International Journal of Engineering and Technical Research (IJETR)
ISSN: 2321-0869 (O) 2454-4698 (P), Volume-3, Issue-8, August 2015

Improved QoS in context of DRINA Algorithm against the in FRA and SPT

Priya Jain, Indiver Purohit

***Abstract*— Energy is a critical resource parameter in Wireless Sensor Networks. This paper presents an overview on one of the existing energy efficient routing protocols which satisfies the criteria of QoS parameters. Redundant data can decrease communication costs and energy consumption. Since energy conservation is a key issue case, redundant data can be aggregated at decreasing communication costs and energy called DRINA, that has some key aspects such overlapping routes, high aggregation rate, extensively compared to two other known solutions: built by DRINA provides the best aggregation proposed solution outperforms these solutions networks, it is likely that redundant data will be detected by issue in WSNs, data fusion and aggregation should be exploited at intermediate nodes reducing the size and number of consumption. In this work we propose a novel Data Routing such as a reduced number of messages for setting up a routing and reliable data aggregation and transmission. The proposed solutions: the InFRA and SPT algorithms. Our results indicate aggregation quality when compared to these other algorithms. The solutions in different scenarios and in different key aspects required by nearby nodes when sensing an exploited in order to save energy. Our result indicates aggregation quality and satisfies the criteria of QoS parameters, when compared to these other algorithms.**

***Index Terms*— WSN: Wireless Sensor Network, QoS: Quality of Service, MEMS: Micro Electro Mechanical Systems, SMP: Sensor Management Protocol, MAC: Medium Access Protocol, AES: Advance Encryption Standard, GUI: Graphical User Interface.**

I. INTRODUCTION

The development of wireless sensor nodes has permitted specialist to anticipate networking a large set of nodes sprinkled over a broad area of interest into a Wireless Sensor Networks (WSNs) for large-scale data collection and filtering and event monitoring. Confidentiality, genuineness, accessibility, and integrity are archetypal security goals for WSNs. A routing protocol establishes how routers converse with each other, disseminating information that empowers them to pick routes between whichever two nodes on a computer network. Routing algorithms find out the specific choice of route. Each router has a priori information only of networks connected to it directly. A routing protocol overlaps this information first amongst instant neighbors, and then right through the network. This way, routers grow information of the topology of the network.

AWireless Sensor Network (WSN) inhere of spatially disseminated independent devices that considerately sense physical or environmental surroundings, such as temperature, sound, vibration, pressure, motion, or pollutants at dissimilar places [1], [2]. WSNs have been utilized in applications such as environmental monitoring, native soil security, significant infrastructure systems, communications, manufacturing, and numerous other applications that can be important to save lives and resources [3], [4], [5].

A prospective approach to optimize the routing task is to exploit the available indulgence ability convey by the intermediary sensor nodes all along the routing paths. This is recognized as data-centric routing or in-network data aggregation. For more proficient and effectual data assembly with a least use of the inadequate resources, sensor nodes should be arranged to elegantly report data by manufacture local decisions [10], [11], [12], [13]. For this, data aggregation is an effectual method for cutback energy in WSNs. Due to the intrinsic redundancy in unprocessed data collected by the sensor nodes, in-networking aggregation can repeatedly be used to decrease the communication cost by organize of idleness and forwarding simply minor aggregated information. As ostensible communication manages straightly to energy savings, which enhance the network lifetime, in-network data aggregation is a key technology to be supported with wireless sensor network. In this work, the terms information fusion and data aggregation are utilized as synonyms. In this framework, the use of information fusion is twofold [14]: 1) to take advantage of data redundancy and increase data accuracy, and 2) to reduce communication load and save energy.

One of the major challenges in routing algorithms for WSNs is how to promise the delivery of the sensed data even in the existence of nodes failures and interruptions in communications. In the situation of WSN, data aggregation conscious routing protocols should present some enviable distinctiveness such as: a abridged number of messages for creation a routing tree, maximized amount of overlapping routes, high aggregation rate, and also a trustworthy data transmission. In order to conquer these challenges, in this work, we recommend a novel Data Routing algorithm for In-Network Aggregation for WSNs, which we refer to as DRINA algorithm. Our proposed algorithm was conceived to exploit information fusion along the communication route in reliable way, during a fault-tolerant routing mechanism.

II. THE IMPLEMENTATION

Implementation of projected Mobile Replica Node Detection application is constantly preceded by important decisions concerning the language used, selection of the platform, etc. The decisions are often influenced by numerous factors such as actual environment in which the system works the speed that is necessary, the security concerns, and other implementation specific details. There are three most important implementation decisions that have been made before the implementation of this project. They are as follows:

- Selection of the platform (Operating System)

Priya Jain, Research Scholar, Institute of Technology & Management, Bhilwara, Rajasthan, India
Indiver Purohit, Counsellor, Vardhaman Mahaveer Open University, Kota, Rajasthan, India

- Selection of the programming language for development of the application
- Coding guidelines to be followed.

The implementation of the proposed system will need a standard cover image along with a normal plain text file for performing the message embedding procedure. However the software requirements for performing the implementation will be:

- The software chosen for the implementation of this project is Matlab2009.
- The operating system used will be either Microsoft Windows XP, Vista, Windows7.

III. DRINA IMPLEMENTATION

The projected system is designed with three fundamental modules as explained.

There are three main modules in the project.

- Building a hop tree
- Cluster formation
- Routing formation of hop tree updates and route repair acknowledgment mechanism

In this phase, the distance from the sink to each node is computed in hops. This phase is started by the sink node sending, by means of a flooding, the Hop Configuration Message (HCM) to all network nodes. The HCM message contains two fields: ID and Hop To Tree, where ID is node identifier that started or retransmitted the HCM message and Hop To Tree is the distance, in hops, by which an HCM message has passed.

Algorithm 1. Hop Tree Configuration Phase

1. Node sink needs a broadcast of HCM messages with the value of HopToTree =1;
   //R_u is the set of nodes that received the message HCM
2. **For each** $u \in$ **R_u do**
3. if HopToTree(u) >HopToTree(HCM) and FirstSending (u) **then**
4. $NextHop_u \leftarrow ID_{HCM}$;
5. HopToTree $\leftarrow$ $HopToTree_{HCM}$ + 1;
   //Node u update the value of the ID field in the message HCM
6. $ID_{HCM} \leftarrow ID_u$;
7. $HopToTree_{HCM} \leftarrow HopToTree_u$;
8. Node u sends a broadcast message of HCM with the new values ;
9. $FirstSending_u \leftarrow$ false ;
10. end
11. else
12. Node u discards the received message HCM ;
13. end
14. End

Before the first event takes place, there is no established route and the HopToTree variable stores the smallest distance to the sink. On the first event occurrence, HopToTree will still be the smallest distance; however, a new route will be established. After the first event, the HopToTree stores the smaller of two values: the distance to the sink or the distance to the closest already established route.

- Cluster formation

When an event is detected by one or more nodes, the leader election algorithm starts and sensing nodes will be running for leadership (group coordinator); this process is described in Algorithm 2.

Algorithm 2. Cluster formation and leader election

1. Input: S // set of nodes that detected the event
2. Output: u // A node of the set S is elected leader of the group
3. foreach $u \in$ S do
4. $role_u \leftarrow$ coordinator;
   // Node u sends message MCC in broadcast
5. Announcement of event detection ;
6. //N_u is the set of neighbours of node $u \in$ S
7. foreach $w \in N_u$ do
8. if HopToTree(u) >HopToTree(w) then
9. $role_u \leftarrow$ collaborator ;
10. Node u retransmits the MCC message received from node w ;
11. end
12. else if HopToTree(u) = HopToTree(w) $\wedge$ ID(u) >ID(w) then
13. $role_u \leftarrow$ collaborator;
14. Node u retransmits the MCC message received from node w ;
15. end
16. else
17. Node u discards the MCC message received from w;
18. end
19. end
20. end

- Routing formation of hop tree updates and route repair acknowledgment mechanism

The elected group leader, as described in Algorithm 2, starts establishing the new route for the event dissemination. This process is described in Algorithm 3:

Algorithm 3.Route establishment and hop tree update

1. Leader node v of the new event sends a message REM to its $NextHop_v$;
2. Repeat
   // u is the node that received the REM message, that was sent by node v
3. if u=$Nextop_v$ then
4. HopToTree$\leftarrow$ 0;
   //node u is part of the new route built
5. $Role_u \leftarrow$ Relay;

6. Node u sends the message REM to its $NextHop_u$;
7. Node u broadcasts the message HCM with the value of HopToTree=1;
8. Nodes that receive the HCM message sent by node u, will run the command line
   2 until the line 14 of algorithm 1 ;
9. end
10. until find out the sink node or a node belonging to the routing structure already established;
11. repeat
    // $sons_u$ is the number of descendants of u
12. if $sons_u$ >1 then
13. Aggregates all data and sends it to the $nexthop_u$;
14. if $Role_u$ = Relay then
15. Execute the mechanism of section 3.4
16. end
17. end
18. else
19. Send data to $nexthop_u$;
20. if $Role_u$ = Relay then ;
21. Execute the mechanism of section 3.4
22. end
23. end
24. until The node has no data transmit/ retransmit.

IV. State Diagram

A deploying process shows the sequence of steps that make up a complex process, such as an algorithm or workflow. The state diagram as shown in figure 4.1:

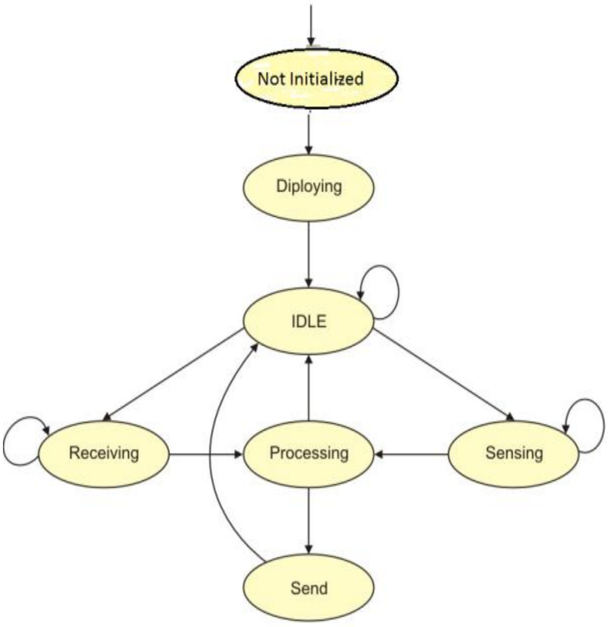

Fig. 4.1: State Diagram of Deploying and Event process

- **Not Initialized state:** When the application is executed initially.
- **Deploying state:** If the state is Not Initialized then the nodes can be deployed. In this state the nodes are deployed within the sensor network.
- **Idle state:** Once the nodes are deployed all the nodes will be in the idle state
- **Sensing state:** The events or objects are placed in the sensor network then the state of the sensor node changes to idle to sensing state.
- **Processing state:** The nodes which are within the sensing range changes to the processing state where nodes generates the data.
- **Send state:** The generated data is sent to other sensor node or sink node.
- **Receive state:** The data is received by the sensor node or sink.

V. Drina v/s Infra v/s SPT Simulation

The simulation performed on MATLAB simulator which provides a simulation framework for two dimensional sensor networks. The simulations are performed on a region of surveillance with a volume of 100m*100m. In this region, any numbers of nodes for example 20 static sensors nodes are deployed for the analysis. The objects are placed in the network, which is nearer to the object will get detected and by using the neighbor table the shortest path route will be selected to reach the sink.

The data that are sending is encrypted and it will get decrypted in the sensor node or sink.The proposed system has decreased the no of iterations based on the below enhancements; Screen Shots for Drina shows the sensor nodes packets reaching to BS in several rounds as in the below figure 5.1

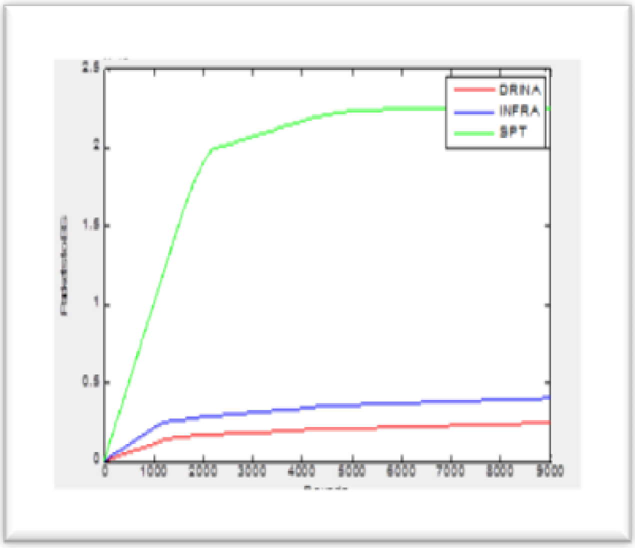

Fig. 5.1: the sensor nodes packets reaching to BS in several rounds

- Total Number of Alive nodes w.r.t total number of Rounds.

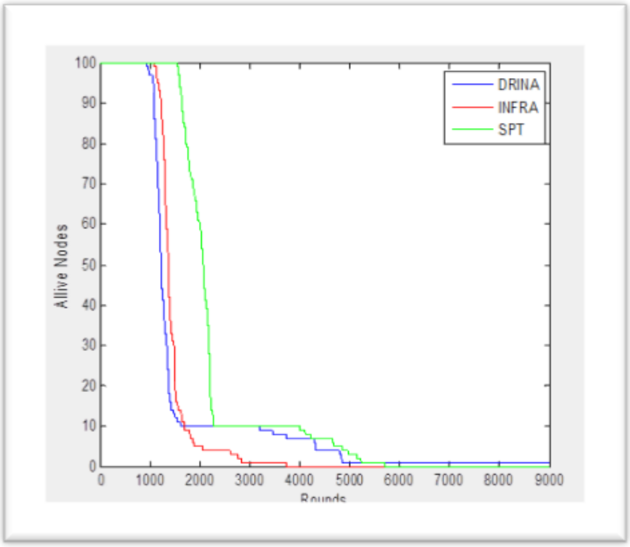

Fig. 5.2: Total Number of Alive nodes w.r.t total number of Rounds

- Shows the Dead nodes w.r.t. Total number of Rounds.

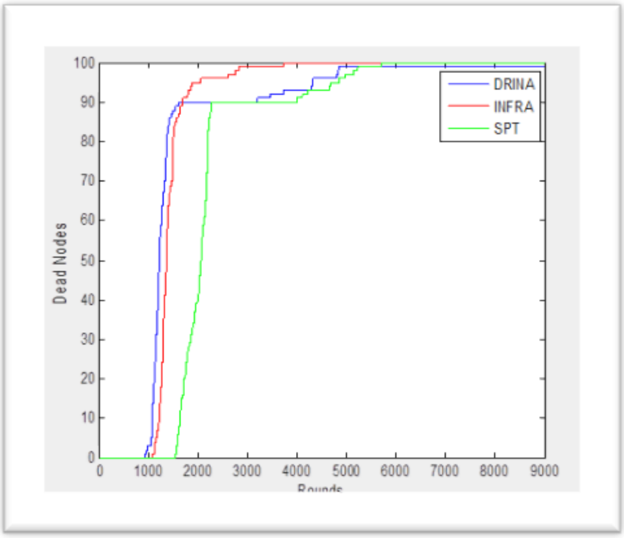

Fig. 5.3: Shows the Dead nodes w.r.t. Total number of Rounds

- Comparison graph for Time v/s Packet Arrival rate

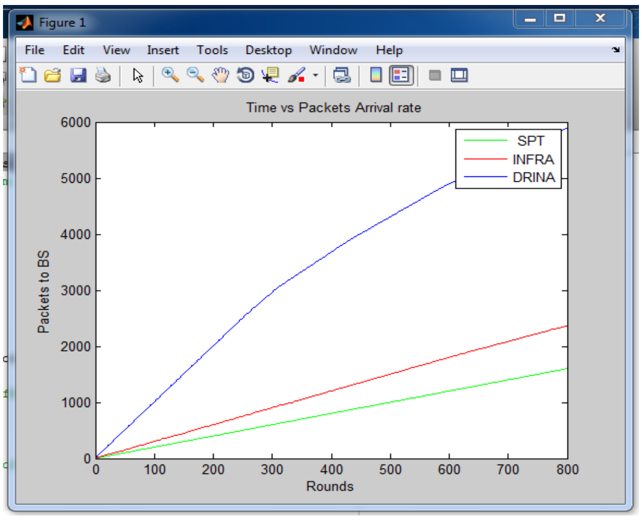

Fig. 5.4: Comparison graph for Time v/s Packet Arrival rate

- Comparison graph for Time vs Dead Nodes

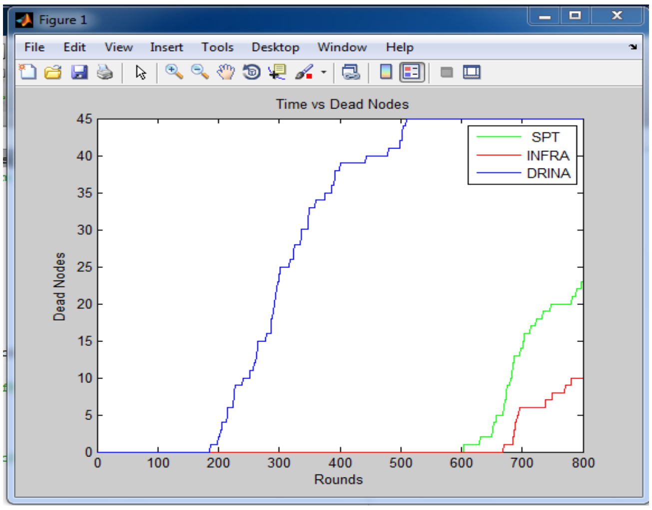

Fig. 5.5: Comparison graph for Time v/s Dead Nodes

- Comparison graph for Time vs Packet Arrival rate at Cluster

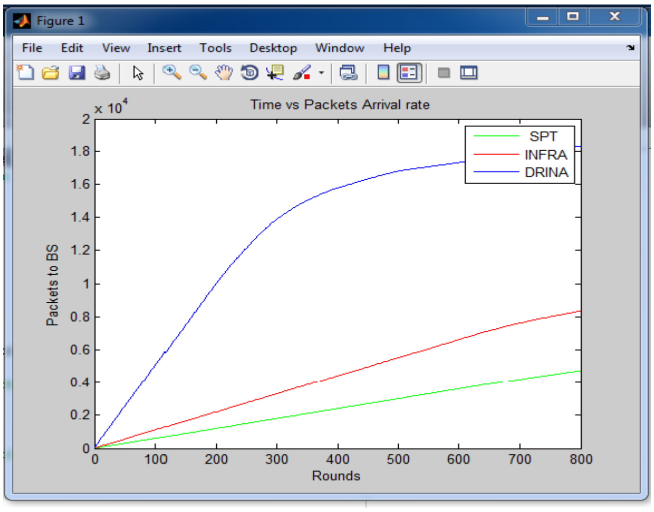

Fig. 5.6: Comparison graph for Time v/s Packet Arrival rate at Cluster

VI. CONCLUSION

Aggregation aware routing algorithms play an important role in event-based WSNs. In this work, we presented the DRINA algorithm, a novel and reliable Data Aggregation Aware Routing Protocol for WSNs. Our proposed DRINA algorithm was extensively compared to two other known routing algorithms, the InFRA and SPT, regarding scalability, communication costs, delivery efficiency, aggregation rate, and aggregated data delivery rate. By maximizing the aggregation points and offering a fault tolerant mechanism to improve delivery rate, the obtained results clearly show that DRINA outperformed the InFRA and SPT algorithms for all evaluated scenarios. Also, We explain that this proposed algorithm has some key aspects required by WSNs aggregation aware routing algorithms such as a reduced number of messages for setting up a routing tree, maximize number of overlapping routes, high aggregation rate, and reliable data aggregation and transmission.

REFERENCES

[1] J. Al-Karaki and A. Kamal, "Routing Techniques in Wireless Sensor Networks: A Survey," *IEEE Wireless Comm.*, vol. 11, no. 6, pp. 6-28, Dec. 2004.

[2] I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cyirci, "Wireless Sensor Networks: A Survey," *Computer Networks,* vol. 38, no. 4, pp. 393-422, Mar. 2002.

[3] K. Romer and F. Mattern, "The Design Space of Wireless Sensor Networks," *IEEE Wireless Comm.,* vol. 11, no. 6, pp. 54-61, Dec. 2004.

[4] O. Younis, M. Krunz, and S. Ramasubramanina, "Node Clustering in Wireless Sensor Networks: Recent Developments and Deployment Challenges," *IEEE Network*, vol. 20, no. 3, pp. 20-25, Dec. 2006.

[5] A.P. Chandrakasan, A.C. Smith, and W.B. Heinzelman, "An Application-Specific Protocol Architecture for Wireless MicrosensorNetworks," IEEE Trans. Wireless Comm., vol. 1, no. 4, pp. 660-670, Oct. 2002.

[6] E. Fasolo, M. Rossi, J. Widmer, and M. Zorzi, "In-network Aggregation Techniques for Wireless Sensor Networks: A Survey," IEEE Wireless Comm., vol. 14, no. 2, pp. 70-87, Apr. 2007.

[7] I. Solis and K. Obraczka, "The Impact of Timing in Data Aggregation for Sensor Networks," IEEE Int'l Conf. Comm., vol. 6, pp. 3640-3645, June 2004

[8] F. Hu, X. Cao, and C. May, "Optimized Scheduling for Data Aggregation in Wireless Sensor Networks," Proc. Int'l Conf. Information Technology: Coding and Computing (ITCC '05), pp. 557-561, 2005

[9] L. Villas, A. Boukerche, R.B. de Araujo, and A.A.F. Loureiro, "Highly Dynamic Routing Protocol for Data Aggregation in Sensor Networks," Proc. IEEE Symp. Computers and Comm (ISCC),pp.496502,http://dx.doi.org/10.1109/ISCC.2010.5546580, 2010.

[10] I. Chatzigiannakis, T. Dimitriou, S.E. Nikoletseas, and P.G. Spirakis, "A Probabilistic Algorithm for Efficient and Robust Data Propagation in Wireless Sensor Networks," Ad Hoc Networks, vol. 4, no. 5, pp. 621-635, 2006

[11] S. Olariu, Q. Xu, and A. Zomaya, "An Energy-Efficient Self-Organization Protocol for Wireless Sensor Networks," *Proc. IEEE Intelligent Sensors, Sensor Networks and Information Processing Conf. (ISSNIP),* pp. 55-60, Dec. 2004.

[12] I. Chatzigiannakis, T. Dimitriou, S.E. Nikoletseas, and P.G. Spirakis, "A Probabilistic Algorithm for Efficient and Robust Data Propagation in Wireless Sensor Networks," *Ad Hoc Networks,* vol. 4, no. 5, pp. 621-635, 2006.

[13] L.A. Villas, D.L. Guidoni, R.B. Araújo, A. Boukerche, and A.A. Loureiro, "A Scalable and Dynamic Data Aggregation Aware Routing Protocol for Wireless Sensor Networks," *Proc. 13th ACM Int'l Conf. Modeling, Analysis, and Simulation of Wireless and Mobile Systems,* pp. 110-117, http://doi.acm.org/10.11451868521. 1868540 , 2010.

[14] E.F. Nakamura, A.A.F. Loureiro, and A.C. Frery, "Information Fusion for Wireless Sensor Networks: Methods, Models, and Classifications," *ACM Computing Surveys,* vol. 39, no. 3, pp. 9-1/9-55, 2007.

[15] A. Boukerche, B. Turgut, N. Aydin, M.Z. Ahmad, L. Bölöni, and D. Turgut, "Survey Paper: Routing Protocols in Ad Hoc Networks: A Survey," *Computer Networks,* vol. 55, pp. 3032-3080, http://dx.doi.org/10.1016j.comnet.2011.05.010 , Sept. 2011.

AUTHORS


Priya Jain, Research Scholar, Institute of Engineering And Technology, Bhilwara Rajasthan, India


Indiver Purohit, Counsellor, Vardhaman Mahaveer Open University, Kota, Rajasthan, India