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Analyze Portrayl of SEP for WSN Using Matlab

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Abstract: Wireless Sensor Networks (WSNs) are made out of heaps of sensor nodes, with restricted energy, that cooperates to perform a sensing project. In Wireless Sensor Network, the energy efficiency is the important thing difficulty for designing the protocol because sensor nodes have one-time battery backup. There are many cutting-edge protocols which increase the life of the wireless sensor Network through correctly the use of battery energy of the sensor node. In this research work, a brand new strategy and protocol based totally on Stable Election Protocol (SEP) in wireless Sensor network have been proposed. For proposed method, we've assumed heterogeneous environment i.e. the impact of heterogeneity of nodes, in terms of their strength, in wireless sensor networks which might be hierarchically clustered. In those networks, some of the nodes grow to be cluster heads, combination the records of their cluster members and transmit it to the sink. We count on that a percentage of the population of sensor nodes is ready with extra strength assets. We additionally anticipate that the sensors are randomly distributed and aren't cellular, the coordinates of the sink and the size of the sensor discipline are known. The uniqueness of the proposed method is that cluster head is chosen amongst normal Nodes, Intermediate Nodes and Advanced Nodes based upon their common strength. This assets will increase the number of cluster heads in keeping with spherical and number of packets per spherical. First of all the nodes had been labeled as everyday Nodes, Intermediate Nodes and advanced Nodes. Then, all three kinds of nodes are similarly categorized as alive nodes and dead nodes. The cluster head is selected among all 3 types of nodes on the premise of average energy. Cluster head collects statistics from member nodes, mixture it and transmit it to the base station. Cluster head choice is maximum critical. Once the cluster head is selected then the cluster head broadcasts a commercial message to the nodes. The nodes get hold of the message and decide to which cluster head it is going to be long for the cutting-edge round. A Modified-SEP (proposed approach) has been applied and in comparison with existing SEP. Three parameters i.e. the number of dead nodes, the number of alive nodes and packets transmitted to base station and so forth has been taken as performance parameters. The simulation end result shows that overall performance and throughput of our proposed protocol deliver the effective and widespread power efficiency in addition to more Network lifetime as compared to different protocols. MATLAB R2013a has been taken as an implementation platform.

Keywords: Wireless Sensor Network, Network Lifetime, LEACH, SEP etc.

INTRODUCTION

Wireless Sensor Networks [8] are networks of tiny, battery [3] [4] powered sensor nodes [5] [6] with limited onboard processing, storage, and radio capabilities. Nodes sense [2] and send their reports toward a processing center which is called "sink." The design of protocols and applications for such networks has to be energy aware in order to prolong the lifetime of the network because the replacement of the embedded batteries is a very difficult process once these nodes have been deployed.

In Wireless Sensor Network [9], the energy efficiency [7] [8] is the key issue for designing the protocol because sensor nodes have one-time battery backup. There are many modern protocols which extend the lifetime [6] of the wireless sensor network by efficiently using battery power of the sensor node [2].

SEP (Stable Election Protocol)

SEP protocol is an improvement and enhancement of LEACH [2] protocol which uses clustering based routing strategy based on the node heterogeneity of the sensor node in the networks. In this protocol and technique, some of the sensor nodes have the high energy they are referred to as the advanced nodes and the probability of the advanced nodes to become CHS is more as compared to the normal nodes and the normal nodes have lower energy as compared to the advanced nodes in the network. SEP strategy uses a distributed method to select a CH in WSNs. It is heterogeneity-aware protocol [1] and CH selection probabilities of nodes

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are weighted by initial energy of each node compared to the other nodes in WSN. So basically, SEP protocol is based on two levels of node heterogeneity as normal nodes and advanced nodes.

Advantage of SEP

Any identification or global knowledge of energy of sensor node is not required in SEP [7] technique at each selection round of cluster head.

Limitations of SEP

The cluster head (CH) selection among sensor nodes is not dynamic, which results that nodes that are far away from the powerful nodes will die first.

PROPOSED METHODOLOGY

In this research work, a new strategy and protocol based on Stable Election Protocol (SEP) in Wireless Sensor Network have been proposed. For proposed system, we have assumed heterogeneous of environment i.e. the impact of heterogeneity of nodes, in terms of their energy, in wireless sensor networks that are hierarchically clustered. In these networks, some of the nodes become cluster heads, aggregate the data of their cluster members and transmit it to the sink. We assume that a percentage of the population of sensor nodes is equipped with additional energy resources. We also assume that the sensors are randomly (uniformly) distributed and are not mobile, the coordinates of the sink and the dimensions of the sensor field are known. Firstly, all the nodes have been categorized as Normal Nodes and Advanced Nodes. Then Advanced nodes are further categorized as Alive Advanced nodes and Dead Advanced Node. The cluster head is selected among advanced nodes only. Cluster head collects data from member nodes, aggregate it and transmit it to the base station. Cluster head selection is most important. Once the cluster head is selected then the cluster head broadcasts an advertisement message to the nodes. The nodes receive the message and decide to which cluster head it will be long for the current round.

We have simulated the proposed protocol in a field with dimensions 100m×100m and 100 nodes are deployed in specific zones with respect to their energy. Some of the other parameters are:

Parameters of WSN	**Values**
Number of rounds	500
Alpha (α)	1
Initial energy (Eo)	1.5 J
Initial energy of advanced nodes	Eo(1+α)
Energy for data aggregation (EDA)	5 nJ/bit/signal
Number of nodes	100
Transmitting and receiving energy (Eelec)	5 nJ/bit
Amplification energy for short distance (Efs)	10 Pj/bit/m2
Amplification energy for long distance (Eamp)	0.013 pJ/bit/m4
Probability (Popt)	0.1
Filed dimension	100 x 100 square meters

MATLAB R2013 has been used as an implementation platform. In this work, existing SEP and Advanced SEP (proposed) has been implemented and compared through their performance parameters. These parameters are:

1. Number of Dead nodes in accordance with increasing number of rounds.
2. Number of alive nodes in accordance with increasing number of rounds.
3. Number of Packets transferred to a base station in accordance with increasing number of rounds.

Here, all the implementation steps:

Initialization of some parameters for establishing the network

- Field dimensions x and y maximum (in meters)
- X and y coordinates of the sink, number of nodes in the field
- Optimal election probability of alpha node to become cluster head
- Energy model (all values in joules)
- Initial energy
- Energy dissipated per bit to run transmitter and receiver circuit,
- Amplification energy for short distance (efs)
- Amplification energy (emp)
- Data aggregation energy
- M-fraction of the total nodes or values for heterogeneity percentage of nodes than are advanced
- Alpha-times advance nodes have energy greater than normal nodes
- Maximum number of rounds

Creation of the random Sensor Network according to the dimensions of field and number of nodes

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- Declaration of a loop according to number of nodes
- G is the set of nodes which have not been cluster heads
- Initially, there are no cluster heads only nodes
- Random Election of Normal Nodes
  - Normal nodes have energy category 0
- Random Election of Advanced Nodes
  - Alpha-times advance nodes have energy greater than normal nodes
  - Advanced nodes have energy category 1

Initialization of First Iteration
Declaration of counter for Cluster Heads
Declaration of counter for Cluster Heads per round
Declaration of counter for number of clusters
Assignment of total alive nodes
Declaration of counter for packets or data to base station and cluster head

Implementation of SEP

- Declaration of a loop according to a number of rounds.
  - Calculation of Election Probability for Normal Nodes
  - Calculation of Election Probability for Advanced Nodes
  - Assignment of nodes which have not been cluster heads or operation of heterogeneous epochs
  - Operations for sub-epochs
  - Declaration of counter of Number of dead nodes
  - Declaration of counter of Number of dead Advanced Nodes
  - Declaration of counter of Number of dead Normal Nodes
  - Declaration of a loop according to number of nodes
  - Checking if there is a dead node
  - Updation of dead node counter
  - Checking if node is advanced
  - Checking if node is normal
  - Checking if there is an alive node
  - Assignment of total dead nodes and alive nodes for each round to new variable
  - Checking of first node dead or alive
  - Declaration of a loop according to number of nodes
  - Checking if there is an alive node
  - Checking if the node cluster head or not
  - Election of Cluster Heads for normal nodes
    - Updation of cluster head counter
    - Updation of counter of packets to the base stations
    - Assigning of particular node as cluster head
    - Assigning of selected node dimensions to another variable
    - Calculation of average distance between a cluster member and its cluster head
    - Assignment of calculated distance to new variable
    - Updation of cluster counter
    - Calculation of Energy dissipated where Eelec = (ETX + EDA) is the energy dissipated per bit to run the transmitter or the receiver circuit.
    - Checking if average distance between a cluster member and its cluster head is greater than initial distance
    - Checking if average distance between a cluster member and its cluster head is lesser than initial distance
  - Election of Cluster Heads for Advanced nodes
    - Updation of cluster head counter
    - Updation of counter of packets to the base stations
    - Assigning of particular node as cluster head
    - Assigning of selected node dimensions to another variable
    - Calculation of average distance between a cluster member and its cluster head
    - Assignment of calculated distance to new variable
    - Calculation of Energy dissipated where Eelec =(ETX + EDA) is the energy dissipated per bit to run the transmitter or the receiver
    - Checking if average distance between a cluster member and its cluster head is greater than initial distance
    - Checking if average distance between a cluster member and its cluster head is lesser than initial distance
  - Updation of counter of packets to the base station
  - Assignment of updated variable to new variable
  - Election of Associated Cluster Head for Normal Nodes
    - Declaration of a loop according to number of nodes

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- Checking if there is any normal and alive node
- Checking if number of clusters more than one
- Calculation of average distance between a cluster member and alive node
- Initialization of loop according to total number of clusters
- Calculation of average distance between a cluster head and alive node and comparison with average distance between a cluster member and alive node
- Calculation of Energy dissipated where ETX is the energy dissipated per bit to run the transmitter or the receiver circuit or Energy dissipated by associated Cluster Head
- Again checking if associated Cluster head distance is greater than initial distance
- Again checking if associated Cluster head distance is greater than initial distance
- Calculation of Energy dissipated
- Checking if minimum distance is positive
- Calculation of energy dissipated by cluster head with minimum distance
- Updation of counter cluster head per round

Display of alive nodes in accordance with number of rounds
Display of dead nodes in accordance with number of rounds
Display of number of packets transmitted to base station in accordance with number of rounds

EXPERIMENTAL RESULTS

An effective protocol for Wireless sensor network has been designed and carried out the use of Modified Stable Election Protocol for transmission of packets to the bottom station thru an efficient cluster head. The uniqueness of the proposed method is that cluster head is selected amongst normal Nodes, Intermediate Nodes and Advanced Nodes based upon their average strength. This belonging increases the number of cluster heads in keeping with round and number of packets consistent with the round. Firstly, all the nodes had been labeled as Normal Nodes, Intermediate Nodes, and Advanced Nodes. Then, all 3 kinds of nodes are similarly categorized as alive nodes and dead Nodes. The cluster head is chosen among all 3 forms of nodes on the basis of average energy. Cluster head collects packets from member nodes, a combination it and transmits it to the base station. Cluster head choice is maximum important. As soon as the cluster head is chosen then the cluster head publicizes a commercial message to the nodes. The nodes receive the message and decide to which cluster head it will likely be long for the modern spherical. This segment is known as cluster formation phase. On the basis of received signal energy, nodes respond to cluster head and turn out to be a member of the cluster head. Cluster head then assigns a TDMA time table for the nodes for the duration of which nodes can send statistics to the cluster head. After the formation of the cluster, each node facts and sends it to the cluster head in the time slot allotted with the aid of the cluster head to the node. While records are received from nodes, Cluster head then aggregates this statistics and ship it to the base station this phase is known as transmission segment. we've got simulated the proposed protocol in a field with dimensions 100m ×100m and 100 nodes are deployed in unique zones with respect to their power. Some of the other parameters are:

Parameters of WSN	**values**
Number of rounds	500
Alpha (α)	1
Initial energy (Eo)	1.5 J
Initial energy of advanced nodes	Eo(1+α)
Energy for data aggregation (EDA)	5 nJ/bit/signal
Number of nodes	100
Transmitting and receiving energy (Eelec)	5 nJ/bit
Amplification energy for short distance (Efs)	10 Pj/bit/m2
Amplification energy for long distance (Eamp)	0.013 pJ/bit/m4
Probability (Popt)	0.1
Filed dimension	100 x 100 square meters

We have implemented the method and got some snapshots of MATLAB command window and figure window along with some output parameters i.e. Number of packets sent to base station at each round, Number of packets sent to cluster head at each round, Number of Cluster Head at each round, Normal Nodes, Intermediate Nodes and Advanced Nodes at last round, number of alive nodes at each round and average energy of a live nodes at each round. Figure 1 is the snapshot of the field having size 100 x 100 meters having normal nodes (o), intermediate nodes (*) and advanced nodes (⌂) with cluster head (*). Figure 2 is the snapshot of Number of packets sent to the base station at each round. Figure 3 is the snapshot of Number of packets sent to cluster head at each round. Figure 4 is the snapshot of Number of Cluster Head at each round. Figure 5 is the snapshot of comparison of a number of Normal Nodes, Intermediate Nodes and Advanced Nodes at last round. Figure 6 is the snapshot of a number of alive nodes at each round. Figure 7 is the snapshot of the average energy of live nodes at each round.

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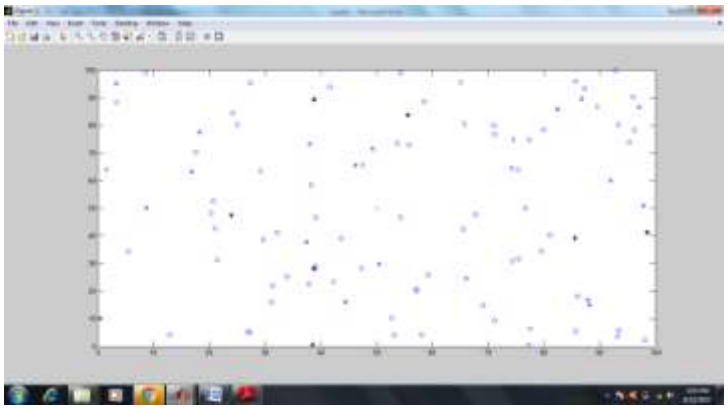

Figure 1 snapshot of field having size 100 x 100 meters having normal nodes (o), intermediate nodes (*) and advanced nodes (⌂) with cluster head (*)

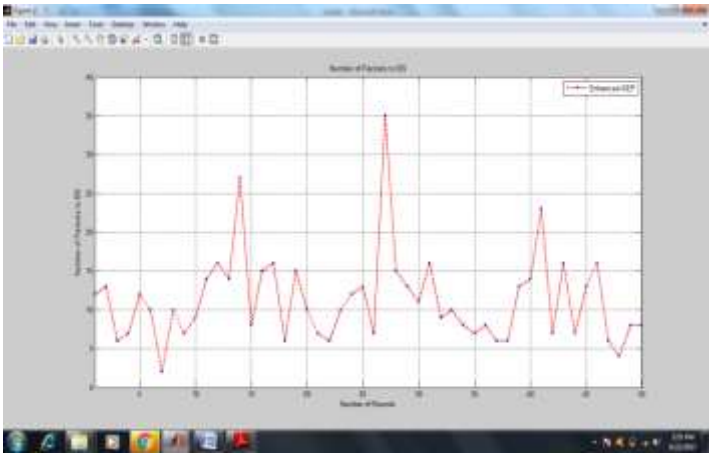

Figure 2 snapshot of Number of packets sent to base station at each round

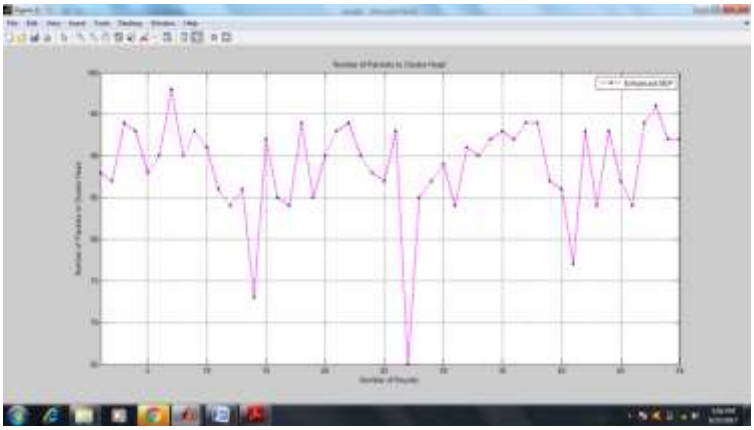

Figure 3 snapshot of Number of packets sent to cluster head at each round

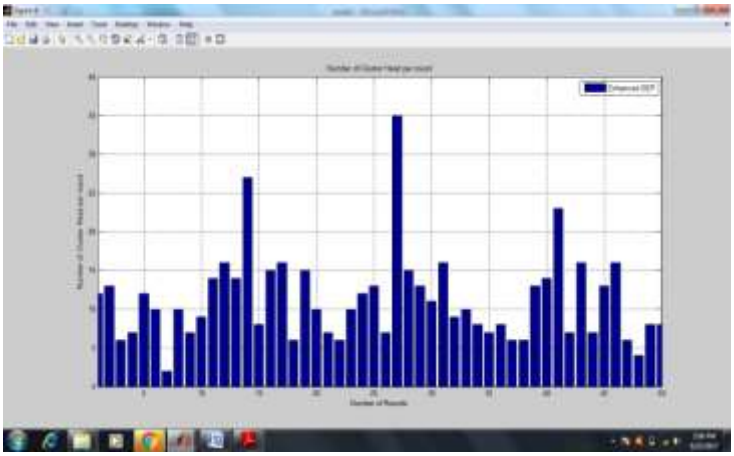

Figure 4 snapshot of Number of Cluster Head at each round

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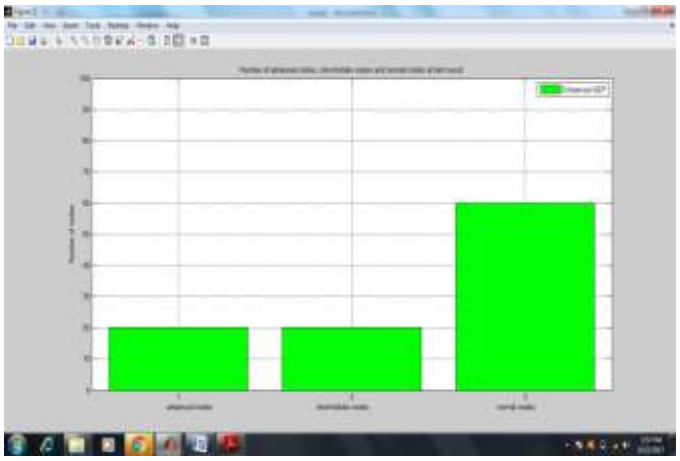

Figure 5 snapshot of comparison of number of Normal Nodes, Intermediate Nodes and Advanced Nodes at last round

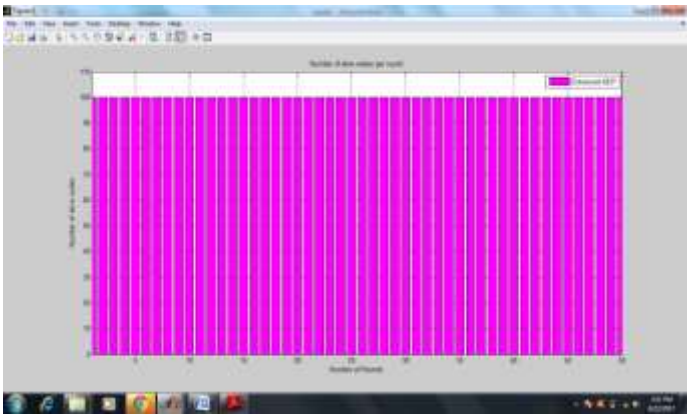

Figure 6 snapshot of number of alive nodes at each round

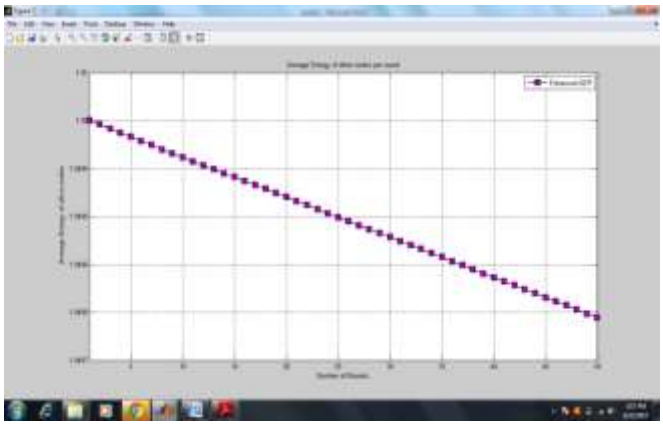

Figure 7 snapshot of average energy of live nodes at each round

CONCLUSION AND FUTURE SCOPE

The Modified Stable Election based totally routing Protocol for WSNs has been proposed, tested and compared with present SEP routing protocols, in this Research work. In this work, we've proposed Modified-SEP for a heterogeneous environment. The individuality of the proposed technique is that cluster head is chosen among Normal Nodes, Intermediate Nodes and Advanced Nodes based upon their average energy. This property increases the number of cluster heads per round and number of packets per round. The field is divided into 3 styles of nodes i.e. normal Nodes, Intermediate Nodes and advanced Nodes. All three types of nodes use clustering approach to transmit packets to the base station primarily based upon their average energy. Simulation consequences show that the proposed Modified Stable Election primarily based routing Protocol shows higher overall performance in terms of strength saving, alive nodes, dead nodes and packet transmission. The proof of above statements is the fee of packets transmitted to base stations at last round in each the instances. The throughput of modified-SEP is also elevated compared with present SEP.

But, Modified-SEP isn't always suitable in which frequent statistics are received from the Wi-Fi sensor network. Our future direction may be to overcome this obstacle on this protocol. Finally, in future, the idea and implementation of the mobile base station can be introduced in the proposed gadget to carry out the subsequent degree of the technology of wireless sensor community.

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REFERENCES

[1] Jeevan L J Pinto and Manjaiah D. H "Modified Enhanced Stable Election Based Routing Protocol for Wireless Sensor Networks" International Journal of Innovative Research in Computer and Communication Engineering, Vol.2, Special Issue 5, October 2014. Pp. 54-59.

[2] Mishra, Yogesh, Ashish Singhadia, and Rashmi Pandey. "Energy Level Based Stable Election Protocol in Wireless Sensor Network." International Journal of Engineering Trends and Technology (IJETT)–Volume 17 (2014): 32-38.

[3] Smaragdakis, Georgios, Ibrahim Matta, and Azer Bestavros. SEP: A stable election protocol for clustered heterogeneous wireless sensor networks. Boston University Computer Science Department, 2004.

[4] Singh, Debabrata, and Sanjeet Kumar Nayak. "Enhanced modified LEACH (EMODLEACH) protocol for WSN." Advanced Computing and Communication (ISACC), 2015 International Symposium on. IEEE, 2015.

[5] Faisal, S., et al. "Z-SEP: Zonal-stable election protocol for wireless sensor networks." arXiv preprint arXiv: 1303.5364 (2013).

[6] LavitaVirmani, S. K. Agarwal, Dharam Vir "Energy Efficient Cluster Based Multihop Routing for Wireless Sensor Network" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3, Issue 10, October 2014. Pp. 12575-12586.

[7] Shweta Sharma, Tarun Kumar "Energy Efficient Modified Cluster Routing Algorithm for Maximizing Stability Period of WSN" International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 3, Issue 9, September 2015. Pp. 8423-8428.

[8] Kirankumar B. Balavalad, Ajaykumar C. Katageri, Balaji M. Biradar, Deepa Chavan, and Basavaraj M. Angadi "Multipath-LEACH an Energy Efficient Routing Algorithm for Wireless Sensor Network" Journal of Advances in Computer Networks, Vol. 2, No. 3, September 2014.

[9] Taruna, S., Rekha Kumawat, and G. N. Purohit. "Multi-hop clustering protocol using gateway nodes in wireless sensor network." International Journal of Wireless & Mobile Networks 4.4 (2012): 169.

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