IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

Lossless Data Compression Based General Tree Based Routing Protocol

Manpreet Kaur[1], Er. Varinderjit Kaur[2], Dr. Naveen Dhillon[3]

P.G Student, Department of CSE, RIET, Phagwara[1]

HOD, Department of M.TECH CSE, RIET, Phagwara[2]

Principal of RIET, Phagwara[3]

Abstract: WSN is becoming key subject of research in computational basic principle because of its great deal of applications. General Self-Organized Tree-Based Energy-Balance routing protocol (GSTEB) constructs the redirecting or routing tree via a method by which, for every single circular or round, Base Station (BS) chooses the root node in addition to shows the following substitute for every node. In order to prevail over the actual constraints with the sooner work a new increased method proposed in this research work. The proposed method has the capacity to prevail over the constraints of GSTEB routing protocol using the principle with reactivity, mobile sink and also the lossless data compression technique. The proposed method examined through for the 100 * 100 wireless indicator spot with single sink. The evaluation has clearly displayed some sort of suggest improvement in network lifetime can be 2.17 % along with 3.71 % regarding network stability.

Index Terms: Wireless Sensor Network, LEACH, HEED, DWEHC, PANEL, GSTEB.

1. WIRELESS SENSOR NETWORK

Any Wireless Sensor Network (WSN) features large number of compact sensor nodes having constrained calculation potential, minimal recollection, restricted electric power, and restricted assortment communicating device. All nodes send their data to Base Station (BS) or even sink, which will functions calculations and decision-making, and can be in comparison to the actual capabilities involving web server or even in most cases being a trip throughout personal computer network i.e. it act as a gateway between a sensor nodes and end users. Most of these sensor nodes will be used above a substantial geographic area to watch natural or even the environmental conditions, for example heat range, appear, demand, etc. WSN has surfaced seeing that an important area with regard to investigation and development. They may be now with an quicker deployment stage, using massive potential for many applications. It won't be reasonable to convey that they are predicted to cover a tremendous place in the world in the coming decade [1].

A wireless sensor network comprises multitude of small sensor nodes, each node possesses an invisible transceiver, a microprocessor plus a sensor. This sort of sensor nodes can sort a system on their own, sensed facts are carried as a result of this kind of network. Each node possesses digesting potential; details are ready-made the way it passes as a result of network. Given the constraints devices and also the bodily ecosystem and levels of great calls for in which the particular nodes have to function, algorithms and protocols have to be created to offer powerful and productive vitality consumption. The design of the particular bodily stratum and transmission technological innovation and the information coding continue to symbolize sizeable obstacles for the growing area of indicator networks [2].

2. SENSOR NODE

The Sensor Node is a basic indicator of WSN and it includes Realizing, Computation and instant Interaction unit. Therefore sensor nodes can observe bodily sensation, method the observed and received data and talk the observed or refined data to the nearby sensor nodes to create a system of sensor nodes named Wireless Sensor Networks (WSNs). The instant networking capability of the sensor enabled nodes, have resulted in a variety of interesting programs which range from monitoring, clever residences, detail agriculture, tragedy detection and offer chain administration applications. A sensor node might differ in size from that of a shoebox right down to how big a grain of dust. The price of sensor nodes is similarly variable, which range from several to countless dollars, depending on the complexity of the individual sensor nodes. Size and price restrictions on sensor nodes lead to corresponding restrictions on assets such as for instance energy, storage, computational pace and communications bandwidth. The topology of the WSNs can differ from a simple star system to an advanced multi-hop wireless mesh network [3]. The propagation process involving the hops of the system could be redirecting or flooding.

The typical sensor node consists of four components:

- A power unit, responsible for supplying energy to other components;
- A sensing unit, that actually contains the sensor, for instance, of light, humidity, temperature, etc;
- A computing unit, composed of RAM and flash memories and a processor that typically uses a set of analog-to-digital converters (ADCs) to obtain data from sensors and communications protocols;
- A communication unit, used to send and receive radio signals.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

3. COMPONENTS OF SENSOR NODE

A node consists of four components. The Components of a sensor node are:

Power Unit: Power is usually saved in both battery power and capacitors. Batteries, both normal rechargeable and also non-rechargeable, are usually the main source of power offer intended for indicator or sensor nodes. The indicator or sensor node uses electric power intended for sensing, interacting and also details processing [4].

Sensing Unit: Sensors are hardware gadgets of which build a considerable reaction to a modification of an actual physical problem similar to temperatures or pressure. A new indicator node ought to be compact bigger, eat much reduced electrical power, are employed higher volumetric densities, possibly be autonomous and also operate untreated, and be adaptive to your environment. Sensors measure physical data from parameter get monitored [5].

Computation Unit: A computing unit composed of RAM and flash memories and a processor [6].

Microcontroller**:** The controller performs tasks, processes data and controls the functionality of other components in the sensor node. Many qualities of microcontroller are: affordable, overall flexibility in order to connect with other technology, easy and also multimedia, and then poor capability consumption.
External Memory**:** From energy point of view, this most recent sorts of storage area are definitely the on-chip storage area with a microcontroller and Whizz or Flash memory--off-chip RAM. Two classes with storage area depending on the reason for storage are: end user storage area useful for saving application connected or maybe special data files, and then course storage area useful for and also multimedia the device [7].

Communication Unit: The functionality of both transmitter and receiver are paired suitable solo application known as a transceiver. The operational states are transmit, receive, idle, and sleep [8].

4. CLUSTER-CONSTRUCTION BASED CLUSTERING ROUTING PROTOCOLS

A) LEACH: Low-Energy Adaptive Clustering Hierarchy (LEACH), is one of the revolutionary clustering routing approaches designed for WSNs. A core plan connected with LEACH may be a great enthusiasm for a number of succeeding clustering routing protocols. The true secret aim connected with LEACH is usually to choose sensor nodes because CHs by means of revolution, hence the high energy dissipation inside making contact with BS is usually propagate to be able to every one of sensor nodes while in the network. The whole process of LEACH is usually split up directly into rounds, in which every single round is usually split up into a couple phases, set-up stage plus the steady-state phase. Inside the set-up stage clusters are usually organised, while in the steady-state stage results are taken to BS. Through the set-up stage, every one node makes a decision if they should become converted into a CH for the recent round. This specific determination is usually in line with the advisable small fraction connected with CHs and the number of times node has become a CH and so far. This specific determination is taken via node selecting a quantity among 0 and 1.

Benefits regarding LEACH contain the subsequent:
(1) Any node of which provided just like a CH in distinct round cannot be choose as CH , thus each node may uniformly split up the strain made with CHs to fewer degree
(2) Using a new TDMA routine prevents CHs through unneeded mishaps
(3) Group members are able to open as well as close communication connections in fulfillment making use of their issued time slots to step away through excessive strength dissipation [23].

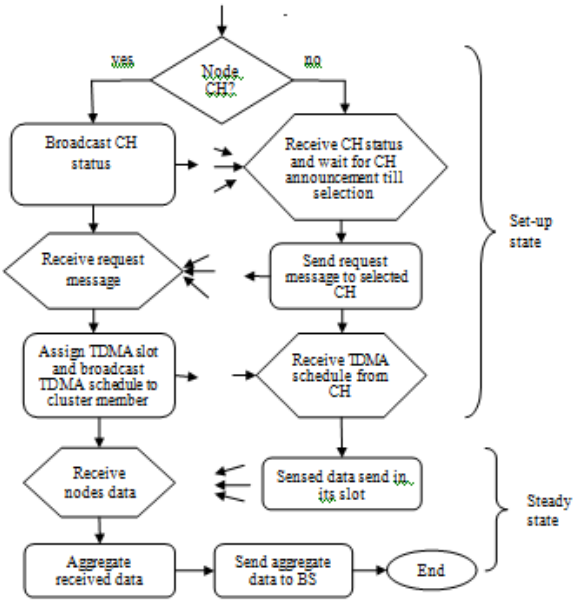


Figure 1.1: Flowchart of LEACH.

B) HEED: Hybrid Energy-Efficient Distributed clustering (HEED), is actually a multi-hop WSN clustering algorithm that literally brings a energy-efficient clustering routing by using sometimes precisely anxiety of energy. Completely different from LEACH while in the practices with CH dedication, HEED would not pick nodes as CHs randomly. The way in which of cluster manufacture is carried out based upon the hybrid grouping with a couple of parameters. One of the parameters relies upon around the node's remaining over energy, and also the other parameter may be the intra-cluster communicating expenditure. Within HEED, preferred CHs have very high regular remaining energy compared to MNs. Moreover, among the main desired goals with HEED will be to receive even existing CHs everywhere over the networks. Moreover, no matter the phenomenon of which two nodes, within each other's communicating variety, turn out to be CHs collectively, yet the possibility of that phenomenon is incredibly minimal in HEED. Within HEED, CHs have regular intervals preferred based upon a couple of vital variables: residual energy and intra-cluster communicating cost in the candidate nodes [24]. The actual benefits in the

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

HEED method are just like practices: (1) It's really a wholly distributed clustering process that gains advantage from the use of the two vital variables with regard to CH dedication; (2) Low power numbers of groupings stimulate an increase in spatial use whereas excessive power numbers of groupings will be necessary with regard to inter-cluster communication. This allows indistinguishable CH distribution through the network plus load balancing (3) Communications in a multi-hop strategy involving CHs and also the BS aid more energy preservation plus scalability in compare with the single-hop strategy, i.e., long-range transmission directly from CHs towards the torpedo i.e base station, within the LEACH method [25].

C) DWEHC: Distributed Weight-based Energy-efficient Hierarchical Clustering protocol (DWEHC), will be a distributed clustering algorithm such as HEED. The key reason for DWEHC will be to advance HEED because they build balanced cluster sizes and optimise a intra-cluster topology by using posture understanding a nodes. Both equally DWEHC and HEED talk about a number of similarities as well as not any presumptions with regards to multilevel sizing and attention, and using under consideration remaining energy in the tactic regarding CH selection. All nodes implements DWEHC on their own along with the algorithm concludes right after several iterations which might be applied in a dispersed manner. Not the same as LEACH and HEED, DWEHC generates a multi-level business intended for intra-cluster communication and limitations a parent node's volume of children.

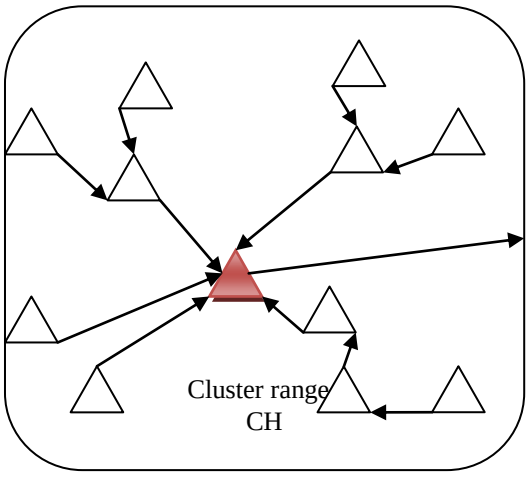


Figure 1.2: Structure of Multi-hop intra-cluster in DWEHC.

D) PANEL: Position-based Aggregator Node Election standard protocol is often a position-based clustering routing standard protocol suitable for WSNs. For past CH choice methodologies, PANEL sustains asynchronous sensor network purposes in which the sensor node numbers tend to be fetched via the BSs. The key purpose of PANEL is always to opt for aggregators, i.e., CHs, regarding efficient and also prolonged info storage space applications.

Listed below are the chief worth connected with PANEL:

(1) This kind of standard protocol be a energy-efficient standard protocol to be able to assures load balancing since every node is definitely selected aggregator, i.e., CH, virtually every bit as commonly. Moreover, data aggregation is accomplished and also load is definitely condensed, consequently PANEL can easily increase network lifeme; (2) A wonderful feature connected with PANEL that means it is diversified by past data-aggregation based clustering protocols is the fact that apart from synchronous clips, it as well sustains asynchronous applications [27].

E) TL-LEACH: Two-Level Hierarchy LEACH (TL-LEACH), can be an growth to the algorithm criteria connected with LEACH. TL-LEACH uses the subsequent a couple ways to gain energy and latency effectiveness: randomized, flexible, self-configuring cluster creation plus nearby manage with regard to information transfers. Within TL-LEACH, a new CH records information via MNs same as original LEACH, but rather than indication data to the BS straightly, the item utilizes a part of CHs this sits one of several CH as well as BS for a exchange station [28]. The deserves connected with TL-LEACH are as follows: (1) TL-LEACH uses hit-or-miss revolving connected with local cluster BSs, i.e., primary CHs plus secondary CHs, which often can bring about better energy load submission over the network; (2) TL-LEACH uses nearby dexterity, that's conductive to help scalability plus robustness in network; (3) In contrast to LEACH, the structure connected with two-levels clustering leads to help much less average transmission range, plus less nodes are required to transmit a lot distance to the BS by means of TL-LEACH. That successfully reduces the total energy consumption [29].

5. METHODOLOGY

5.1 STEPS INVOLVED FOR PROPOSED WORK

The current research effort is proposed to be reached in several phases that have to be preceded in parallel manner, as described below.

1. Literature review
2. Prepare algorithm in MATLAB 7.10.0 (R2010a) programming.
3. Comparison and analysis is done by using various parameters.
4. Documentation

5.2 PROPOSED ALGORITHM:

To beat the down sides in GSTEB protocol and for obtaining efficient results, proposed a much better GSTEB routing protocol algorithm according to loseless data compression and also reactivity.

In recommended approach, the device model has the following properties:

- Sensor nodes tend to be at randomly distributed in square area and there's one single BS deployed far away from the area.
- sensing unit nodes tend to be immobile as well as energy constrained. Once stationed, they will hold operating until their energy is exhausted.

DOI 10.17148/IJARCCE.2016.5146

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

- Sensor nodes tend to be location-aware. A sensing unit node could get their position information through different mechanisms such as for instance GPS or position algorithms.
- Each node has it's unique identifier (ID).

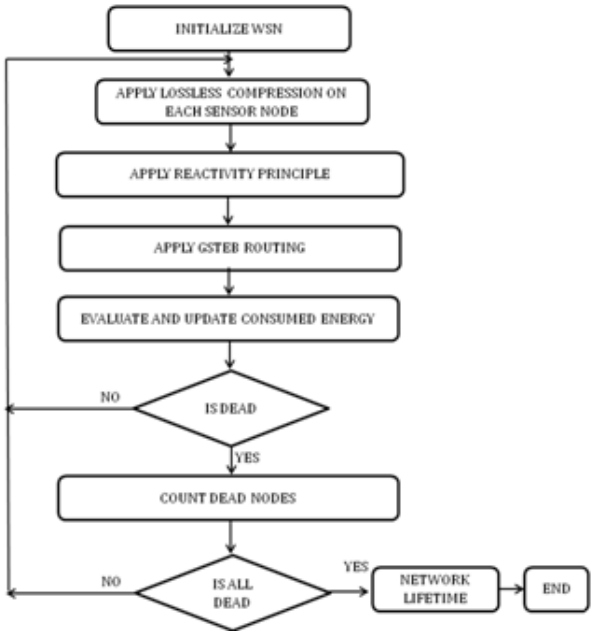


Fig 1.3: Flow chart of proposed methodology

5.3 PROPOSED DATA AGGREGATION BASED EDDEEC

The Initialization of WSN is explained below in the following steps:

1. Initially nodes are deployed randomly.
2. Identification of normal nodes:if(rand $\geq (m + x) \times n + 1)$
3. S(i). $E = E_o$ // E_o=Initial energy
4. end if
5. /*Setup phase*/

Apply tree construction phase using GSTEB

6. /*Setup phase*/
7. Elected road nodes broadcast the message to sensor nodes(SNs).
8. root nodes allocate TDMA schedule to member nodes.

/*Transmission phase1*/

9. For every root node
10. Data sent from member nodes to root nodes as per TDMA schedule.
11. Apply Loss less Data compression

(a) Addition= $\sum_{i=1}^{X}(A_i)$ for $\forall$ (A_i) = Distinct Data // i=1…X, X=nodes having different data packets.

(b) Division = $\frac{1}{Y}\sum_{j=1}^{Y}(B_j)$ for $\forall$ (B_j) = Similar data // j=1…Y, Y=nodes having similar data packets.

12. end

/* Evaluate Reactivity principle*/

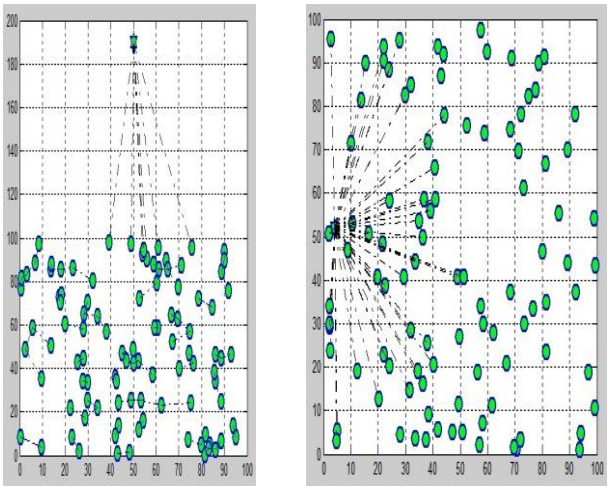
13. $CV = minfq + (maxfq - minfq) * rand$ // CV means current value
14. if $CV < HT\ then$ //HT means hard thresholding (also define it)
15. Communicate data with sink
16. end if

/*Transmission phase2*/

17. Send compressed data from relay node to BS.
18. Apply divisible data aggregation at BS
19. End of code

6. EXPERIMENT RESULTS

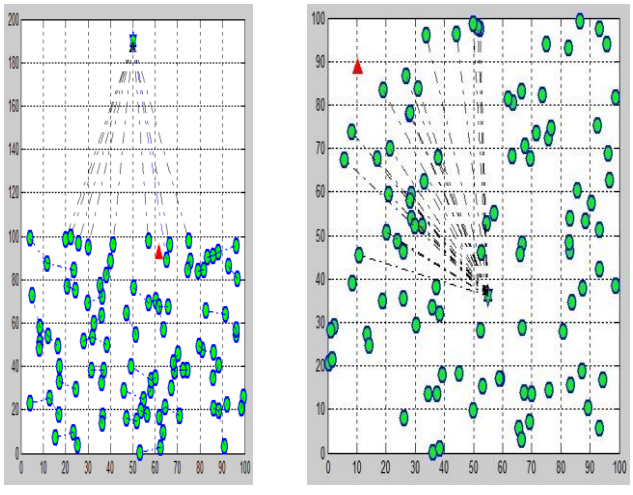
On applying recommended compressive sensing based reactive GSTEB routing protocol for mobile sink, the below success shall be achieved.



(a) (b)

Figure 1.4: when all the sensor nodes are alive

Fig.1.4 (a) is normally indicating an active environment of recommended compressive sensing based reactive GSTEB routing protocol and Fig. 1.4(b) is normally indicating a active environment of recommended GSTEB regarding mobile sink in which base station is moving. Green star represents the base station. Green circles represents the sensor nodes . Each one of these nodes transmits their own data to Base Station. Dotted lines from BS to nodes represent how nodes send their data to the base station.



(a) (b)

Figure 1.5: when First Node is dead

IJARCCE

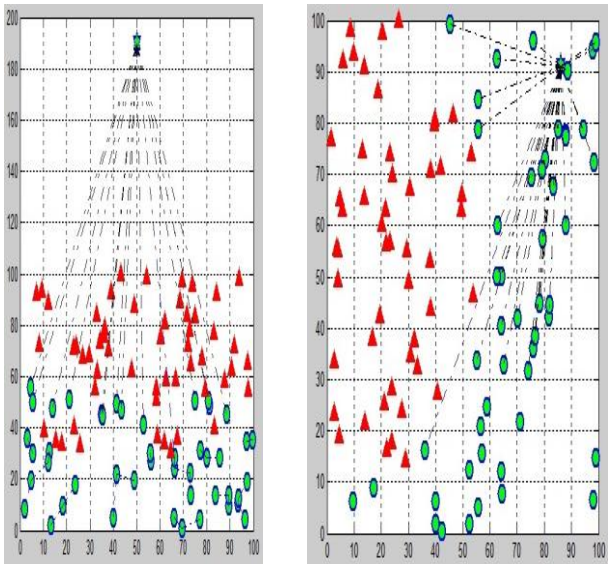
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

Fig1.5 (a) is undoubtedly showing the environment of planned compressive sensing based reactive GSTEB routing protocol in which one node is dead along with Fig.1.5 (b) is undoubtedly showing the environment of planned GSTEB intended for mobile sink in which one node is dead. Red triangle represents the dead node. Green star represents the base station. Green circles represents the sensor nodes .These nodes transmits their data to Base Station. Dotted lines from BS to nodes represent how nodes send their data to the base station.

Red-colored triangles show any fifty percent old nodes. Eco-friendly music star shows the camp station. Eco-friendly circles show any detector nodes.

All of these nodes transmits his or her's details in order to Bottom Station. Sprinkled creases right from BS in order to nodes shows the simplest way details right from nodes ship in to the put faitth on station. Typically the marked crease within nodes demonstrates to that all node dynamically can determine in order to speak with BS direct or simply throughout others simply by making direction-finding tree.

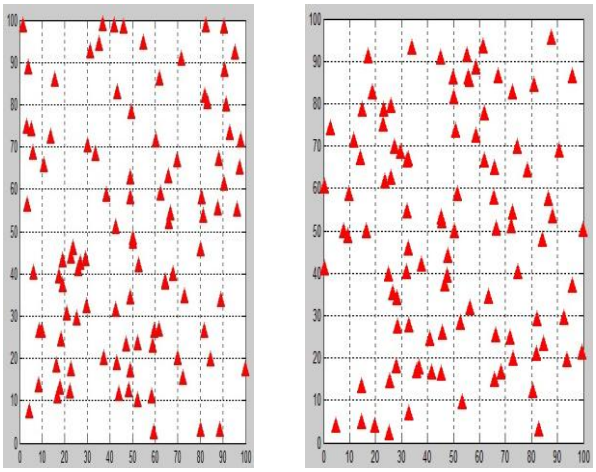


(a) (b)

Figure 1.6: when Half Nodes are dead

Fig.1.6 (a) is certainly explaining the oxygen about consist of compressive realizing primarily based responsive GSTEB direction-finding method rrn which fifty percent nodes seem to be old along with Fig.1.6(b) is certainly explaining the oxygen about consist of GSTEB just for mobile or portable submerge rrn which fifty percent nodes seem to be dead.

Fig.1.7 (a) is expressing the oxygen regarding planned compressive perception depending responsive GSTEB nav communications protocol in which pretty much all nodes happen to be dead as well as Fig. 1.7(b) is expressing the oxygen regarding planned GSTEB pertaining to cellular style of sink in which pretty much all nodes happen to be dead. Red-colored trilateral provides a dead node.



(a) (b)

Figure 1.7: when All Nodes are dead

7. RESULT IN TABULAR

TABLE 1.1: FIRST NODE DEAD

Node	Existing	Proposed	Mobile Sink
100	140	285	243
120	114	243	213
140	87	199	210
160	175	151	216
180	154	316	221
200	136	267	189
220	121	235	223
240	108	221	181
260	101	193	201
280	88	186	190
300	79	136	186
320	71	156	197
340	63	123	190
360	56	117	199
380	51	101	195
400	46	84	199

Table 1.1 shows the comparison among Existing GSTEB, Proposed compressive sensing based reactive GSTEB routing protocol and Proposed GSTEB for mobile sink with respect to first node dead time. It clearly shows that in case of proposed GSTEB the number of rounds for first node dead is more than the existing GSTEB.

TABLE 1.2: HALF NODE DEAD

Node	Existing	Proposed	Mobile Sink
100	298	564	719
120	261	565	709
140	230	464	397
160	304	419	360
180	285	575	645
200	268	513	321
220	259	456	354
240	216	465	349
260	208	424	331
280	193	411	361
300	194	372	344

320	190	410	322
340	186	376	315
360	185	390	328
380	184	367	321
400	185	374	322

Table 1.2 demonstrates the comparison among Existing GSTEB, Proposed compressive sensing based reactive GSTEB routing protocol and Proposed GSTEB for mobile sink with respect to half node dead time. It definitely shows that the number of rounds for half node dead in case of the proposed is more than the Existing GSTEB.

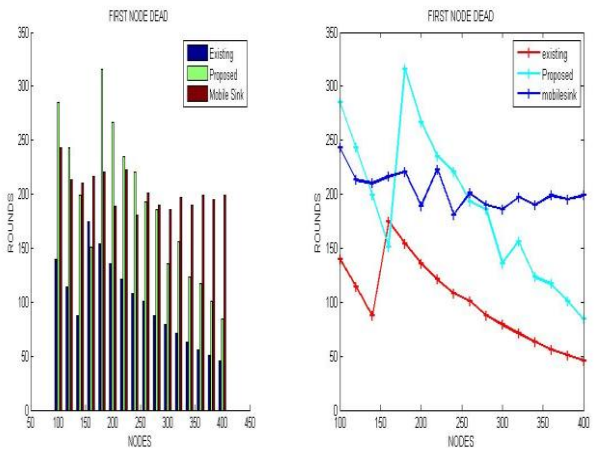
TABLE 1.3: ALL NODES DEAD

Node	Existing	Proposed	Mobile Sink
100	323	602	1480
120	293	617	1182
140	251	542	783
160	330	493	755
180	308	612	826
200	288	548	675
220	270	517	728
240	257	547	723
260	248	507	669
280	234	494	761
300	235	445	742
320	230	491	610
340	214	431	632
360	210	446	420
380	206	417	633
400	204	405	649

Table 1.3 shows the comparison among Existing GSTEB , Proposed compressive sensing based reactive GSTEB routing protocol and Proposed GSTEB for mobile sink with respect to last node dead time. It clearly shows that the number of rounds for last node dead in case of the proposed are more than the Existing GSTEB.

8. ANALYSIS OF RESULTS

8.1 FIRST NODE DEAD TIME (STABLE PERIOD EVALUATION)



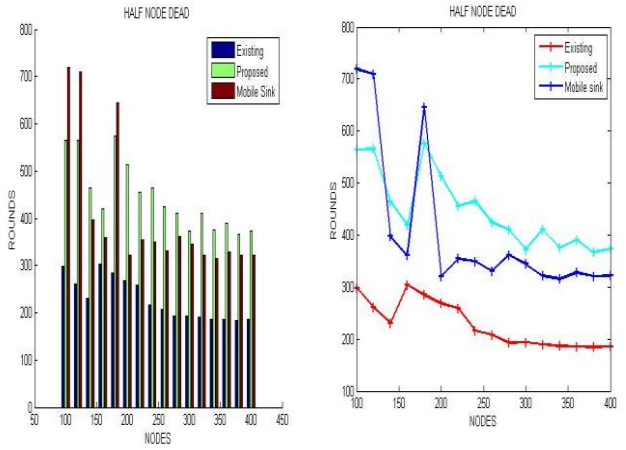
(a) (b)

Fig 1.8: First Node Dead

Figure 1.8 shows the comparison among Existing GSTEB, Proposed compressive sensing based reactive GSTEB routing protocol and Proposed GSTEB for mobile sink with respect to first node dead time. Bar graph and Line graph clearly shows that the numbers of rounds for first node dead in case of the proposed are more than the Existing GSTEB. It is confirmed that the proposed algorithm is comparatively better than the existing techniques.

8.2 HALF NODE DEAD TIME

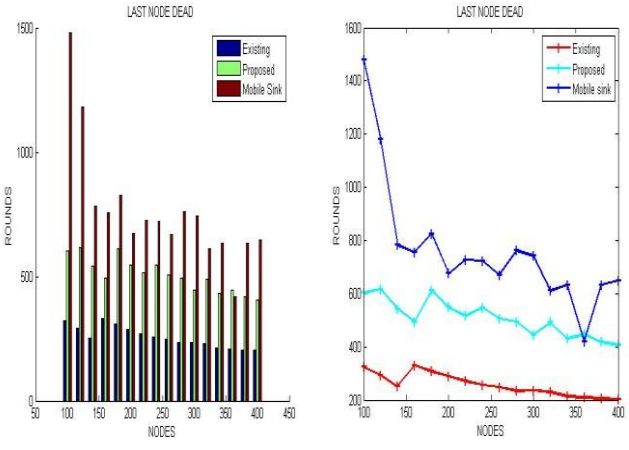
Figure 1.9 displays the comparison among Existing GSTEB, Proposed compressive sensing based reactive GSTEB routing protocol and Proposed GSTEB for mobile sink with respect to half node dead time. Bar graph and Line graph clearly shows that the numbers of rounds for half node dead in case of the proposed are more than the Existing GSTEB. It is confirmed that the proposed algorithm is comparatively better than the existing techniques.



(a) (b)

Fig 1.9: Half Node Dead

8.3 LAST NODE DEAD TIME i.e. NETWORK LIFETIME



(a) (b)

Fig 1.10: Last Node Dead

9. CONCLUSION

The effectiveness of WSN lies in the chance to install many little nodes that assemble and also set up themselves. The need of WSN as a result of remarkable ability intended for complete tracking throughout out of the way and also unreachable regions where it's not simple to put together regular wired infrastructure. WSN is great enabling technology that could revolutionize details and also connection technology.

The proposed technique can conquer the limitations of the GSTEB routing standard protocol when using the basic principle regarding reactivity, mobile sink plus the lossless data compression technique. This planned method is screened simply by taking into consideration the 100 * 100 wireless sensor area along with solitary sink. This comparing has displayed some sort of improvement in network lifetime is 2.17 % and 3.71 % in the case of network stability.

REFERENCES

[1] Nawaz, Faiza, and Shafat Ahmed Bazaz. "Lifetime optimization of Wireless Sensor Network through energy efficient clustering for robust data routing." in 2nd IEEE International Conference on Computer Technology and Development (ICCTD), pp. 235-239, 2010.

[2] Ji, Peng, Yupeng Li, Jingqi Jiang, and Tianbao Wang. "A Clustering Protocol for Data Aggregation in Wireless Sensor Network." In Proceedings of the IEEE International Conference on Control Engineering and Communication Technology, pp. 649-652, 2012.

[3] Lindsey, Stephanie, and Cauligi S. Raghavendra. "PEGASIS: Power-efficient gathering in sensor information systems." Aerospace conference proceedings, 2002. IEEE. Vol. 3. IEEE, 2002.

[4] Tan, Hüseyin Özgür, and Ibrahim Körpeoğlu. "Power efficient data gathering and aggregation in wireless sensor networks." ACM Sigmod Record 32.4 (2003): 66-71.

[5] Kumar Dilip "Performance analysis of energy efficient clustering protocols for maximising lifetime of wireless sensor networks." Wireless Sensor Systems, IET 4, No. 1, pp. 9-16, 2014.

[6] Li, Nan, Shangru Li, and Xiaozhou Fang. "Adaptive data aggregation mechanism based on leach protocol." in International Conference on Advanced Intelligence and Awareness Internet (AIAI 2010), pp. 131-134, 2010.

[7] Mantri, Dnyaneshwar, Neeli R. Prasad, and Ramjee Prasad. "Grouping of clusters for efficient data aggregation (GCEDA) in wireless sensor network." in 3rd IEEE International Advance Computing Conference (IACC), pp. 132-137, 2013.

[8] Mathapati, Basavaraj S., Siddarama Patil, and V. D. Mytri. "A cluster based Energy Efficient Reliable Routing Protocol for Wireless Sensor Networks." in 2012 1st IEEE International Conference on Emerging Technology Trends in Electronics, Communication and Networking (ET2ECN), pp. 1-6, 2012.

[9] Younis, Ossama, and Sonia Fahmy. "HEED: a hybrid, energy-efficient, distributed clustering approach for ad hoc sensor networks." IEEE Transactions on Mobile Computing, Vol.3, No. 4, pp. 366-379, 2004.

[10] Younis, Ossama, Marwan Krunz, and Srinivasan Ramasubramanian. "Node clustering in wireless sensor networks: recent developments and deployment challenges." Network, IEEE, No. 3 pp. 20-25, 2006.

[11] Liang, Weifa, and Yuzhen Liu. "Online data gathering for maximizing network lifetime in sensor networks." Mobile Computing, IEEE Transactions on 6.1 (2007): 2-11.

[12] Manzoor, Basit, et al. "Q-LEACH: A New Routing Protocol for WSNs." Procedia Computer Science 19 (2013): 926-931.

[13] Kumar, Dilip, Trilok C. Aseri, and R. B. Patel. "EEHC: Energy efficient heterogeneous clustered scheme for wireless sensor networks." Computer Communications 32.4 (2009): 662-667.

[14] Qureshi, T. N., Nadeem Javaid, A. H. Khan, Adeel Iqbal, E. Akhtar, and M. Ishfaq. "BEENISH: Balanced Energy Efficient Network Integrated Super Heterogeneous Protocol for Wireless Sensor Networks." Procedia Computer Science 19 (2013): 920-925.

[15] Han, Zhao, Jie Wu, Jie Zhang, Liefeng Liu, and Kaiyun Tian. "A General Self-Organized Tree-Based Energy-Balance Routing Protocol for Wireless Sensor Network." pp. 1-2, 2014.