

# Implementation of Power and Band Optimization in Secured Wireless Sensor Network

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**ABSTRACT:** A collection of spatially distributed sensor nodes in a Wireless Sensor Network (WSN) work collaboratively to sense the physical phenomena around them and then send the sensed information to the sink node through single-hop or multi-hop paths. In this work, we propose a scheme, named ReDAST, for reliable and efficient data acquisition in a stationary WSN in the presence of transfaulty nodes. Due to the transfaulty behavior, a sensor node gets temporarily isolated from the network. Temporary node isolation leads to the formation of dynamic communication holes in the network, which form and disappear dynamically. Further, they may increase or decrease in size dynamically as well. These effects result in loss of information in the radiation affected area. To prevent information loss in WSN due to transfaulty behavior of sensor nodes, in the proposed scheme, we construct the network using sensor nodes having dual mode of communication – RF and acoustic. To get redundant coverage within a radiation affected area, all the sensor nodes in the area become activated and switch to the acoustic communication mode after detecting themselves to be affected by radiations. Clustering can be used for load balancing to extend the lifetime of a sensor network by reducing energy consumption. Load balancing using clustering can also increase network scalability. It proposes a clustering technique which will balance the load among the cluster by using some backup nodes. This approach will increase the network lifetime and will provide high throughput.

**KEYWORDS:** Power Supply, PIC Micro Controller, Zigbee, LCD display, Temperature sensor, Jelly fish Attack.

## I. INTRODUCTION

ADVANCEMENT of wireless technology and its integration with low-power devices has led to the development of wireless sensor technology, which is a prominent technological invention in recent years. The WSN technology has large application domain including security, surveillance, health care, environment monitoring, and object tracking. The main characteristics of a WSN include autonomy, energy-constrained and resource constrained Nodes and dynamic topology. Sensor nodes can be deployed randomly or pre-planned manner. Sensor nodes detect physical phenomenon as like temperature, pressure, and humidity. Sensed information is send collaboratively to a base station or sink through single-hop or multi-hop connectivity. Cooperation and collaboration among nodes is an important factor aiming the successful operation of a WSN. Misbehaviors, faults, and attacks are major challenges facing successful cooperation and collaboration among the nodes of a WSN. In this work, we propose a scheme, named ReDAST, for reliable and efficient data acquisition in stationary WSNs in the presence of transfaulty nodes.

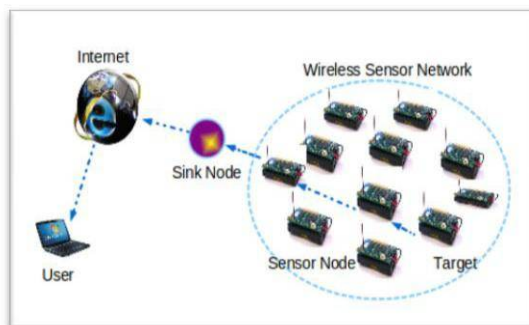
Information gathering is a fast growing and challenging field in today's world of computing. Sensors provide a cheap and easy solution to these applications especially in the inhospitable and low-maintenance areas where conventional approaches prove to be very costly. Sensors are tiny devices that are capable of gathering physical information like heat, light or motion of an object or environment. Sensors are deployed in an ad-hoc manner in the area of interest to monitor events and gather data about the environment. Networking of these unattended sensors is expected to have significant impact on the efficiency of many military and civil applications, such as combat field surveillance, security and disaster management.

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**Fig.1:Wireless Sensor Network**

Sensors in such systems are typically disposable and expected to last until their energy drains. Therefore, energy is a very scarce resource for such sensor systems and has to be managed wisely in order to extend the life of the sensors for the duration of a particular mission. Typically sensor networks follow the model of a base station or command node, where sensors relay streams of data to the command node either periodically or based on events.

The command node can be statically located in the vicinity of the sensors or it can be mobile so that it can move around the sensors and collect data. In either case, the command node cannot be reached efficiently by all the sensors in the system. The nodes that are located far away from the command node will consume more energy to transmit data than other nodes and therefore will die sooner. A wireless sensor network is typically consisting of a potentially large number of resource constrained sensor nodes and few relatively powerful control nodes.

Each sensor node has a battery and a low-end processor, a limited amount of memory, and a low power communication module capable of short range wireless communication. As sensor nodes have very limited battery power and they are randomly deployed it is impossible to recharge the dead battery. So the battery power in WSN is considered as scarce resource and should be efficiently used. Sensor node consumes battery in sensing data, receiving data, sending data and processing data.

Generally a sensor node does not have sufficient power to send the data or message directly to the base station. Hence, along with sensing the data the sensor node act as a router to propagate the data of its neighbor. In large sensor network, the sensor nodes can be grouped into small clusters. Each cluster has a cluster head to coordinate the nodes in the cluster. Cluster structure can prolong the lifetime of the sensor network by making the cluster head aggregate data from the nodes in the cluster and send it to the base station.

The rest of this paper is organized as follows: Related work and the System model for the proposed scheme are presented in Sections II and III; the problem formulation is described in Section IV; Section V presents the analysis and performance results; and lastly, we conclude the paper in Section VI.

## II. RELATED WORK

Cooperation and collaboration among sensor nodes are essential factors affecting the successful operations of multi-hop WSNs. Misbehavior and faults are major problems impeding proper cooperation and collaboration among sensor nodes. A lot of existing works address misbehavior in WSNs. Two classes of problems for improper functioning of sensor nodes. First, the sensor nodes exhibit abnormal function in the presence of environmental noise, malicious attacks, and interference. Second, physical damage and energy depletion as reasons behind the improper functioning of sensor nodes.

Kamhoua et al. [9] address the issues of routing misbehavior in the presence of selfish nodes in the network using evolutionary game theory. Their proposed distributed algorithm forces a selfish node to cooperate and forward

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data packets. Soltanmohammadi et al. [10] proposed a distributed scheme to detect different classes of misbehaving nodes using binary hypothesis testing. However, the above cited works only consider misbehavior that are permanent in nature, i.e. the misbehavior of sensor nodes persists throughout the remaining lifetime after their arise. But they have not considered temporary misbehavior, which can arise due to environmental factors

These movable nodes act as both hosts and routers. The neighboring nodes are also called hop nodes that send and receive data packets. Each node in this network is free to move in any direction and change its links from one node to other frequently.

Wireless sensor networks (WSN), sometimes called wireless sensor and actuator networks (WSAN) are spatially distributed autonomous sensor to monitor physical or environmental conditions, such as temperature, sound, pressure etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller an electronic circuit for interfacing with the sensors and an energy source, usually as battery or form of energy harvesting.

A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth.

The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding. A sensor network consists of multiple detection station called sensor nodes. A sensor node is light weight, portable, and small. Sensor network consists of three subsystem sensor subsystem, processing subsystem and Communication subsystem.

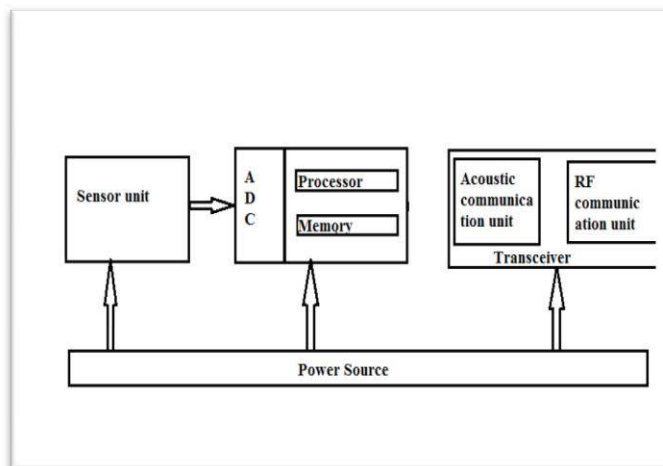
Wireless Sensor Network (WSN) power optimization is an ongoing research issue directed towards achieving low power consumption while retaining desired performance. Various techniques for such optimization exist, oriented at different levels of a WSN. One approach is a data aggregation method for an application oriented WSN.

This technique involves in-network data aggregation allowing a faster information delivery, saving transmission energy and reducing network congestion. The data aggregation method implies replacing a network coordinator with the data aggregation node capable of processing aggregated data.

In this paper we propose PIC 18 architecture-based WSN Data Aggregation Node (P-WDAN), capable of an aggregated data processing and a faster data delivery. Considering WSN energy constrains, the proposed work analyzes and provides a power optimization of the WSN data aggregation node. And also secondary node for all user node. If any user node failure then automatically secondary node send the data to server.

### III. SYSTEM MODEL

In the presence of radiations, the sensor nodes communicate in three different ways. The node affected by radiations transmit the sensed information using the acoustic communication mode, whereas it receives from other nodes using the acoustic communication mode



. The nodes that are outside the radiation affected area transmit the sensed information using the RF communication mode and receive from others also using the same mode. The nodes on the boundary of the holes, need to communicate using both the RF and acoustic communication modes. These nodes should transmit and receive using both RF and acoustic communication modes to establish a bridge between the nodes communicating using solely acoustic or RF communication. A node identifies itself as affected by radiations based on its signal-to-noise-ratio (SINR) level. If the SINR level is above the communication threshold, a node identifies itself as affected by radiations, and switches to the acoustic communication mode.

If a node identifies itself to be not affected by radiations, it continues its communication using RF. There are two major tasks present in this scheme. First, determining the boundary nodes of dynamic natured hole created due to the effects of radiations and assigning responsibility to these nodes to communicate using both the communication modes. Second, the collection of accurate information from these affected nodes.

In the proposed scheme, ReDAST, it is necessary to identify the boundary nodes of dynamic holes for selecting the appropriate mode of communication of the nodes. The existing hole boundary identification schemes lack to work with dynamic holes, which occur in the presence of radiation effects. Therefore, we propose a centralized boundary node detection scheme performed by the sink. After the deployment of network, a minimum subset of sensor nodes remain activated to cover the entire region optimally. In this work, we consider a grid based approach to find minimum subset of nodes. In this approach, we divide the entire terrain into a grid having width and height of each cell equal to the sensing radius of a node.

#### IV. PROBLEM FORMULATION

The proposed scheme Wireless sensor network to monitor physical condition such as temperature, pressure etc. Consists of large number of nodes that are able to interact with environment by sensing and controlling the physical parameters. It pass their data through the network to the sink A sink or base station acts like an interface between users and the network. WSN contain hundreds of thousands of sensor nodes.

A sensor network consists of multiple detection station called sensor nodes. Sensor node is lightweight, small, portable. Sensor node does not have sufficient power to send the data or message directly to the base station .It will sensing the data, the sensor node act as a router to propagate the data of its neighbor. Sensor node can be grouped into small clusters.

Normal Behavior: A sensor node, which can sense physical phenomena in its surroundings and transmit the sensed data during its entire lifetime, is termed as normal-behaved node.

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**Transfaulty Behavior:** A sensor node that may or may not correctly sense the physical phenomena in its surroundings, and cannot transmit the sensed data at a certain instant of time due to the effect of external phenomena (such as electro-magnetic radiation or nuclear radiation), but transmit at a different instant of time with the resumption of favorable condition, is termed as a transfaulty node.

Dini et al. [14] proposed a method for repairing a split network by using mobile sensor nodes. They determined the proper position of mobile sensor nodes, and used them to send data from one node in a partition to another in different partitions or sink. In this manner, connectivity between the sensor nodes can be re-established. Senel et al. [15] proposed a spider-web based scheme using the minimum spanning tree algorithm to reconnect the partitioned network due to the damage of sensor nodes.

One major advantage of wireless sensor networks is the ability for data aggregation to occur in the network. In a densely populated network there are often multiple nodes sensing similar information.

Data aggregation allows the differentiation between sensed data and useful data. Network processing makes this process possible and now it is fundamental in many sensor network schemes, as the power required for processing tasks is substantially less than communication tasks. As such, the amount of data transferred in network should be minimized. Many clustering schemes provide data aggregation capabilities, and as such, the requirement for data aggregation should be carefully considered when selecting a clustering approach.

Data aggregation reduces the number of data transmission thereby improving the energy in WSN. This method is used for faster information delivery, saving the transmission energy, reducing network congestion. The main goal of data aggregation algorithm is to gather and aggregate data in an energy efficient manner so that *network lifetime is enhanced*.

### V.PERFORMANCE EVALUATION

The hardware components are power supply, PIC Micro controller, Zigbee, LCD display, temperature sensor. *PIC Micro Controller:* Programmable input /output peripherals. Programming is also easy when compared to other micro controllers. It consists of RAM, ROM, Timer, A/D converter, counter. The performance of the PIC is very fast



*Power:* The power of each sensor node is derived from a battery

*Zigbee:* It is used for high level communication. It supports large number of nodes .Long battery life.

Source sends the information to the destination through single hop or multihop path .Secondary node is used for all user nodes. If any of the user nodes will failure then automatically secondary node sends the data to server. Shortest path method is not involved. To avoid this node failure, considering the power.

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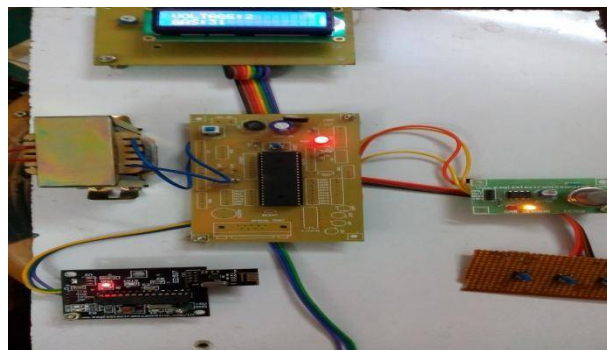
Bandwidth – amount of data that can be transmitted in a fixed amount of time. Jellyfish attack - The nodes that communicate through wireless links. The neighboring nodes that can send and receive data packets.

Each node in the network is free to move in any direction and change its links from one to another frequently



*Transformer:* It converts input voltage to a higher or lower AC voltage. Step down transformer is used.

*Rectifier:* A rectifier is used to convert the transformer output voltage to a varying DC voltage



## VI.CONCLUSION

The paper proposes approach for load balancing in the wireless sensor network. Experiments are planned to be extended for parameters and scenarios like coverage, fault tolerance, impact of aggregation and mobility of nodes. Transfaulty behavior of sensor nodes arises due to temporary fault and interference in communication attributed to radiation effects. The sensing activity of a node may also achieves better energy efficiency and reduced average end-to-end delay compared to the case in which all the sensor nodes get affected due to environmental radiations. This behavior isolates a sensor node from the network temporarily, which increases the information loss in the network. To prevent from information loss and improve the reliability of data acquisition, we proposed ReDAST scheme, which reliably gathers data from the temporarily isolated node in WSN. It achieves better energy efficiency and reduced average end-to-end delay compared to the case in which all the sensor nodes.

## REFERENCES

1. H. Huangshui and Q. Guihe, —Fault management frameworks in wireless sensor networks,| in Proceedings of Intelligent Computation Technology and Automation, vol. 2, Guangdong, China, March 2011, pp. 1093 –1096.
2. I. F. Akyildiz, S. Weilian, Y. Sankarasubramaniam, and E.Cayirci—A Survey on Sensor Networks,| in Communications Magazine, vol. 40, no. 8, November 2002, pp. 102–114.

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Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 5, May 2017

3. K. McCusker and N. E. O'Connor, —Low-energy symmetric key distribution in wireless sensor networks,| IEEE Transactions on Dependable and Secure Computing, vol. 8, no. 3, pp. 363–376, May-June 2011.
4. C. Alippi, G. Anastasi, M. D. Francesco, and M. Roveri, —An adaptive sampling algorithm for effective energy management in wireless sensor networks with energy-hungry sensors,| IEEE Transactions on Instrumentation and Measurement, vol. 59, no. 2, pp. 335–344, February 2010.
5. L. Buttyan, L. Czap, and I. Vajda, —Detection and recovery from pollution attacks in coding-based distributed storage schemes,| IEEE Transactions on Dependable and Secure Computing, vol. 8, no. 6, pp. 824–838, Nov.-Dec 2011.
6. I. Chen, A. P. Speer, and M. Eltoweissy, —Adaptive fault-tolerant qos control algorithms for maximizing system lifetime of query-based wireless sensor networks,| IEEE Transactions on Dependable and Secure Computing, vol. 8, no. 2, pp. 161– 176, March-April 2011.
7. S. Khan, D. Turgut, and L. Boloni, —Bridge protection algorithms – a technique for fault-tolerance in sensor networks,| Ad Hoc Networks (Elsevier), vol. 24, pp. 186 – 199, January 2015.
8. M. Miyazawa, M. Hayashi, and R. Stadler, —vNMF:Distributed fault detection using clustering approach for network function virtualization,| in IFIP/IEEE International Symposium on Integrated Network Management, May 2015, pp. 640–645.
9. C. A. Kamhoua, N. Pissinou, J. Miller, and S. K. Makki,—Mitigating routing misbehavior in multi-hop networks using evolutionary game theory,| in GLOBECOM Workshops on Advances in Communications and Networks, Florida, USA, 2010, pp. 1957–1962.
10. E. Soltanmohammadi, M. Orooji, and M. Naraghi-Pour,—Decentralized hypothesis testing in wireless sensor networks in the presence of misbehaving nodes,| IEEE Transactions on Information Forensics and Security, vol. 8, no. 1, pp. 205–215, 2013.
11. A. R. M. Kamal, C. J. Bleakley, and S. Dobson, —Failure Detection in Wireless Sensor Networks: A Sequence-based Dynamic Approach,| ACM Transactions on Sensor Networks, vol. 10, no. 2, pp. 1–29, January 2014.
12. A. Munir, J. Antoon, and A. R. Gordon, —Modeling and Analysis of Fault Detection and Fault Tolerance in Wireless Sensor Networks,| ACM Transaction on Embedded Computing Systems, vol. 14, no. 1, pp. 1–42, January 2015.
13. T. Vladimirova, C. P. Bridges, G. Prassinou, W. Xiaofeng, K. Sidibeh, D. J. Barnhart, A. H. Jallad, J. R. Paul, V. Lappas, A. Baker, K. Maynard, and R. Magness, —Characterising wireless sensor motes for space applications,| in Proceedings of 2<sup>nd</sup> NASA/ESA Conference on Adaptive Hardware and Systems, Edinburgh, U.K., August 2007, pp. 43–50.
14. G. Dini, M. Pelagatti, and I. M. Savino, —An Algorithm for Reconnecting Wireless Sensor Network Partitions,| in Proceedings of the 5th European conference on Wireless sensor networks, 2008, pp. 253–267.
15. F. Senel, M. F. Younis, and K. Akkaya, —Bio-Inspired Relay Node Placement Heuristics for Repairing Damaged Wireless Sensor Networks,| IEEE Transactions on Vehicular Technology, vol. 60, no. 4, pp. 1835–1848, May 2011.
16. S. Misra, P. Kar, A. Roy, and M. Obaidat, —Existence of Dumb Nodes in Stationary Wireless Sensor Networks,| Journal of S. S. McClure, L. D. Edmonds, R. Mihailovich, A. H. Johnston, P. Alonzo, J. DeNatale, J. Lehman, and C. Yui, —Radiation Effects in Micro-Electromechanical Systems (MEMS): RF Relays,| IEEE Transactions on Nuclear Science, vol. 49, no. 6, pp. 3197–3202, December 2002
17. W. Dargie and C. Poellabauer, Fundamentals of Wireless Sensor Networks, X. Shen and Y. Pan, Eds. John Wiley and Sons, Ltd., 2010.
18. Sampath and D. R. Jeske, —Analysis of signal-to-interference ratio estimation methods for wireless communication systems,| in Proceedings of IEEE International Conference on Communications, vol. 8, Helsinki, Finland, 2001.
19. D. R. Jeske and A. Sampath, —Signal-to-interference-plus-noise ratio estimation for wireless communication systems: Methods and analysis,| Naval Research Logistics, vol. 51, no. 5, pp.720–740, August 2004.
20. Shirsat and B. Bhargava, —Local geometric algorithm for hole boundary detection in sensor networks,| Security and Communication Networks, vol. 4, no. 9, pp. 1003–1012, 2011, DOI:10.1002/sec.271.
21. D. Zorbas, D. Glynos, P. Kotzanikolaou, and C. Douligeris, —Solving Coverage Problems in Wireless Sensor Networks Using Cover Sets,| Ad Hoc Networks, vol. 8, no. 4, pp. 400– 415, 2010.
22. M. Cardei and D. Du, —Improving Wireless Sensor Network Lifetime through Power Aware Organization,| Wireless Networks (Springer), vol. 11, no. 3, pp. 333–340, May 2005.
23. A Secure Data Aggregation Algorithm Based on Behavior Trust in Wireless Sensor Networks Ming-Zheng Zhou, Jin-Sheng Xu, Cheng Zhu Department of Computer Science & Engineering Anhui University of Technology and Science Wuhu, Anhui, 241000, China Laxmi Shrivastava, G.S. Tomar & Sarita Bhadoria, —Secure and Congestion Adaptive Mechanism with Load Balancing forMANETs|, International Journal of Communication Systems and Networks, Vol.1 No.1, pp41-51, Feb 2012
24. I. F. Akyildiz, S. Weilian, Y. Sankarasubramaniam, and E.Cayirci, —A Survey on Sensor Networks,| in Communications Magazine, vol. 40, no. 8, November 2002, pp. 102–114.
25. I. F. Akyildiz, W. Su, Y. Sankara subramaniam, and E. Cayirci, —Wireless Sensor Networks: A Survey,| in Computer Networks, vol. 38, no. 4, 2002, pp. 393–422.