ISSN 2347 - 3983
Volume 8. No. 4, April 2020
International Journal of Emerging Trends in Engineering Research
Available Online at http://www.warse.org/IJETER/static/pdf/file/ijeter79842020.pdf
https://doi.org/10.30534/ijeter/2020/79842020

A New Strategy Adopted to Save Energy to Localizing a Moving Object in WSN

Anshuman Prakash Singh[1], Prof. (Dr.) S. Hasan Saeed [2]
[1]Integral University, India, apsingh3103@gmail.com
[2]Integral University, India, hasansaeedcontrol@gmail.com

ABSTRACT

In the last many years if we have seen and found that wireless sensor network is one of the most reliable systems in the real-time word and many application like military, surveillance, environment forecast, space, dense area and many application. Many works have already done as detect a moving object, design of a network, collection of data from the system, and we know in all research the most challenging task of a researcher is how to save power because we have minimal control. We know that power is nothing but the rate of change of energy. So if we save energy, then we contribute excellent work in WSN. In this paper, we discuss most of the research work which has done already and give a comparable result to our algorithm, which saves energy, which has used to localize a moving object in WSN.

In this paper, we have briefly described a new strategy adopted to save energy which is use to localize a moving object in WSN.

Key words: Wireless Sensor Network, Object Tracking, Static Cluster, Network Architecture, LEACH

1. INTRODUCTION

Wireless sensor networks are clusters of small device nodes connected via broadcast media. They are low-value battery-charged [1], and are placed at will to create device fields. Distribute sensors to all physical appearances, such as warmth, music, wave, movement, strength, or contaminants. It can work together and pass its information to the base station (BS) or sink node [2] through the network. WSN applies to all environments like dense area, boarder security, and hospitality. Object tracking is one of all imperious demands of wireless sensor interfaces, in which the job of tracking running objects requires bunches of wireless sensor nodes. In two phases, the purpose is detected first, and then the object is observed a second time to track the moving object. Object tracking has widely used in naval purposes, industrial purposes, police fields, and interrupter applications, and shipping applications [5]. Many indicators could use to examine recipient tracking, such as cluster creation, tracking precision [7], cluster head length, death rate, total energy utilized, the distance between the origin and the receiver, etc. incomplete problems in target tracking are detecting the improvement of the direction of rolling objects, purposes of different activities, prophecy accuracy, lapse limit, and lost target recovery.

In traditional object tracking, all device nodes pass their detected information to a node (base station or sink node), so The computing burden of that node will increase, resulting in a decrease in the accuracy of the network and a decrease in energy efficiency And if sensors will increase in the network, many messages are passed to the base station which consumes a lot of bandwidth. Therefore, this method lacks measurability. Similarly, if that node fails due to reduced energy, the entire network will crash. This is called a accumulate passageway. In WSN, the power of each node is strictly limited, so traditional object tracking strategies that support advanced signal processing algorithm rules do not seem to apply.

In target advising utilization, sensor nodes that can sense targets a definite time are in active mode. In diversity, the remaining nodes will remain in idle mode, saving energy until goals are close to them. In order to continuously monitor a moving object, it should be turned into an active mode before reaching the sensor. The bunch of mobile device nodes changes depending on the momentum of the shifting target.

The sensor node localizes the position of object and captures them to send data to the base station. [15]

The target tracking algorithm habits should design in such a way that they can obtain available worth trailing with low energy dissipation, through spreading the life of the system and delivering high sharpness.

Routing protocol - Routing is the process of establishing a path between the sender and receiver nodes for transmitting the packets along the path Routing protocol is find the best optimum Route between sender and Receiver basically it create the shortest path. Routing work is basically two level Interior and Exterior [32].

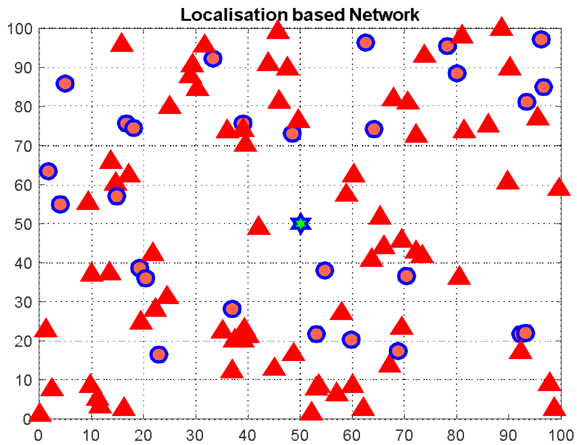
Table 1: Assign parameter values

Parameter	value
Network size	100m*100m
Number of nodes	100
Packet length	4000bits
Initial energy of normal nodes	0.5J
Initial Energy of advanced nodes	1.0J
Number of rounds	5000
Transmitter Electronics(ETX)	50nJ/bit
Receiver Electronics(ERX)	50nJ/bit
Data Aggregation Energy	5nJ/bit

2. RELATED WORK

2.1 Network formation

In network formation we take some parameter and selected experimental value which is mention in table 1. In this paper we also discuss some work who already done to minimize the energy most of work to focuses on object tracking likes OTSN



[27].

Figure 1: Localization of a network

2.2 Object Detection

Trilateration is a method of determining the absolute or relative position of an object based on simultaneous distance measurements received from multiple stations located at known locations [15]. Due to its easy implementation, it widely used in various applications that provide location-aware services such as robotics, radar, aerospace surveillance, wireless sensor network (WSN), and automotive applications. triangulation-based positioning methods face many challenges, as errors are inevitably introduced in all ranging technologies, including but not limited to received signal strength (RSS) [5], time of arrival (TOA), and time difference. Time of Arrival (TDOA) [9]. Although vision-based positioning technology [1] is feasible, camera images are sensitive to weather conditions. In dynamic systems, distance measurement results are noisy and fluctuating, making trilateral measurement problems difficult.

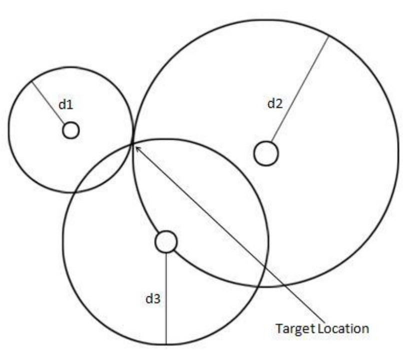


Figure 2: Target localized at point of intersection

. 2.3 Signal parameter

RSSI technology is a localization technology used for computing [5]. A node propagates a model through RF signals. It mainly estimates the distance between the node under test and multiple anchor nodes by the degree of signal attenuation. It then determines the coordinates of the node under test based on the calculated distance. In practice, the diffraction of radio waves is affected by multiple paths [13], which reduce positioning accuracy. We set the coordinate of positive node as (p_i ,q_i) And the coordinates of the nodes to be measured (p, q) are, and the surrounding anchor points can determine different circles. RSSI is a receive signal strength indicator that defines the power of the cluster head to receive the information [ref]. as shown in the following formula

$$R_i = \sqrt{(p_i - p)^2 + (q_i - q)^2} \quad (i=1, 2, …….. M)$$

The intersection point of this circle is the coordinate of the moving object.
Where M is the number of positive node
The positioning performance is affected by the accuracy of the path loss model. If the loss model can accurately estimate the propagation distance, the positioning accuracy will be improved [14]; otherwise, it will reduce. Here, we use the RSSI-based circular correction method to solve the accuracy problem [21]. The overall design theory is as follows:
The node under test receives the data frames sent by the surrounding positive nodes, uses the positioning algorithm to estimate all RSSI values. Then sorts the RSSI values obtained by the nodes to find the three RSSI values with the highest surrounding Nodes and then use trilateration and other related algorithms to calculate the coordinates of the nodes to be measured.
The anchor node with the highest RSSI value has shielded, and the remaining two positive nodes and the next positive node [5] with a higher RSSI value form a triangle area. In this way, the new coordinates of the node will calculate by the positioning algorithm, and the offset direction of the node can be determined. Then, the anchor node with the highest RSSI value is deleted again from the anchor nodes. Each time the node moves a certain distance, the positioning will repeat to achieve higher positioning accuracy.

2.4 Cluster Based Architecture

The cluster-based methodology has manipulated to encourage collaborative data processing [20]. In this system, a whole network is a divide toward humbler sectors called clusters. Every cluster contains a bunch head (CH) [29] and menial nodes. Clustering is particularly useful for applications that need to be measured across a thousand nodes.
The clustering algorithm includes four stages:

• Geographic formation of clusters.
• Select a cluster head (CH) [19] with higher functionality than other sensor nodes. The choice depends on various parameters such as remaining energy, processing power, and object position.

• Data collection to transfer received data sensed by segment lumps to the cluster head [24].

• Data transmission phase, where the cluster head transmits collective data to the receiver nodes. There are two types of clusters: static clusters and dynamic clusters.

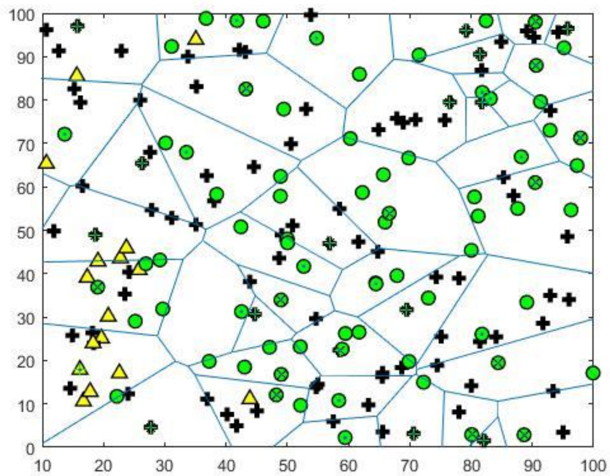


Figure 3: Cluster Formation

2.4.1 Static Cluster

In a static cluster, a cluster that is manually constructed during network deployment [28]. The qualities of each cluster are implanted entirely the system round. Despite its simple design, there are still many disadvantages to static cluster design. First, from a fault tolerance perspective, immobile membership is not strong. If the CH dies due to power loss, all the sensors in it will become useless. Second, immobile properties check sensor links in other clusters from yielding information and colluding on processing. Some events of interest exam trigger the development of a bunch. Unlike the immobile bunch passageway, in the energetic bunch procedure, sensors do not resemble to be motionless segments of a distinct bunch during the network round, they may sustain various bunches at separate times.

2.4.2 Dynamic Cluster

A dynamic clustering algorithm for acoustic object monitoring in WSN [9] constructs a Voronoi diagram [5] of CH and selects the CH closest to the object in each interval as the active CH. The active CH then broadcasts a message and the node receiving this message reply and sends data that has perceived from an object. The active channel calculates the position of the current object and sends it to the base station. If the threshold value of the node is similar, then the selection of the cluster head is a typical task.

The Cluster-based tracking algorithm [19] covers three main steps, target detection, source localization, and target evaluation. Liu Dan, Wang Nihong, and others. It has proposed that an algorithm based on active clustering [26] enhances active or hibernate by divining the movement trajectory of a target, diminishing the number of muddying nodes to reduce network energy dissipation. Choosing the best node to implement tracking tasks on the exacted movement trajectory also secures load balancing and improves network time.

2.4.3 Hybrid Architecture

Hybrid structures typically connect one of all the earlier suggested structures with a brewing device [27].Examples include forecast-based energy savings, dual forecast-based reporting, and distributed forecast track. These strategies specifically increase energy efficiency by keeping most nodes in sleep mode. Xu Yingqi and others. We have planned reports based on double predictions [9], regardless of the subsequent position of the object at the sensor nodes and sinks. When the difference between the actual position and the predicted position is appropriate, no update message has sent to the receiver, so fewer data packets are transmitted to the receiver, resulting in lower utilization of the communication bandwidth. The dual-prediction-based DPR [9] report diminishes the energy dissipation of the radio section by reducing the number of long-distance transmissions between sensor nodes and sink nodes with the least expenses. In a dual-prediction-based report [20], each base station and sensor node makes the same predictions for the future movement of a movable object that maintains its movement memoir. The custom works cluster-based scalability scheme and predictive-based tracking arrangements to generate assigned and energy-efficient clarifications.CH uses object descriptors to discover objects and predict their next position. The advantage of this protocol is that its prediction failure leads to the temporary loss of objects, and it can quickly recover from such accidents with little additional energy consumption, to achieve a lower omission rate, so the distributed prediction tracking algorithm should be extended.

3. RESULT

In this paper, we conclude all the essential parameter which has used to save energy and it is very important to monitoring the energy system [33] for us. When an object is moving in the wireless sensor network. We apply an algorithm which name is Localized Leach (L-LEACH) compare with the Enhance Leach (EN-LEACH) [31] scaling parameter is Alive node, Dead node, packets transmitted to the base station (BS) and cluster head (CH) concerning the number of Rounds comparative value is mention at Table 3 and figure 4, 5 you can see that in my algorithm is useful than other. In the same way, we take other parameter packets to the base station and rounds [30], as to mention in table 2 and figure 7, 9. Figure 10 is the most important because, in this figure, we show the Energy Residual of each node, and the initial energy of each node is mention in table 1. At till two thousand round nodes transfer the data.

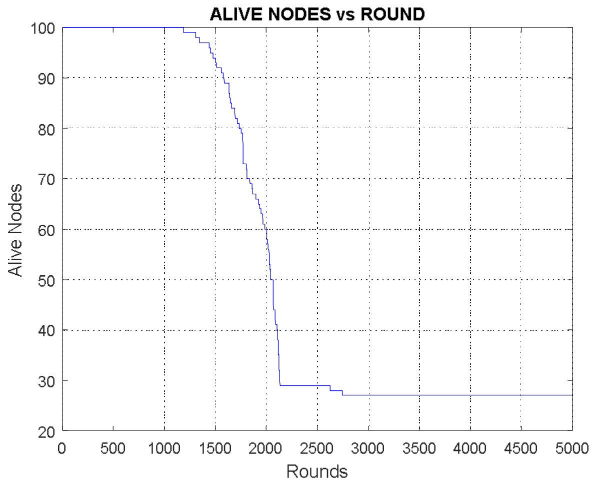


Figure 4: Alive node vs Round for Localization LEACH

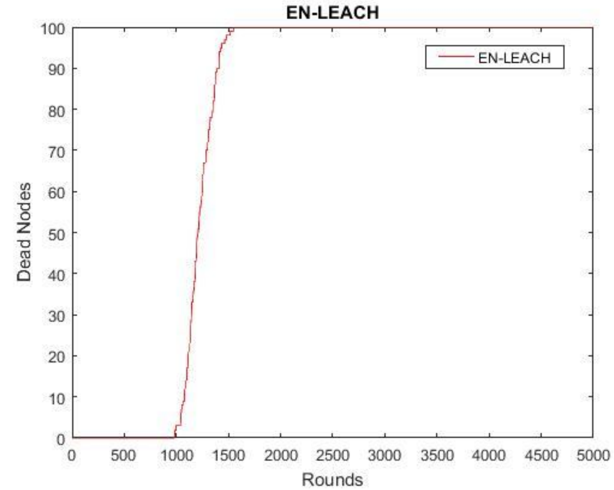


Figure 7: Dead node vs Round for EN-LEACH

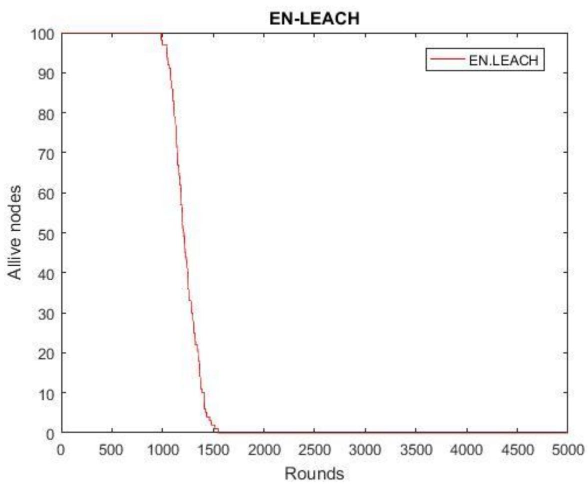


Figure 5: Alive node vs Rounds for EN- LEACH

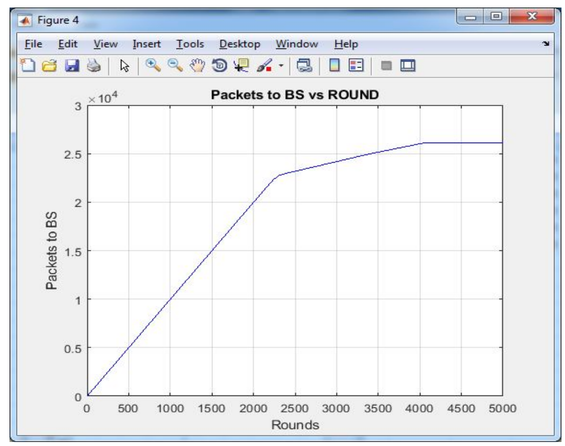


Figure 8: Packets to Base Station (BS) vs Rounds for Localization LEACH

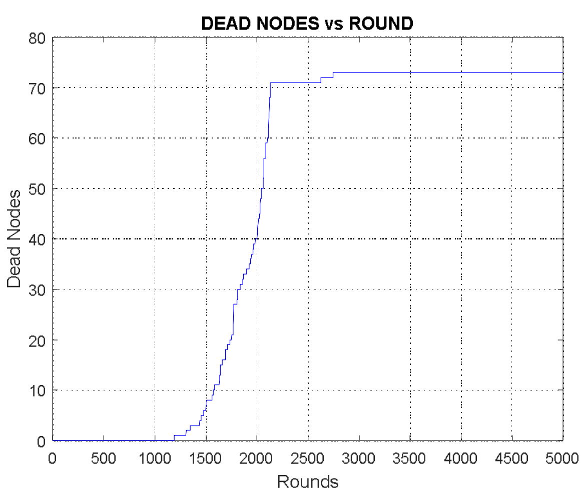


Figure 6: Dead node vs Rounds for Localization LEACH

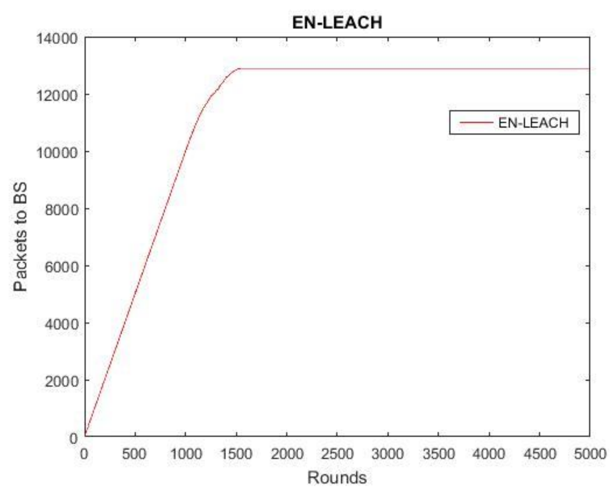


Figure 9: Packets to Base Station (BS) vs Rounds for EN-LEACH

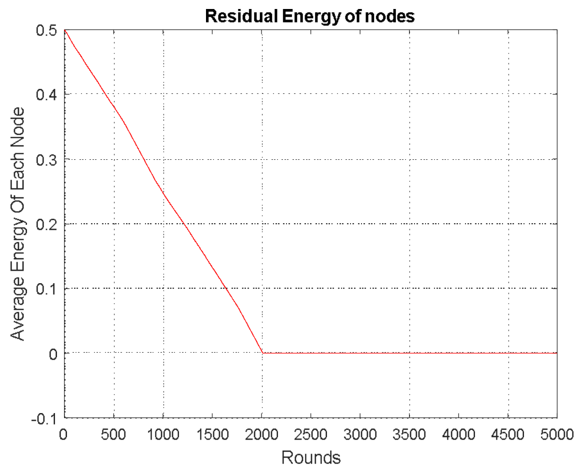


Figure 10: Residual Energy of nodes

Table 2 : Comparision Result for number of Rounds

S.NO	ROUNDS	L-LEACH	EN-LEACH
1	300	2983	2983
2	900	8980	8980
3	1500	14976	12760
4	1800	17970	12760
5	2400	22977	12760

Table 3: Comparision Result for Dead node and Alive node

S.NO		L- LEACH		EN- LEACH	
	ROUNDS	ALIVE NODE	DEAD NODE	ALIVE NODE	DEAD NODE
1	500	100	0	100	0
2	1000	100	0	100	0
3	1500	95	5	2	98
4	2000	56	44	0	100
5	2500	28	72	0	100

4. CONCLUSION

Based on the result and above discussion, it is clear that this new strategy adopted to save energy, which has used to localize a moving object in WSN, was given the great result as when compared to the LEACH [31] result. In this paper, we compare the result parameter like Alive node, Dead node concerning the number of rounds, residual energy, and packet to base station data transfer. In all these results, our algorithm result is more accurate than others. In the future, we work to get combine results with LEACH protocol. This work is new, and we are sure this work is not having done before.

REFERENCES

[1] T. Rault, 'Energy-efficiency in wireless sensor networks To cite this version : HAL Id : tel-01470489 Thèse présentée pour l ' obtention du grade de Docteur de l ' UTC', 2017.

[2] N. Sabor, S. Sasaki, M. Abo-Zahhad, and S. M. Ahmed, 'A comprehensive survey on hierarchical-based routing protocols for mobile wireless sensor networks: Review, taxonomy, and future directions', *Wireless Communications and Mobile Computing*, vol. 2017. 2017. https://doi.org/10.1155/2017/2818542

[3] A. M. Shafiei, 'An Energy-Efficient Target Tracking Protocol Using Wireless Sensor Networks', 2015.

[4] K. W. Lin, M. Hsieh, and V. S. Tseng, 'Expert Systems with Applications A novel prediction-based strategy for object tracking in sensor networks by mining seamless temporal movement patterns', *Expert Syst. Appl.*, vol. 37, no. 4, pp. 2799–2807, 2010. https://doi.org/10.1016/j.eswa.2009.09.011

[5] P. Joshi and A. Joshi, 'Prediction Based Moving Object Tracking In Wireless Sensor Network', *Int. Res. J. Eng. Technol.*, vol. 4, no. 7, pp. 3364–3368, 2017.

[6] Y. Xu and W. Lee, 'Prediction-based Strategies for Energy Saving in Object Tracking Sensor Networks', 2004.

[7] L. Paris and M. H. Anisi, 'An Energy-efficient Predictive Model for Object Tracking Sensor Networks', *IEEE 5th World Forum Internet Things, WF-IoT 2019 - Conf. Proc.*, pp. 263–268, 2019. https://doi.org/10.1109/WF-IoT.2019.8767195

[8] S. Samarah, M. Al-hajri, A. Boukerche, and S. Member, 'A Predictive Energy-Efficient Technique to Support Object-Tracking Sensor Networks', vol. 60, no. 2, pp. 656–663, 2011. https://doi.org/10.1109/TVT.2010.2102375

[9] Y. Xu and W. Lee, 'Dual Prediction-based Reporting for Object Tracking Sensor Networks', 2004.

[10] A. Abid, F. Khan, M. Hayat, and W. Khan, 'Real-time object tracking in wireless sensor network', in *2017 10th International Conference on Electrical and Electronics Engineering, ELECO 2017*, 2018, vol. 2018–January.

[11] Y. X. W. Lee, 'On Localized Prediction for Power Efficient Object Tracking in Sensor Networks', 2003.

[12] M. Naderan, M. Dehghan, and H. Pedram, 'Mobile Object Tracking Techniques in Wireless Sensor Networks'.

[13] V. S. Raja, 'A Predictive Energy-Efficient Mechanism to Support Object-Tracking Sensor Networks', no. Icon3c, pp. 13–17, 2012.

[14] H. Musafer, R. Abdulhameed, E. Abdelfattah, and K. Elleithy, 'A Dynamic Clustering Algorithm for Object Tracking and Localization in WSN 1 Introduction 2 Related Works 3 Cluster-based Tracking Techniques'.

[15] C. Lin, S. Member, and W. Peng, 'Efficient In-Network Moving Object Tracking in Wireless Sensor Networks', vol. 5, no. 8, pp. 1044–1056, 2006.

[16] S. A. Nandhini and S. Radha, 'Compressed sensing based object detection and tracking system using measurement selection process for wireless visual sensor networks', in *Proceedings of the 2016 IEEE International Conference on Wireless Communications, Signal Processing and Networking, WiSPNET 2016*, 2016.

[17] M. Bagaa, Y. Challal, A. Ksentini, A. Derhab, and N. Badache, 'Data Aggregation Scheduling Algorithms in Wireless Sensor Networks : Solutions and Challenges', pp. 1–30, 2014. https://doi.org/10.1145/2744198

[18] L. Cheng, C. Wu, Y. Zhang, H. Wu, M. Li, and C. Maple, 'A Survey of Localization in Wireless Sensor Network', vol. 2012, 2012.

[19] M. Toumi, A. Maizate, and M. Ouzzif, 'Dynamic cluster algorithm for improving percolation of targets in a sensor network (DC-AIPT)', *Egypt. Informatics J.*, vol. 20, no. 3, 2019. https://doi.org/10.1016/j.eij.2019.04.002

[20] M. Wu, L. Tan, and N. Xiong, 'Data prediction, compression, and recovery in clustered wireless sensor networks for environmental monitoring applications', *Inf. Sci. (Ny).*, vol. 329, pp. 800–818, 2016.

[21] O. Cayirpunar, B. Tavli, E. Kadioglu-Urtis, and S. Uludag, 'Optimal Mobility Patterns of Multiple Base Stations for Wireless Sensor Network Lifetime Maximization', *IEEE Sens. J.*, vol. 17, no. 21, 2017.

[22] O. Oguejiofor, A. Aniedu, H. Ejiofor, and A. Okolibe, 'rssi', *Int. J. Sci. Mod. Eng*, no. 10, pp. 21–27, 2013.

[23] G. Abdul-Salaam, A. H. Abdullah, and M. H. Anisi, 'Energy-Efficient Data Reporting for Navigation in Position-Free Hybrid Wireless Sensor Networks', *IEEE Sens. J.*, vol. 17, no. 7, 2017. https://doi.org/10.1109/JSEN.2017.2665663

[24] C. Gherbi, Z. Aliouat, and M. Benmohammed, 'An adaptive clustering approach to dynamic load balancing and energy efficiency in wireless sensor networks', *Energy*, vol. 114, 2016.

[25] P. B. Solanki, 'Voronoi Diagram Based Roadmap Motion Planning'.

[26] L. Rajesh and C. R. B. Reddy, 'Efficient wireless sensor network using nodes sleep/active strategy', *Proc. Int. Conf. Inven. Comput. Technol. ICICT 2016*, vol. 2, 2016.

[27] Z. Wang, W. Lou, Z. Wang, J. Ma, and H. Chen, 'A Hybrid Cluster-Based Target Tracking Protocol for Wireless Sensor Networks', vol. 2013, 2013. https://doi.org/10.1155/2013/494863

[28] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, 'A CCEPTED FROM O PEN C ALL A Survey on Sensor Networks', no. August, pp. 102–114, 2002.

[29] A. Ez-Zaidi and S. Rakrak, 'A comparative study of target tracking approaches in wireless sensor networks', *Journal of Sensors*, vol. 2016. 2016.

[30] W. Xu, Wu, Daneshmand, Liu, 'A data privacy protective mechanism for WBAN', *Wirel. Commun. Mob. Comput.*, no. February 2015, pp. 421–430, 2015.

[31] J. Singh, B. P. Singh, and S. Shaw, 'A new LEACH-based routing protocol for energy optimization in Wireless Sensor Network', *Proc. - 5th IEEE Int. Conf. Comput. Commun. Technol. ICCCT 2014*, pp. 181–186, 2015.

[32] P. Srikanth Reddy, P. Saleem Akram, M. Adarsh Sharma, P. Aditya Sai Ram, and R. Pruthvi Raj, 'Study and analysis of routing protocols', *Int. J. Emerg. Trends Eng. Res.*, vol. 7, no. 11, pp. 434–440, 2019. https://doi.org/10.30534/ijeter/2019/067112019

[33] E. R. Magsino, 'Energy monitoring system incorporating energy profiling and predictive household movement for energy anomaly detection', *Int. J. Emerg. Trends Eng. Res.*, vol. 7, no. 8, pp. 151–156, 2019. https://doi.org/10.30534/ijeter/2019/08782019