

# Collaborative Energy Efficiency for Modleach in WSN



Pragya Pandey, Inderjeet Kaur

**ABSTRACT:** *Conceptual - Advancement in remote innovation described human life turn as basic and nice. Remote Ad hoc Sensor Network (WASN) is one of the benevolent remote systems used to screen the most horrible and consistently changing unique condition that limits constant human consideration. WASN has attracted huge consideration because of its unmistakable abilities to manage complex system activity in exceptionally asset compelled arrange build. WASN is turning into a demandable and advancing region of designing which has been right now occupied with different fields, especially to make remote correspondence framework successful and solid. WASN is settling continuous applications in the spots where geological, natural territories and climatic marvel are consistently fluctuating. This impromptu and unstructured arrangement of small sensor hubs work with controlled transmission run, preparing abilities, just as restricted battery reinforcement. Vitality is a crucial parameter in remote specially appointed sensor arrange. Especially, it has all the more dominant necessity under a powerful domain. The serious power exhaustion influences the presence of dynamic hubs. Consequently, information sending and solid parcel directing in such marvel situated system turning into a test. Grouping has made present remote sensor arrange framework vitality mindful because of information total, information combination and information pressure at bunch heads. That outcomes non repetitive message age and transmission, lead to least radio overhead. Yet, under completely powerful system condition the outcome isn't a lot of acceptable in Wireless Ad hoc Sensor Networks (WASNs).*

**Keywords:** MANET, WSN, Energy Consumption, Network Lifetime, Clustering

## I. INTRODUCTION

Wider use of sensors in varieties of complex and real-time networked applications brought Wireless Ad hoc Sensor Network (WASN) into the picture. Recent advancement in WASN has proven itself as one of the desired technology for people. Sensors are likely to be remotely positioned in unattended network settings and this becomes the reason of development of many routing protocols. Routing is one of the key exercises that any network performs for better quality of service and it is impossible that a single routing protocol for all applications.

This is the region why strategic routing and packet communication are becoming the point of attention in WASN research. However, limited power source, bandwidth and wireless medium with node mobility still remain as fundamental constraints in protocol designing in WASN.

Routing is very challenging in WASN, where information and data moves from a source point to a goal point through moderate hubs, called multi bouncing in bundle directing. Be that as it may, gathering and assembling information at some general goal point is very troublesome as there is constantly an opportunity of capricious power exhaustion, coming about parcel misfortune and system delay. That prompts early breakdown of the entire system structure. Specially appointed ability continuously arrange setting makes remote directing basic due to regularly changing steering way as for various example of time. Dynamic examine in remote impromptu and portable sensor sort of system is being completed in the field of steering, asset the board, control, security, and so on. The thought of vitality for making the steering procedure effective is the most ideal approach to manage any of these issues by expanding system activity. There are a few additional contemplations that make the planning of WASN convention an intense errand

As WASN, has been aimed for locations with zero human interference where geographical changes are continuous and dynamic. An upgrade in the abilities of existing sensor arrange is a basic need to manage dynamic and genuine remote organize situations. Subsequently, development of improved vitality mindful group directing in WASN become fundamental. To do as such, consolidate versatility in the sensor hubs is one of the ways. The inclusion of such realistic behavior in the current WASN helps to draw a distinct line between static and dynamic states in terms of random node mobility. To deal with power problems with such network settings several protocols are developed. Data aggregation and data fusion methods in clusters inspire non redundant bulk of packet transfer at a quicker pace to the base station with lower routing overhead. Hence, it is always desirable an effectual routing protocol, that has low routing overhead and well organized data capturing mechanisms. However, the performance of the cluster routing requires optimization when WASN becomes heterogeneous with mobility. Serious control consumption emphatically influences the presence of dynamic hubs and the system activity as well. So as to delay the system usage, a few power the executives approaches are accessible that proficiently decrease the vitality utilization exclusively in every sensor just as in the entire system.

Manuscript published on November 30, 2019.

\* Correspondence Author

**Pragya Pandey\***, Department of Computer Engineering, Ajay Kumar Garg Engineering College, Ghaziabad  
[pragya985@gmail.com](mailto:pragya985@gmail.com)

**Inderjeet Kaur**, Ajay Kumar Garg Engineering Colleges, Ghaziabad  
[inderjeetk@gmail.com](mailto:inderjeetk@gmail.com)

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

A few thinks about state, because of ongoing unique practices and complexities of specially appointed remote hubs, the utilization of customary strategies for improving quality and solidness during the time spent steering turns into a difficult activity. Improvement is useful in making the proper exchange off between various clashing parameters to get the most ideal result.

The potential ideal models of developmental calculation, delicate processing based heuristics and multi objective meta-heuristics can be good with such system setting to overpower the complexities. Two significant issues in remote sensor systems are vitality proficiency and nature of administration. Bio-enlivened developmental meta-heuristics can have the option to upgrade current grouping and directing conventions to augment nature of administrations and proficiency as far as vitality.

**II. PROPOSED WORK**

**2.1 Wireless Network Topology Management**

The proficiency for correspondence relies upon control conventions yet additionally helps in building topology. In actuality, the specially appointed conduct of sensor hubs in the application space supports hub uprooting progressively at various time examples, presenting portability in the system just as keeping the quality especially regarding vitality is testing. To build interchanges in WASN by utilizing traditional bunching approaches is somewhat extreme because of quick topology change as a result of irregular hub portability. So it gets important to examine and create conventions that manage fast topology change.

The topology of an impromptu system assumes a key job in the exhibition of the control calculations utilized in the system for the reasons, for example, planning of transmissions, steering, and broadcasting, and so on. By and large, a few system joins are not required for setting up customer sharing of the channel among neighboring hubs or the steering of information bundles. There are two sorts of ways to deal with the topology the executives in specially appointed systems and they are, control based and progressive topology association. Power control put together instruments direct the power with respect to per hub premise, so one-jump neighbor availability is adjusted and generally organize network is guaranteed and accommodating at segment level. Then again, various leveled topology control, with which a subset of the system hubs is chosen to fill in as the system spine over which basic arrange control capacities are bolstered. This strategy to the topology control is once in a while named as bunching, and comprises of choosing a lot of CHs such that each hub is related with it, and group heads are associated with each other legitimately or by methods for doors, so the association of entryways and CHs establish an associated spine. When chosen, the bunch heads and the portals help to lessen the multifaceted nature of keeping up topology data, and can improve basic capacities like steering, transmission capacity allotment, channel get to, control or virtual-circuit backing and others. To make bunching viable, the connections and hubs that are a piece of the spine must be near least with better availability. In a perfect world, topology control dependent on grouping, chooses a base and

adequate number of connections to fill in as the correspondence spine of the system, while decreasing the system support and control overhead as well.

**2.2 Mobility in Protocol Design**

To frame better bunching in remote specially appointed system condition, it is amazingly proposed to think about and understand each one of those components that are impacting vitality intricacy under hub versatility for further up-degrees in the current conventions to satisfy front line needs. One part of this work is to comprehend, the conduct of grouping in bundle directing when irregular versatility design is added to the sensor hubs. With regards to execution and quality assessment of WASN conventions, it is necessitated that the conventions are to be broke down and reproduced under sensible just as outrageous powerful conditions. To create practical portable specially appointed condition for sensor arrange a few versatility models have been concentrated to pick a reasonable portability system that is depending on sensible development designs dependent on parameters like area, speed, speed, quickening changes after some time of the impromptu sensor hubs. Random waypoint mobility model [171] provides very rapid and non-uniform movement pattern to the nodes as already discussed in last chapter. By implementing appropriate mobility pattern, it can be possible to calculate and predict the relative speed between nodes, the link strength and status of the link, etc. easily and relative speed based mobility metrics and others can be computed, which can be utilized for assessing different other aspects and issues evolved in next generation protocol designing.

**Table 1 Simulation Parameters for modeling WASN**

Simulation Parameter	Value
Network size	200 x 200 sq. m.
No. of Mobile Nodes	100 nos.
Probability (p)	0.1
Initial Energy (E <sub>0</sub> )	1J
Energy dissipated(Trans/Receive)	50 nJ/bit
Amplification Energy	100 pJ/bit/m <sup>2</sup>
Energy (Data Aggregation)	5 nJ/bit
Control Packet	1 bit
Min. Speed	0 ms.
Max. Speed	20 ms.
Pause Time	2 ms.
Time	50 sec.



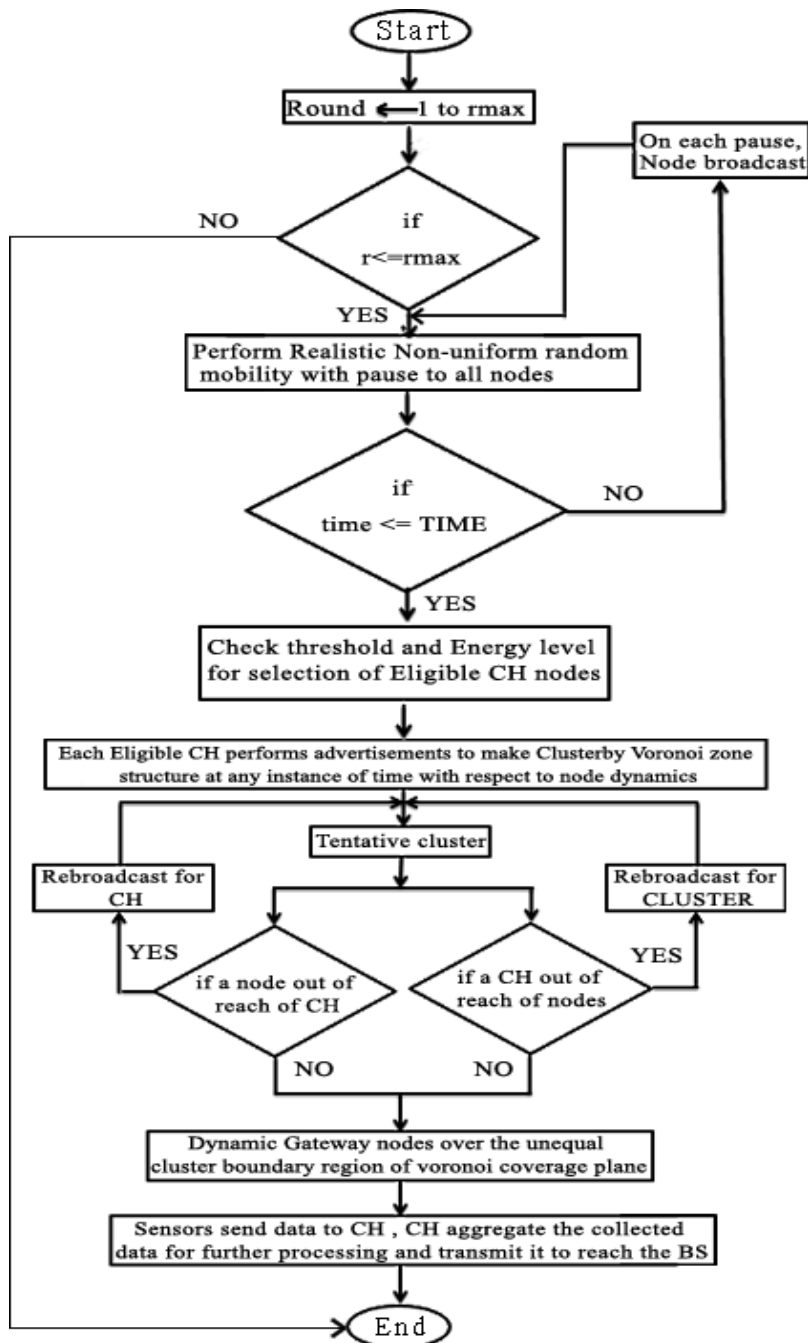


Figure 1 Control flow diagram of the simulation

### III. RESULT ANALYSIS

A few perceptions have been made after the reproduction of the program for various adjusts. It has been viewed as complete 20 most extreme rounds for examination. Figure 2 presentations both alive and dead hubs alongside the high vitality bunch head in the Voronoi plane after 20 rounds of run. Voronoi method sorts out the absolute system so that no single hub will show up out of the inclusion territory and each individual hub must be accessible to a specific CH at any occurrence of time, which is basic to manage versatility in a specially appointed condition. Because of quick hub uprooting the system, results inconsistent groups. During the numerous run of the reproduction, it has been discovered, number of hubs can be showed up inside the phone aside from the qualified CH hub, which significantly influences

the vitality utilization level of among the group heads and henceforth the all out system. In spite of the fact that the bunch head is chosen through probabilistic edge [14] and vitality save factor, however during nearby group development the number of inhabitants in the portable hubs accessible closest to a qualified CH hub, chooses the phone size of grouping zone to be increased or littler. This dynamic component of Voronoi is reflected in the present investigation.

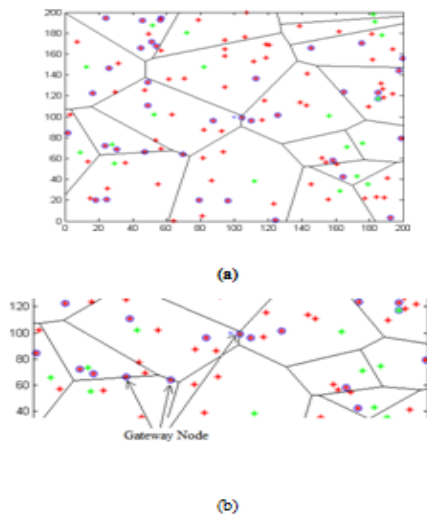


Figure 2(a) Voronoi plane after 20th rounds (b) gateway nodes on the Voronoi plane

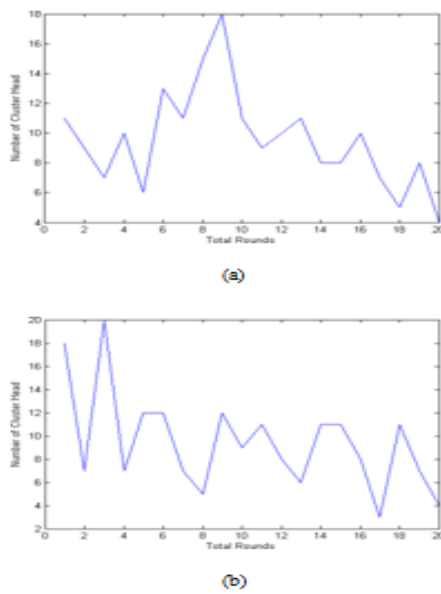


Figure 3(a) (b) Number of CH elected per round at different simulation runs

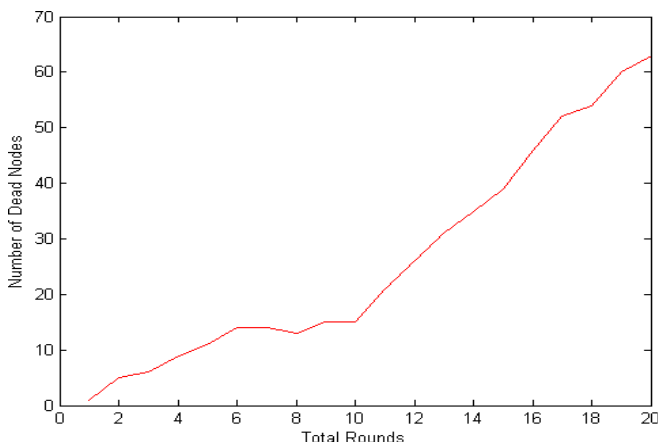


Figure 4: Number of dead nodes with respect to rounds

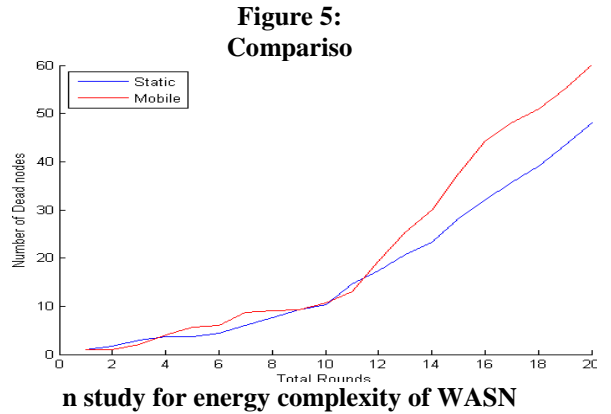


Figure 5: Comparison

n study for energy complexity of WASN

IV. CONCLUSION

As studied in the literatures, most of energy aware routings are static in nature and few are mobility based but they are in semi-mobile wireless environment and most of the protocols are still under development stage. To understand the changes, issues and limitations that happened to WASN in terms of Energy Complexity in routing under random real time mobility of nodes, compared to static one with analysis has been presented. A hybrid protocol has been proposed in this work, where the intensity of mobility in terms of new mobility factor is being used in the threshold calculation for the clustering process along with other attributes. Heterogeneity of WASN depends on the functionalities of deployed nodes and functionality is directly proportional to the energy consumption level of individual nodes and network as well as stated by distinguished authors earlier. This theory seems vital in a static network environment. But, in this work it has been found and analyzed that the mobility pattern and mobility count of nodes as an important factor in network heterogeneity in terms of energy in the hierarchical cluster based mobile WASN. The hybrid nature of the proposed protocol is to take the best features of various existing routing protocols are in place in the algorithm. The network performance of proposed one has been described based on evaluation parameters like, Network Lifetime, Cluster Count, The proposed protocol in this work outperforms LEACH (M) and LEACH-ME in terms of energy, throughput and others. The assessment of Link Quality and energy consumption in packet routing with hands on devices has been made to understand the routing in a variety of real time network scenarios which are helpful to design different operations on WASN at physical layer implementation..

ACKNOWLEDGEMENTS

I would like to say a special thanks to my guide and advisor Dr. Inderjeet Kaur for her time and support to me, her valuable suggestions and ideas have given me great scope and flexibility to work in the best possible way to achieve my goals in this thesis. This work would not have been possible without the extensive personal and professional guidance that taught me a great deal about both scientific research and life in general. Most importantly, nobody has been more important to me in the pursuit of this project than the members of my family.

## REFERENCES

1. Pandya, N.K.; Kathiriya, H.J.; Kathiriya, N.H.; Pandya, A.D., "Design and simulation of enhanced MODLEACH for wireless sensor network," in Computing, Communication & Automation (ICCCA), 2015 International Conference on , vol., no., pp.336-341, 15-16 May 2015
2. Pandya, N.K.; Kathiriya, H.J.; Kathiriya, N.H.; Pandya, A.D., "Design and simulation of advance MODLEACH for wireless sensor network," in Computer, Communication and Control (IC4), 2015 International Conference on , vol., no., pp.1-6, 10-12 Sept. 2015
3. Gambhir, S.; Fatima, N., "Op-LEACH: An Optimized LEACH Method for Busty Traffic in WSNs," in Advanced Computing & Communication Technologies (ACCT), 2014 Fourth International Conference on , vol., no., pp.222-229, 8-9 Feb. 2014.
4. Rahayu, T.M.; Sang-Gon Lee; Hoon-Jae Lee, "Survey on LEACH-based security protocols," in Advanced Communication Technology (ICTACT), 2014 16th International Conference on , vol., no., pp.304-309, 16-19 Feb. 2014
5. Kodali, R.K.; Aravapalli, N.K., "Multi-level LEACH protocol model using NS-3," in Advance Computing Conference (IACC), 2014 IEEE International , vol., no., pp.375-380, 21-22 Feb. 2014
6. Salim, M.M.; Elsayed, H.A.; El Ramly, S.H., "PR-LEACH: Approach for balancing energy dissipation of LEACH protocol for wireless sensor networks," in Radio Science Conference (NRSC), 2014 31st National , vol., no., pp.252- 259, 28-30 April 2014.
7. Yong-Zhen Li; Ai-Li Zhang; Yu-Zhu Liang, "Improvement of Leach Protocol for Wireless Sensor Networks," in Instrumentation, Measurement, Computer, Communication and Control (IMCCC), 2013 Third International Conference on , vol., no., pp.322-326, 21-23 Sept. 2013.
8. P. N. Renjith and E. Baburaj, "An Analysis on Data Aggregation in Wireless Sensor Networks," IEEE International Conference on Radar Communication and Computing (ICRCC), SKP Engineering College Tiruvannamalai, TN., India. 21-22 pp. 62-71, December 2012.
9. S. Younis, O. Fahmy, "HEED: A hybrid energy-efficient distributed clustering approach for ad-hoc sensor networks," IEEE Trans. Mobile Computer, pp. 366-379, 2004.
10. D.P Manjeshwar, E. Agrawal, "TEEN: A Routing Protocol for Enhanced Efficiency in Wireless Sensor Networks," IEEE In Proceedings of the 15th International Parallel and Distributed Processing Symposium (IPDPS), San Francisco, CA, USA, pp. 2009-2015, 23-27 April 2001.
11. W. Heinzelman, A. Chandrakasan and H. Balakrishnan, "Energy Efficient Communication Protocol for Wireless Microsensor Networks," IEEE Proceedings of the 33rd Hawaii International Conference on System Sciences (HICSS '00) 2000.
12. N Israr, I Awan, "Multihop clustering Algorithm for load balancing in Wireless Sensor Networks," International Journal of Simulation, Systems, Science and Technology, vol. 8, No. 1, pp. 13-25, 2007.
13. L. Qing, Q. Zhu, M. Wang, "Design of a distributed energy- efficient clustering algorithm for heterogeneous wireless sensor networks," In ELSEVIER, Computer Communications, 2006.
14. K. Ramesh, K. Somasundaram, " Wireless Sensor Network Lifetime Enhancement Using Modified Clustering and Scheduling Algorithm", June 2016 in SciRes. <http://www.scirp.org/journal/cs>, <http://dx.doi.org/10.4236/cs.2016.78154>
15. Gurpreet Kaur, Vishal Arora, " ENHANCEMENT OF NETWORK LIFETIME USING IMPROVED MODLEACH IN WSN", International Journal of Computer & Distributed Systems, Volume 1 Number 4, June -2016
16. Lalita Yadav, Ch. Sunitha, "Low Energy Adaptive Clustering Hierarchy in Wireless Sensor Network (LEACH)", (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (3) , 2014, 4661-4664
17. Baljinder Kaur, Parveen Kakkar, " Comparative Analysis of EDDEEC & Fuzzy Cost Based EDDEEC Protocol for WSNs", International Conference on Communication, Computing & Systems (ICCCS-2014).

## AUTHORS PROFILE



**Pragya Pandey** is pursuing her Master in Computer Science Engineering from Ajay Kumar Garg Engineering College. She has completed Bachelor in Computer Science Engineering from Ideal Institute of Management and Technology in 2017. Her main research area includes, Energy Efficiency in Wireless Sensor Network.



**Dr. Inderjeet Kaur** is currently Associate Professor in the Department of Computer Science & Engineering at AKG Engineering College, Ghaziabad. She is B.Tech, M.Tech, PhD and having over than 14 years of experience teaching undergraduate and postgraduate students. She has contributed over 20 papers to various national and international journals/conferences. She is life time member of ACM, IETE. Her chief interest lies in the design and development of smart devices for various applications and study of various operating system concepts.