



International Journal of Engineering and Robot Technology

Journal home page: www.ijerobot.com



ENERGY RESOURCEFUL ROUTING IN MOBILE WIRELESS SENSOR NETWORK UTILIZING CLUSTERED RELATED METHOD

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ABSTRACT

In mobile sensor networks, the power consumed by every node of the network affects the lifetime of the networks, greater than the consumption of electricity increases extra than the life of the networks decreases, this is why the boom of the life of the networks requires a strategy (protocol) which reduces the energy consumption of the transmission or reception of records by way of the sensor nodes. In recent years lots studies has been accomplished to maximize an existence time of network sensor. To deal with this, the hierarchical protocols (Cluster primarily based-technique, chain primarily based-approach) had been evolved in order to reduce the network traffic toward the sink and therefore prolong the community lifetime. In this paper, the focal point is mainly pushed over the survey of the strength-efficient the use of hierarchical cluster-primarily based technique namely LEACH (Low Energy Adaptive Clustering Hierarchy Protocol), so one can suggest a brand new method to maximize extra the lifestyles time of community sensor. Our approach is to conserve electricity intake whilst transmitting information to the Base Station (BS). We evaluated the performance of the LEACH protocol with our proposed method simulated, the results of our approach are established by way of the simulation outcomes the usage of Matlab Simulink.

KEYWORDS

Network Sensor, Hierarchical Protocols, LEACH, Energy-Efficient, Cluster Based-Approach and Matlab.

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INTRODUCTION

A mobile sensor community consists of a big wide variety of small-sensor nodes used to display regions, gather and document facts to the base station (BS)¹ inside the other, each node serves as transmitter and router, these sensors (node) are used to manipulate an surroundings and transmit the

captured statistics to the bottom stations². In trendy Wireless Sensor Network (WSN) is a set of communicating sensors the usage of mobile hyperlinks^{1,2}. The nodes are usually powered with the aid of batteries with finite ability and it's far usually not possible to top off the power^{3,24}, for that the failure of the strength sensor can significantly alter the topology of the community and impose an high-priced reorganization of the network⁴. In order to increase the lifetime of the community, numerous routing tactics had been proposed. Among these protocols, the hierarchical routing in which the community is partitioned into small companies and every organization is monitored and controlled by way of a node called (Cluster Head: CH). A CH is responsible for transmitting the statistics accrued by using the nodes of its cluster and it may compress the records before sending it to the BS⁶. In WSN energy saving techniques can generally be classified in two categories³:

- a) Scheduling the sensor nodes to exchange among energetic and sleep mode.
- b) Adjusting the transmission or sensing radius of the wireless nodes.

In this paper we take a look at the performances of the LEACH protocol and the prevailing development has been carried out and our technique to lengthen the lifetime of the sensors.

In Section II we gift the software and traits of mobile sensor community. Section III affords the cluster based totally approach protocols and the operation of LEACH protocol. Section IV unique the existing approach algorithm based on LEACH protocol, Section V and VI unique our proposed method technique, the consequences acquired and discuss result, Finally Section VII concludes a comparative between our technique and technique current and our angle for future works.

MOBILE SENSOR NETWORK: PRESENTATION AND CHARACTERISTICS

Wireless Sensor community is maximum adaptive communication network that is used in lots of programs and corporations: army, scientific, and environmental, for the tracking of essential

infrastructure in the affected regions and adversarial WSN has numerous Characteristics are as below^{9,23}:

- a) Power consumption constrains for nodes the use of batteries or strength harvesting.
- b) Ability to cope with node disasters.
- c) Mobility of nodes.
- d) Dynamic community topology.
- e) Communication screw ups.
- f) Heterogeneity of nodes.
- g) Scalability to large scale of deployment.
- h) Ability to resist harsh environmental conditions.
- i) Ease of use.

CLUSTER RELATED METHOD IN MWSN AND LEACH PROCEDURE OPERATION

Clustering Based Approach in WSN

The structuring of a network is one of the principal tools to keep strength in each network node¹¹. In sensor networks there are styles of architecture for networks, flat architecture that constitutes a homogeneous network in which all nodes have the same in terms power assets, calculation and reminiscence^{8,10,18} and another hierarchical architecture in which all nodes do no longer have the same roles and consequently the identical assets. Being given that the principle cause of a routing protocol for WSN is the proper and green development of routes among a pair of nodes in order that messages can be routed, why multiple routing protocols (Hierarchical Protocols, Flat protocols) were developed these last year's. The contrast studied between the flat and hierarchical shape on the electricity consumption degree indicates that the hierarchical architecture has more advantage than the flat architecture, namely: well-structured community, easy network management, less energy intake, high lifetime, unless the message circulating on networks and the flood trouble is averted. In the other hierarchical shape there are fundamental tactics are derived from those protocols: cluster-based approach and chain-primarily based technique^{12,13,21}.

- A. Cluster-based totally approach: The node is prepared in cluster, each cluster have his chief to transmit a records to the base station.

B. Chain-primarily based technique: The node is prepared in a series to send the information to the base station.

Many studies sports have been executed at the region of energy-efficient records accumulating in WSN, because the simple assignment of the WSN is to correctly gather the statistics with lesser useful resource intake. Most of the records collecting algorithms are aimed to reduce the power intake trouble like this LEACH Protocols^{14,15,20}. LEACH is one of the protocols primarily based at the concept of classification (clustering) shown in Figure No.1, which consists of to partition the network into clusters. The nodes ship their statistics to the CHs who ship those Data to the SB. CHs make simple treatments (Aggregation for example) on the data before to transmit^{14,15,20}.

In this section, we gift a quick evaluation of some related research paintings evolved like this LEACH protocols.

Leach Protocol Operation

Low-Energy Adaptive Clustering Hierarchy (LEACH), that's a popular cluster based totally routing approach, is an energy-green conversation protocol^{16,25}. In LEACH, the sensor nodes are divided periodically into several clusters. For every cluster, a sensor node is selected as a CH. Thus, LEACH plays a periodic randomized rotation of the CH nodes. The operations of LEACH are commonly separated into two phases: the setup section and the consistent-nation section. In the setup segment, CHs are selected and clusters are prepared. In the regular-kingdom segment, the statistics transmissions to the BS take place. The function of the CH is assigned through the node getting a random number between 0 and 1. If the wide variety is less than the threshold values $T(n)$, the node will become a CH for the modern-day round¹⁷, the following equation (1) bellow indicates how to compute $T(n)$:

$$T(n) = p / (1 - p * (r \bmod (1/p))) \text{ if } n \in G \quad (1)$$

Zero in any other case

Where n is the given node, P is the predetermined percent of CHs ($P = \text{five}\%$), r is the current round, and G is the set of nodes that have no longer been selected as CHs within the remaining $1/P$ rounds.

Using this threshold, each node may be a CH at some round with in $1/p$. After the election of CH nodes, every ordinary node will decide the surest CH to sign up for in phrases of minimum power required for transmission. After the election of CH nodes, every regular node will decide the most reliable CH to enroll in in terms of minimal electricity required for transmission. In the other, after the formation of the clusters, the CHs construct Time Division Multiple Access (TDMA) tables primarily based at the range of nodes in their clusters. In these tables every node is associated with a time slot which it can transmit these messages (the transmission is over the entire bandwidth allotted for the transmission of Data), this is to say that each node that attempts to make a Transmission throughout its time-slot it's far positive that the channel is clean. Finally to prevent interference among cluster messages which might be close, every CH randomly selects a code in a list of CDMA codes (Code Division Multiple Access) and transmits it to the nodes belonging to its group to apply it during transmission, so all nodes use the identical bandwidth but with Frequency modulations which can be targeted within the code Sent by using the CH²⁶.

PROPOSED METHOD

Energy conservation is a key issue in the design of structures primarily based on wireless sensor networks. Clustering routing protocols have been developed on the way to lessen the community visitors closer to the sink and therefore lengthen the network lifetime^{21,24,27}. So several researches treats the problem of electricity consumption through the nodes of the networks, additionally numerous studies deals with the problem of the distance between the nodes that is why the researcher proposes the hierarchical architecture to clear up the problem existing in the flat architecture together with the life of the networks. There are already several techniques that address the trouble of distance, but the existing method serves to decrease the distance with a variety of the cluster head next to base station, this brings returned the death of the node which is far from CH, which we note inside the simulation achieved in the previous part. In system (1), it's been visible that the

nodes self-select and randomly pick a variety of among zero and 1 and that this fee ought to be less than a threshold for the nodes to be CHs, then, it's far important to boom the threshold cost to growth the probability of getting nodes CHs. The Figure No.2 Bellow show one a part of existing approach to pick CHs.

In this context, we suggest our improvement routing protocol for Wireless Sensor Networks (WSN) based on LEACH existing technique. Our technique it primarily based to improvement the set of rules LEACH protocol, precisely to limit a distance between BS and cluster head and minimized range of dead nods far than BS. Our method consists to locating the select cluster heads of the nodes which are some distance from BS at 1/2 the topology of the community. Our Objectives is to avoid the death of the nodes which might be very some distance from the base station and deliver good fortune to the node located on the half of of the topology and base station in order that they emerge as CHs. The threshold equation becomes

$$T3(n) = T(n) * dmoy / d \quad (2)$$

Where $dmoy = (dmax + dmin) / 2$, d is the gap between the node and the base station, $dmax$ is the most distance between the base station and a node, and $dmin$ is the minimum distance among the bottom station and a node. The Figure No.3 bellow indicates one a part of our approach to select CHs in LEACH Protocol.

SIMULATION RESULTS

To make the contrast among our advanced approach and the effects current method how we simulated in section IV, we select the equal parameters provided in desk Table No.2 to simulate our method development.

Results Simulation Proposed Approach with BS in L1 (150m, 50m)

The both Figure bellow (Figure No.4 and Figure No.5) shows the simulation outcomes of our approach method representing respectively the nation of the nodes after simulation and the number of node lifeless after number of rounds with BS in region (150m, 50m). The yellow triangle in Figure

No.4 represents the useless node after subsequently simulation with BS in location (150m, 50m).

Results Simulation Proposed Method with BS in L2 (175m, 50m)

The both discern bellow (Figure No.6 and Figure No.7) shows the simulation effects of our method approach representing the state of the nodes after simulation and the range of node useless after number of rounds with BS in area (175m, 50m). The yellow triangle in Figure No.11 represents the dead node after finally simulation with BS in location (175m, 50m).

Discuss Results Method Approach of LEACH Protocols

Simulation Result Proposed Method

The Table No.1 and Figure No.8 bellow gives a contrast among the simulation results between the prevailing approach and our proposed approach for every base station role L1 and L2.

Discussion Results

The results of the simulation shown inside the Table No.1 and Figure No.8 virtually show that there's an extension of the community lifetime, via making use of our approach:

- A. We decrease the number of lifeless nodes from forty to 18 in the case wherein the bottom station is placed at a distance of (150m, 50m).
- B. We decrease the quantity of useless nodes from fifty eight to twenty-eight in the case where the bottom station is located at a distance of (175m, 50m).

Finally in our approach we've succeeded in extending the network lifetime by using 45% for Bs in (150m, 50m) and forty eight % for BS in (175m, 50m).

Table No.1: Number useless node in current approach and our method for leach protocol

S.No	Position of Base Station	Number of Dead node in existing Method for LEACH	Number of Dead node in Our method for LEACH	Percentage increase live node
1	BS in (150m, 50m)	40	18	45%
2	BS in (175m, 50m)	58	28	48%

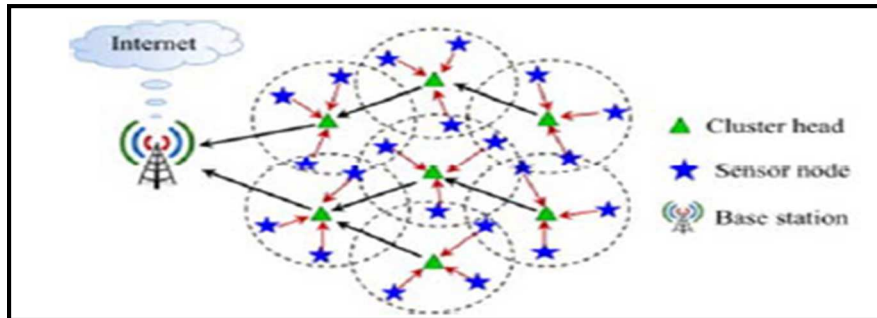


Figure No.1: Clustering primarily based approach Protocol

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\ Election of Cluster Heads
if(temp_rand<= (p/(1-p*mod(r,round(1/p))))))
    countCHs=countCHs+1;
    packets_TO_BS=packets_TO_BS+1;
    PACKETS_TO_BS(r+1)=packets_TO_BS;
    
```

Figure No.2: Methods Select CHs in LEACH Protocols

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\ Improvement Election of Cluster Heads
if(temp_rand<= (p/(1-p*mod(r,round(1/p))))*dnoy/distance)
    countCHs=countCHs+1;
    packets_TO_BS=packets_TO_BS+1;
    PACKETS_TO_BS(r+1)=packets_TO_BS;
    
```

Figure No.3: Our Methods Select CHs in LEACH Protocols

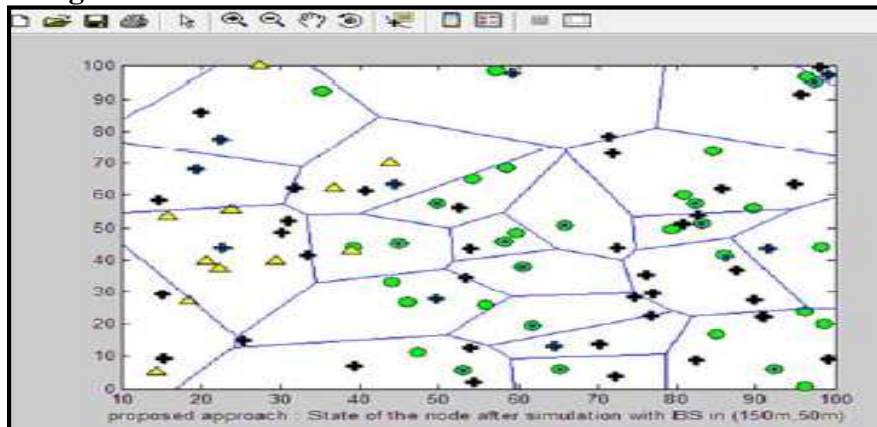


Figure No.4: State of the nodes after 100 rounds with BS in location (150m, 50m) Using Proposed Approach LEACH

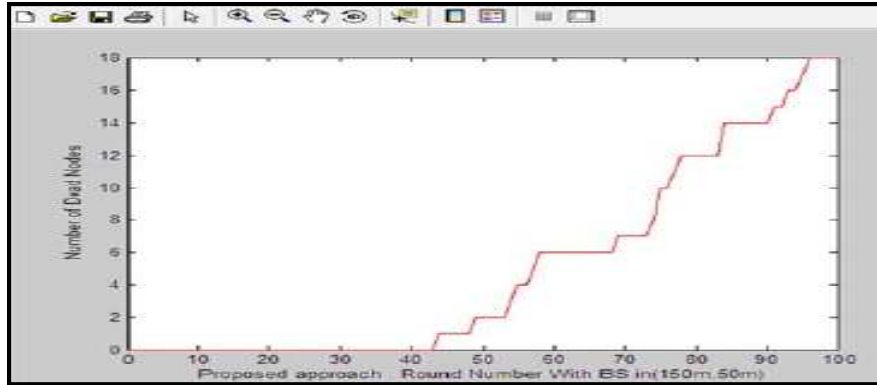


Figure No.5: Using Proposed Approach LEACH

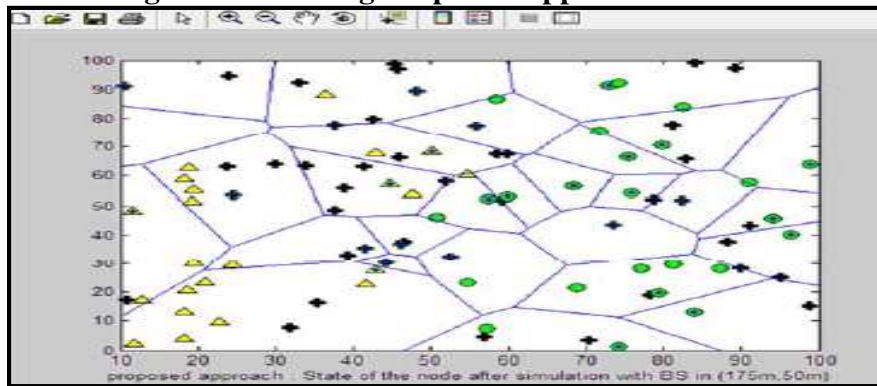


Figure No.6: State of the nodes after 100 rounds with BS in location (175m, 50m) Using Proposed Approach LEACH

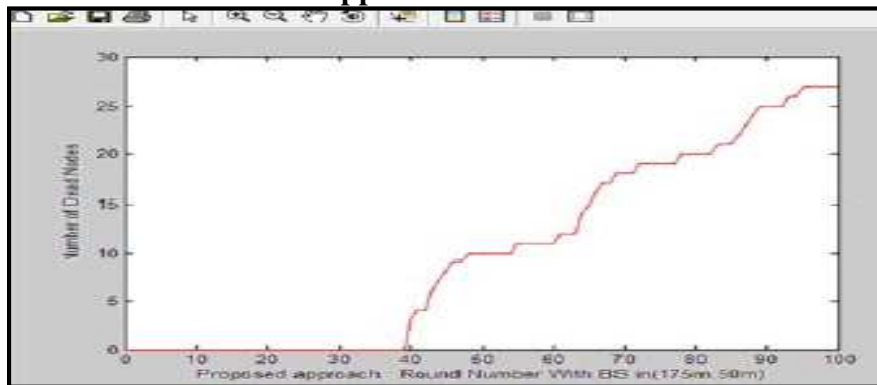


Figure No.7: Number of node dead after 100 rounds with BS in location (175m,50m) Using Proposed Approach LEACH

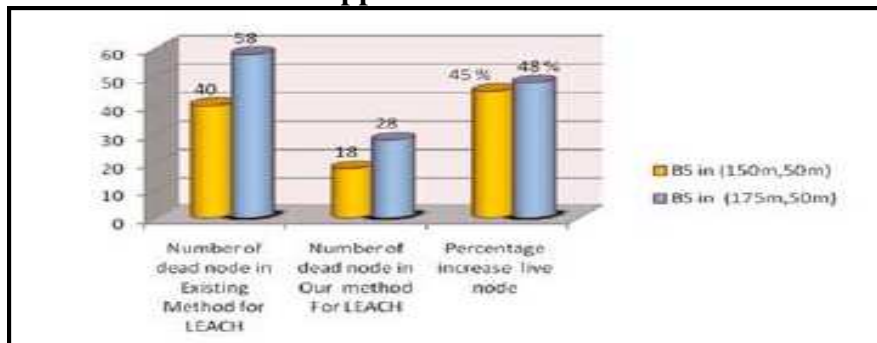


Figure No.8: Number node dead in every technique for each position BS

CONCLUSION AND PERSPECTIVE

In this paper we introduce mobile sensor networks routing algorithms the use of cluster based approach and we've proposed and certain our new development method of clustering primarily based on current method LEACH protocols to minimize electricity intake in mobile sensor network, the simulation outcomes display that our technique ensures the low power intake and improves the community lifetime, so we've succeeded to maximizing the life of networks up to forty five% in comparison to present technique studied on this paper. As angle this paintings may be used in exceptional guidelines in our future works to suggest a protocol with higher consumption of strength and increase extra the lifetime of Mobile Wireless Sensor Network.

ACKNOWLEDGEMENT

The authors wish to express their sincere gratitude to Department of Electrical and Electronics Engineering, Government Polytechnic College, Nagercoil, Tamilnadu, India for providing necessary facilities to carry out this research work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Arumugam G, Ponnuchamy T. "EE-LEACH: development of energy-efficient LEACH Protocol for data gathering in WSN", *EURASIP Journal on Wireless Communications and Networking 2015*, 76, DOI 10.1186/s13638-015-0306-5, 2015, 1-9.
2. Hassan Oudani, Salahddine Krit, Lahoucine Elmaimouni and Jalal Laassiri. "Comparative Study and Simulation of Flat and Hierarchical Routing Protocols for Wireless Sensor Network", *International Conference In Engineering and MIS (ICEMIS), IEEE*, 2016, 1-9.
3. Jia J, Chen J, Chang G, Wen Y and Song J. "Multi-objective optimization for coverage control in wireless sensor network with adjustable sensing radius", *Elsevier, Computers and Mathematics with Applications*, 57(11-12), 2009, 1767-1775.
4. Balaram A, Pushpa S. Resilient Privacy Preservation Scheme to Detect Sybil Attacks in Vehicular Ad Hoc Networks, *Indian Journal of Science and Technology*, 9(48), 2016, 1-12.
5. Qiu T, Xia F, Feng L, Wu G and Jin B. "Queueing theory-based path delay analysis of wireless sensor networks", *Advances in Electrical and Computer Engineering (AECE)*, 11(2), 2011, 3-8.
6. Jong-Shin Chen. "Efficient Cluster Head Selection Methods for Wireless Sensor Networks", *Journal of Networks*, 5(8), 2010, 964-970.
7. Royer E and Toh C. "A Review of Current Routing Protocols for ad hoc Mobile Wireless Networks", *IEEE Personal Communication*, 6(2), 1999, 46-55.
8. Mustapha Kabrane, Lahoucine Elmaimouni, Salahddine Krit, and Jalal Laassiri. Urban mobility in smart cities using low-cost and energy-saving wireless sensor networks, *In International Conference In Engineering and MIS (ICEMIS), IEEE*, 2016, 1-7.
9. Hetal Rana, Sangeeta Vhatkar, Mohommad Atique. "Comparative Study of PEGASIS Protocols in Wireless Sensor Network", *IOSR Journal of Computer Engineering (IOSR- JCE)*, 16(5), 2014, 25-30.
10. Al-Karaki J N. and Kamal A E. "Routing Techniques in Wireless Sensor Networks: A Survey", *IEEE Wireless Communications*, 11(6), 2004, 6-28.
11. Wafaa Ibrihich, Krit Salah-ddine, Jalal Laassiri and Said El Hajji. "Recent Advances of Hierarchical Routing Protocols for AdHoc and Wireless Sensor Networks: A Literature Survey" *International Journal of Informatics Technologies- IJIT*, 9(2), 2016, 71-79.
12. Rajesh D, Firoja Banu M, Stella D, Ansila P. Grace. "Ch Panel Based Routing Scheme for Mobile Wireless Sensor Network",

International Journal of MC Square Scientific Research, 8(1), 2016, 183-198.

13. Mahnaz Esmaceli, Seyed Ali Hosseini Ghahroudi. "Improving Energy Efficiency using a new Game Theory Algorithm for Wireless Sensor Networks", *International Journal of Computer Applications* (0975 – 8887), 136(12), 2016, 1-4.
14. Wang Y, Hsiao Tsai C and Mao H. "HMRP: Hierarchy- Based Multipath Routing Protocol for Wireless Sensor Networks", *Tamkang Journal of Science and Engineering*, 9(3), 2006, 255-264.
15. Mourad Hadjila, Herve Guyennet, Mohammed Feham. "A. Chain-Based Routing Protocol to Maximize the Lifetime of Wireless Sensor Networks", *Wireless Sensor Network*, 5(5), 2013, 116-120.
16. Chen Y F, Fan X G, Xu B. Cluster head optimization strategy for WSN based on LEACH, *Comput Eng*, 22, 026, 2011.
17. Guo D, Xu L. LEACH Clustering Routing Protocol for WSN, in *Proceedings of the International Conference on Information Engineering and Applications (IEA)*, 2012.
18. Allam Balaram, Pushpa S. A Robust Location Privacy in Vehicular Ad Hoc Networks, *International Journal of Applied Engineering Research*, 10(17), 2015, 13135-13141.
19. Kanishka Raheja, Sunil Kr Maakar. "A. Survey on Different Hybrid Routing Protocols of MANET", (*IJCSIT*) *International Journal of Computer Science and Information Technologies*, 5(4), 2014, 5512-5516.
20. Pushpa S, Elias S, Easwarakumar K S, Maamar Z. "Referral based expertise search system in a time evolving social network", *Proceedings of the Third Annual ACM Bangalore Conference*, ISBN: 978-1-4503-0001-8, 2010.
21. Ali Jorio, Sanaa El Fkihi, Brahim Elbhiri and Driss Aboutajdine. "An Energy-Efficient Clustering Routing Algorithm Based on Geographic Position and Residual Energy for Wireless Sensor Network", *Journal of Computer Networks and Communications*, 2015 Article ID 170138, 11, 2015.
22. Pushpa S, Easwarakumar K. "Exploring the Influence of Time-Sensitive and Unsupervised Learning of Topic-Specific Information in Citation Analysis" *European Journal of Scientific Research*, 67(3), 2012, 474-485.
23. Rajesh D, Keiser Jahana S, Sivakalai R, Jasmin Meera Banu P. Detection And Isolation of Attacks in Manet Using Ts-Aomdy, *International Journal of MC Square Scientific Research*, 8(1), 2016, 170-182.
24. Zhang X, Ding X, Lu S and Chen G. "Principles for Energy-Efficient Topology Control in Wireless Sensor Networks", *WiCom '09.5th International Conference on Wireless Communications, Networking and Mobile Computing, IEEE*, 2009.
25. Li C, Zhang H, Hao B and Li J. "A Survey on Routing Protocols for Large-Scale Wireless Sensor Networks," *Sensors*, 11(4), 2011, 3498-3526.
26. Nisha Yadav, Sunil Kumar Yadav. Implementation of Wire Sensor Network using MATLAB Simulator, *International Journal of Recent Development in Engineering and Technology*, 3(2), 2014, 163-167.

Please cite this article in press as: Giji Kiruba D and Rajesh D. Energy resourceful routing in mobile wireless sensor network utilizing clustered related method, *International Journal of Engineering and Robot Technology*, 4(2), 2017, 41-48.