits in its Bloom filter.

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**Step 3** Observe that the number of changed bits is determined by means of the quantity of hash functions used in the Bloom filter out.

**Step 4** Mobile Agent 2 (MA2) changes the 61st bit of its Bloom filter from 0 to 1.

**Step 5** In addition, Mobile Agent 2 (MA2) stores the bit index (i.e., 61) in its CIS.

**Step 6** When the timer expires or a Bloom filter request message is received, Mobile Agent 2 (MA2) propagates the CIS to other Mobile Agent 2 (MAs) and resets the CIS.

**Packet Delivery Procedure**

The procedure follows by the Packet Delivery its mainly used on the Cluster Node (CN) and the Mobile Node (MN).

**Step 1** The packet delivery procedure from a cluster node (CN) to a mobile node (MN) is illustrated. When the first packet arrives at Mobile Agent4 (MA4), which is the serving Mobile Agent (MA) of the Cluster Node (CN).

**Step 2** The identification of the destination Mobile Node (MN) is hashed and Bloom filters of Mobile Agent 4 (MA4) are checked3. For example, if the hashed value is 72, it mentions that the Mobile Node (MN) locates at the Mobile Agent (MA) that has the set 72nd bit in its Bloom filter. The multiple Bloom filters may have the set 72nd bit is false positive probability.

**Timer Selection Algorithm**

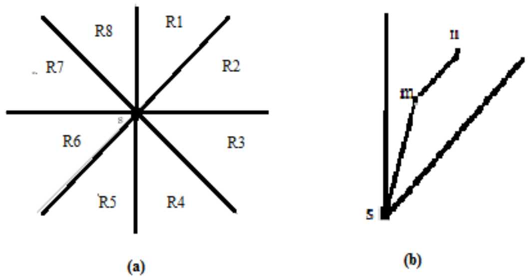
The performance of the Timer Blooming Filter Aggregation (TBFA) scheme is affected by the timer value, T. Therefore, the optimal T providing lower latency while mitigating the signaling overhead should be carefully determined. In addition, the application requirements should be considered. For example, for latency-sensitive applications, the optimal T should minimize the latency whereas the optimal T in latency-insensitive applications on the minimization of the signaling overhead.

## II. ALGORITHM ANALYSIS

### (i) SPANNING GRAPH

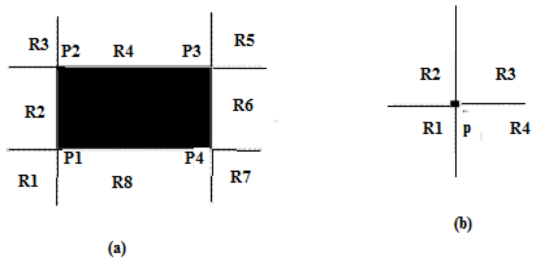
A spanning graph is associated with a undirected graph that contains all minimum spanning trees. The barrier-avoiding spanning graph is that the set of edges that may be fashioned by creating connections between terminals and obstacle corners. Once a spanning graph is constructed, the infinite possible sites for the mobile sink movement will be reduced to a finite set of sites. [6] Therefore, the algorithm based on the spanning graph makes it more efficient to schedule for the mobile sink. Figure 4.2.5 (a) shows the spanning graph on the basis of eight regions of an endpoint S. The plane with respect to the endpoint s is divided into 8 regions (R1 ~ R8) by the two rectilinear lines and the two 45 degree lines through s, as shown in Figure 4.2.5 (a).

A region R has the uniqueness property with respect to s if for every pair of points m,n∈R, kmnk < max(ksmk, ksnk). For example, in Figure 4.2.5(b), the minimal spanning tree for the region R contains the edges (s,m) and (m,n), and the longest edge (s,n) is not contained in the minimal spanning tree. Figure 4.2.5 describes the quadrant partition for an barrier corner and a pin vertex, respectively. [6]




**Eight Regions of an Endpoint and the Uniqueness Property. (a) Eight Regions. (b) The Uniqueness Property.**

According to the quadrant partition for the corner of an barrier and pin vertex, the spanning graph is created. As a result, with the search space of the mobile sink from the grid graph to the spanning graph, the possible locations for the mobile sink movement can be reduced easily. Therefore, this algorithm makes it more efficient for the mobile sink to find an barrier-avoiding shortest t.[6]




**Search Regions for Blockage and Pin. (a) Obstacle Corner. (b) Pin Vertex.**

**Spanning Graph**

Input: Number of nodes N.
Output: A minimum spanning tree T for N.
pick any vertex v of N
{grow the tree starting with vertex v}
T ← {v}

D[u] ← o
E[u] ← Ø
For each vertex u ≠ v **do**
D[u] ←+ ∞
let Q be a priority queue that contains all the vertices using the D labels as keys
**while** Q≠Ø **do**
{pull u into the cloud C }
U ← Q.removeMinElement()
Add vertex u and edge(u,E[u]) to T
**for** each vertex z adjacent to u **do**
**if** z is in Q
{perform the relaxation operation edge (u,z)}
**if** weight (u,z) <D[z]**then**
D[z]←weight(u,z)
E[z]←(u,z)
Change the key of z in Q to D[z]
**return** tree T

The spanning graph construction which is performed .To use the sweep line algorithm, an active set of point is needed in which one point should be popular among all other points in the set.

**(ii) GRID-BASED TECHNIQUE**

In physical environments, the sensing field could contain barrier with completely different shapes and sizes. Attributable to the irregular form of barrier, cannot directly construct the barrier-avoiding spanning graph for the mobile sink programming on the premise of the spanning graph rule . Therefore, a research challenge is how to utilize the spanning graph algorithm to find an barrier-avoiding shortest route for the mobile sink.

According to Grid-based techniques the sensing region is divided into the same size grid cells by using the grid-based techniques. Obviously, edges of barrier intersect grid cells and barrier may occupy part of some grid cells. Once barrier occupy part of one grid cell, To assume that the grid cell is regarded as barrier.[6]

**(iii) DIJKSTRA ALGORITHM**

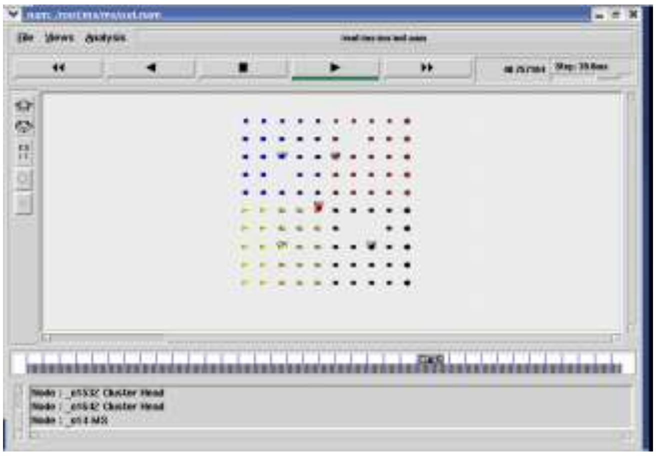
"Dijkstra algorithm is an finding the shortest- paths between the two nodes". The algorithm exists in many variants; "To catches the shortest -paths from the source to other nodes in the graph, generating a shortest path route." For a given source node in the graph, the algorithm catches the shortest path between that node and each other. It can be used for analyzing the shortest paths from a single node to a single destination node by blocking the algorithm once the shortest path to the destination node has been settled. As a result, the shortest path algorithm is generally used in network routing protocols, mobile communication, and Shortest Path.

**Dijkstra Algorithm**

for each vertex node in Network:
dist[v] :=infinity
previous[v] :=undefined
dist[source] :=0
Q:=the set of all nodes in Graph
While Q is not empty:
u :=node in Q with smallest dist[]
remove u from Q
for each neighbor v of u:
alt :=dist[u]+dist_between(u,v)
if alt < dist[v]
dis[v] := alt
previous [v] :=u
return previous[ ]

The main advantage of the use of these Dijkstra's for position estimation is that it may frequently features enormously excessive accurate function estimation even located on limited and distance data.

At last, Barrier restricting-the shortest route was established for mobile sink using Dijkstra's algorithm. Figure shows the Barrier Restricting.



**Barrier Restricting**

## III. APPLYING TIMER BLOOMING FILTER AGGREGATION :

**(i) Location update and packet delivery procedures in the EDD scheme.**

That the Bloom filter request message is transmitted is given by (1−pH) pE and the corresponding, Latency is LD + LC + LC +LC, where LD + LC represents the latency for sending a data packet and receiving an acknowledgement and LC + LC represents the latency for multicasting the Bloom filter request message and receiving the updated from the serving MA.

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**(ii) Signaling Overhead and Latency of Efficient Distributed Detection (EDD)**

To support the location anchor function (for location management) in fully distributed mobility management, DHT-based approaches that achieve load balancing and fault-tolerance are proposed in. However, since the original DHT focuses on very large distributed systems such as peer-to-peer (P2P) system, the original DHT maintains only limited routing information which causes higher signaling overhead in distributed mobility management.

**(iii) Signal Overhead**

The signaling overheads with the increase of T when  is 1 and 100, respectively. It can be seen that the signaling overhead of the TBFA scheme decreases as T increases because the changed indexes are infrequently propagated to Mas. it can be found that the signaling overhead of the TBFA scheme is larger than that of the EDD scheme when T is set to a larger value than 1.78 and 0.17 when  is 1 and 100, respectively.

**(iv) Latency**

In the EDD scheme, the additional latency occurs when the CN and the MN are in different MAs with probability (1 − pH). Therefore, the expected latency in the tree topology, LEDD, is respectively.

**(v) The Timer Selection Algorithm**

The timer selection algorithm based on  Timer Based Filter Aggregation **(**TBFA**)** as follows as, to calculate the timing and energy level. Larger pE causes longer latency. The upper bound of the latency of the TBFA scheme can be obtained by setting T to infinity.

Then, the latency condition to guarantee shorter latency than the EDD scheme even when T is infinite (i.e., the worst case of the TBFA scheme) is given by the latency of the TBFA and EDD schemes, respectively. To lessen the signaling overhead, to proposed a timer-based totally Bloom clear out aggregation (TBFA) scheme for dispensing the region statistics. In the TBFA scheme, the region data of MNs is maintained via Bloom filters at every MA. Also, because the propagation of the whole Bloom filter for each MN motion ends in high signaling overhead, each MA handiest propagates modified indexes inside the Bloom filter whilst a pre-defined timer expires.

To confirm the performance of the TBFA scheme, to expand analytical fashions at the signaling overhead and the latency and devise an algorithm to pick the correct timer price. large simulation effects are given to expose the accuracy of analytical models and effectiveness of the TBFA scheme over the present DMM scheme.

The timer bloom filter aggregation (TBFA) scheme for distributing the location information. In the TBFA scheme, the location information of Mobile node (MNs) is maintained by Bloom filters at each Mobile agent (MA). The propagation of the whole Bloom filter for every Mobile node (MN) movement leads to high signaling overhead, each Mobile agent (MA) only propagates changed indexes in the Bloom filter when a pre-defined timer expires. To verify the performance of the TBFA scheme, To develop analytical models on the signaling overhead and the latency and devise an algorithm to select an appropriate timer value.

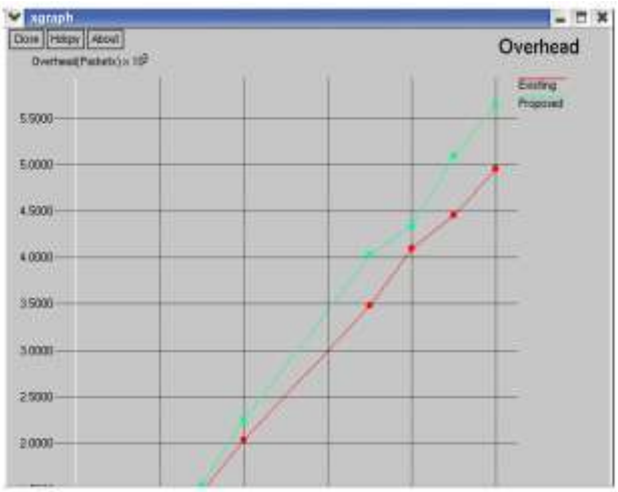
**(vi) SIGNAL OVERHEAD**

The Bloom filter for every Mobile node (MN) movement leads to high signaling overhead, each Mobile agent (MA) only propagates changed indexes in the Bloom filter when a pre-defined timer expires. To verify the performance of the TBFA scheme, to develop analytical models on the signaling overhead and the latency and devise an algorithm to select an appropriate timer value.

## IV. RESULT AND DISCUSSION

To measure the performance of the proposed work, following are the performance metrics considered: Residual Energy, Signal Throughput, Packet Delivery Ratio and Barrier Overhead. The Figure shows the comparison result of the existing work and the proposed work. The existing work with barrier and the proposed work without barrier main disadvantage of existing work to sending a signal it's stopped .But the proposed work without barrier to sending a signals with a time for the shortest path.

The proposed work, to provide better result and improves the network performance in terms of Residual Energy, Signal Throughput, Packet Delivery Ratio and Barrier overhead.




**Barrier overhead**

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## V. CONCLUSION

In this work Barrier restricting for mobile sink and finding the shortest path is proposed using cluster based routing, Dijkstra's algorithm, spanning graph and grid based methodologies. Mobile sink is used to collect data from each cluster heads by travelling near it and consumes less energy. If sensing field contains any barrier it can be avoided by scheduling the mobile sink path. Thus, cluster-based approach is feasible for dispatch of the mobile sink and consequently network life time increased than the existing system.

The Timer blooming Filter Aggregation (TBFA) algorithm presented for selecting an appropriate T (time) based on the developed analytical models. Extensive simulation results demonstrate that the performance of the Timer blooming Filter Aggregation (TBFA) scheme can reduce the signaling overhead and the latency by choosing the appropriate time.

## FUTURE ENHANCEMENT

In the proposed work, network lifetime is elongated and energy consumption is reduced than existing technique but energy consumed mobile sink are still high. So, in future it is going to be minimized by proposing efficient algorithms. The sensor nodes are assumed to be arranged in the form of round or square but sensor nodes may distributed in any form. In further work it is going to be resolved. In addition, simulation results reveal that the performance of the Timer blooming Filter Aggregation (TBFA) scheme is robust even when the Mobile Nodes (MN's) mobility pattern is irregular.

## ACKNOWLEDGEMENT

In future work, the investigate to deploy the Timer blooming Filter Aggregation (TBFA) scheme in small cell and heterogeneous network environments.

## *REFERENCES:*

[1] GUBIAS F.Z.(2004).Wireless sensor network.san Francisco: Elsevier.

[2] Carlos J.Bernardos and Juna Carlos Zungia, "Towards flat and distributing mobility management: A 3GPP evolved network design (2012)"

[3] Cong Wang and Yuanyuan," A Mobile Data Gathering Framework for Wireless Rechargeable Sensor Networks with Vehicle Movement Costs and Capacity Constraints (2014)."

[4] F. Tashtarian, M. H. Y. Moghaddam, K. Sohraby, and S. Effati, "On maximizing the lifetime of WSN with mobile sinks," at IEEE Trans. Veh. Technol., vol. 64, no. 7, 3177 3189, Jul. (2015).

[5] G. Han, A. Qian, J. Jiang, N. Sun L. Liu "A grid-based joint routing and charging algorithm for industrial wireless rechargeable sensor networks" .Comput. Netw.(2016)

[6] Guangqian xie and Feng pan" Cluster based routing for mobile sink in wireless sensor network with obstacles" Digital Object identifier 10.1109/ACCESS2016.2558196 .(2016)

[7] H. Chan, D. Liu, P. Seite, H. Yokota, and J. Korhonen, "Requirements for distributed mobility management," IETF RFC 7333, (2014).

[8] H. Ko, G. Lee, and S. Pack, "Reducing signaling overhead in distributed mobility management via bloom filter," in Proc.IEEE International Conference on Computer Communications (INFOCOM) 2013 Student Workshop, April 2013.

[9] H. Zhou, N. Shenoy, and W. Nicholls, ``Efficient minimum spanning tree construction without Delaunay triangulation," at Inf. Process. Lett., vol. 81, no. 5, pp. 271 276, 2002.

[10] I.-H. Peng, Y.-W. Chen, "Energy consumption bounds analysis and its applications for grid based WSN" J. Netw. Comput. Appl.vol. 36 no. 1 pp. 444-451 (2013).

[11] J. Zuniga, C. J. Bernardos, A. Oliva, T. Melia, R. Costa, and A. Reznik, "Distributed mobility management: a standards landscape," IEEE Communications Magazine, vol. 51, no. 3, pp. 80-87, March (2013).

[12] Ji Li, Yuanyuan Yang and Cong Wang in paper," Mobility Assisted Data Gathering in Heterogeneous Energy Replenishable Wireless Sensor Networks (2015)."

[13] Juan carlos zuniga and Carlos J.Bernardos "Distributed mobility management:"standards landscape IEEE Communication magazine(Volume:51,Issue:3)March (2013).

[14] K. Xu, G. Takahara, and H. Hassanein, ``On the robustness of grid-based deployment in wireless sensor networks," in Proc. Int. Conf Wireless Commun. Mobile Comput., (2006), pp. 1183 1188.

[15] L. Xie, H. D. Sherali, S. F. Midkiff in "Multi-node wireless energy charging in sensor networks" IEEE/ACM Trans. Netw. vol. 23 no. 2 pp. 437-450 Apr. (2015).

[16] M. Dong et al., ``Mobile agent-based energy-aware and user-centric data collection in WSN," at Comput. Netw., vol. 74, pp. 58 70, Dec. (2014).

[17] M. Zhao, Y. Yang, and C. Wang, ``Mobile data gathering with load balanced clustering ", at Comput. Commun vol. 14, no. 4, pp. 770 785, Apr.( 2015).

[18] Ningbo WANG, Hao ZHU “An Energy Efficient Algorithm Based on LEACH Protocol” IOSR J. Comput. Eng.vol. 4 no. 1 pp. 40-45 (2012).
[19] S. Guo, C. Wang, Y. Yang in "Joint mobile data gathering and energy provisioning in WRSN" IEEE Trans. Mobile Comput. vol. 13 no. 12 pp. 2836-2852 Dec. (2014).
[20] W. Khan, A. H. Abdullah, M. A. Razzaque, and J. I. Bangash, ``VGDRA: A virtual grid- based dynamic routes adjustment scheme for mobile sink-based WSN," at IEEE Sensors J., vol. 15, no. 1, pp. 526 534, Jan. (2015).
[21] Y. Yang, M. Zhao in "Tour planning for mobile data-gathering mechanisms in wireless sensor networks"IEEE Trans. Veh. Technol. vol. 62 no. 4 pp. 1472-1482 May (2013).
[22] Y. Yang, W. Wang in "Mobility assisted data gathering with solar irradiance awareness in heterogeneous energy replenishable wireless sensor networks"Comput.Commun.vol. 69 pp. 88-97 Sep. (2015).
[23] Y.C. Wang in paper, “Efficient Dispatch of Multi-Capability Mobile Sensors in Hybrid Wireless Sensor Networks (2012).”
[24] Y.-C. Wang, F.-J. Wu, and Y.-C. Tseng, ``Mobility management algorithms and applications for mobile sensor networks," at Wireless Commun. Mobile Comput., vol. 12, no. 1, pp. 7 21, 2012.
[25] Y.Yang and M.Zhao in paper, “Tour Planning for Mobile Data- Gathering Mechanisms in Wireless Sensor Networks (2013).”
[26] Z.She and C.C.N. Chu, “Efficient Rectilinear Steiner Tree Construction with Rectilinear Blockages (2013).”
[27] Z. Shen et al., ``Energy consumption monitoring for sensor nodes in snap," at Int. J. Sensor Netw., vol. 13, no. 2, pp. 112 120, 2013.