A Reliable and Efficient Technique for Balanced Energy Consumption in Wireless Sensor Networks

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A wireless sensor network (WSN) comprises of thousands of sensor nodes dispersed over a topographical zone. An essential issue of WSNs is to decrease their energy utilization keeping in mind the end goal to improve their life time. Low energy is more essential contrasted with low power for such networks as it will expand lifetime of the network. Thus, minimizing energy utilization turns into the most basic issue in the outline of all WSN protocol. For end-to-end information transmission, media access control (MAC) and routing protocol involved as a vital part in WSNs. In addition, this protocol for the most part uses the hierarchical structure for end-to-end reliable information conveyance. The time and energy required to create a hierarchical structure in a successive way is constantly high. Thus, with a specific end goal to reach the above challenges in such networks, the majority of the energy is devoured when the radios are on, sitting tight for an arrival to happen. Sleep-wake scheduling algorithm is a best method to increase the lifetime of these energy obliged wireless sensor systems. In the proposed methodology I will use suitable algorithm that is parameter based reliable routing(PBRR) for efficient route selection and blowfish algorithm to secure the data furthermore diminishing energy utilization By utilizing above strategies, proposed results ensures in the decreasing of Energy Consumption, Higher the network lifetime, reducing the average delay, and High packet delivery ratio.

Keywords: Energy consumption, PBRR, average delay, network lifetime, routing protocol

I. INTRODUCTION

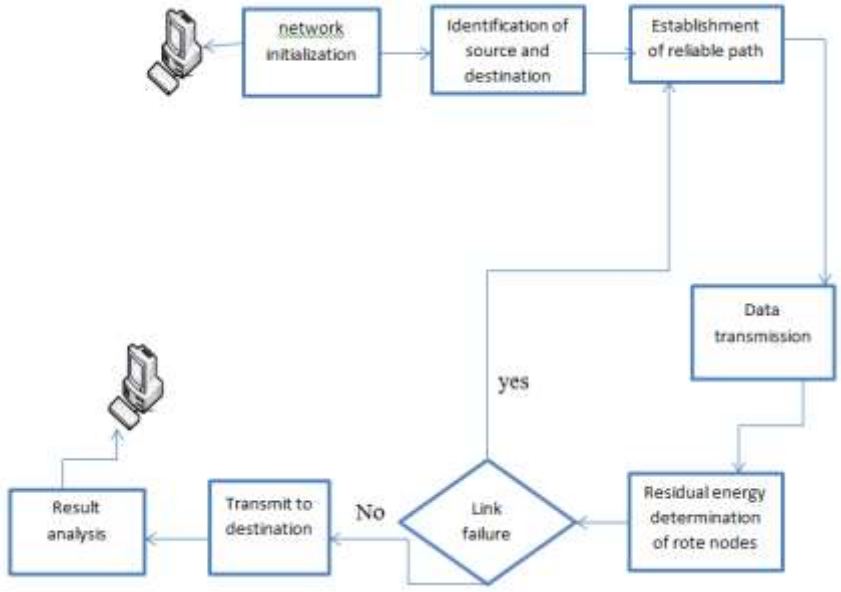
wireless sensor networks (WSNs) have extensive variety of various applications, particularly in civil and military environment. They are normally utilized for periodic observing of environment or detection of arbitrary events. A wireless sensor system (WSN) is comprised of hundreds or a large number of sensor nodes with different detecting devices to monitor events in this present reality over a geographical region. A sensor node comprises of various sorts of sensors, processing unit, memory, and power supply unit. Every node is connected with restricted power supply. Hence during design of any protocols in wireless sensor network decreasing the energy consumption is the major design consideration. Each sensor fueled utilizing battery can keep running for just 100-120 hours and nodes act as a part of dynamic mode. They may be deployed anyplace, i.e, remote, unattended, or antagonistic situations. In these circumstances, it is entirely troublesome and not possible to replace or recharge the battery of sensor nodes. In this therefore, drawing out the life time of WSNs is a critical test. Regardless of the above limitations in WSNs, the information or data transmission from any source to sink must be performed with high throughput. To drag out the life time of sensor nodes alongside keeping up information transmission with high throughput, both MAC and the routing protocols play a critical part in WSNs. Media access control protocols are essentially outlined on top of a tree structure which is normally developed in a centralized manner. The significant downside of the incorporated methodology for constructing these tree structures is that more energy is consumed in the foundation of the tree structure. What's more, the time required to build up such tree structures is additionally very high, which specifically or indirectly effects on the network system life time. All things considered, the principle point of preference of tree structure is that the connectivity among the network is easily maintained through the nodes partaking in the tree structure. So as to conquer the disadvantages of developing the tree in an incorporate way, we propose an efficient routing technique to build the tree structure contingent upon their energy levels in a conveyed way. When contrasted with the sequential approach, the proposed distributed methodology mitigates the energy wastage issue by decreasing the quantity of nodes get chose as internal node and additionally expands the end-to-end information or data delivery. The disseminated approach guarantees that the functionalities of individual sensor nodes can be utilized parallely and also autonomously while developing the tree. The fundamental correspondence in the network relies on the development of the tree structure in a periodic way. So as to save energy in WSNs

II. PROBLEM FORMULATION

There Major Problems in gathering the data sensed by millions of sensors.

1) No appropriate method for optimal path selection
2) The wireless transmission consumes more energy of the sensors during data gathering.
3) Because of end to end data transmission there is a chance of link/ node failure, need to avoid that to reduce delay and prolong network life time.

III. SYSTEM ARCHITECTURE



- Energy consumption
- PDR
- Network lifetime

Figure shows that the block diagram of proposed architecture in that first step is network initialization a sensor network consists of huge number of sensor nodes up to millions of sensors nodes. These sensors nodes are densely deployed. And each sensor nodes has limited power supply, each sensor node has unique ID, The topology and position of the sensor nodes is carefully designed. After the network initialization next step is to identification of source and destination. A network consists of several sensor nodes so it is essential to identify the source and destination nodes to transmit the sensed data to the destination. After identification of source and destination next step is to be establishment of reliable path to transfer the data from source to the destination in this proposed methodology I am using parameter based reliable routing algorithm to establishment of reliable path. This algorithm tries to decrease the number of packets are being dropped out when no energy in the node during the data transmission.

After establishment of reliable path, the received data is to be transmitted towards the destination.in this approach allows less number of sensor nodes to be selected by calculating the distance between the two route sensor nodes within the transmission range of the proposed tree structure which would helpful for transmitting the data from source to the sink node. After residual energy determination of route nodes next step is to finding the link failure if any link failure in between any sensor nodes in a data transmission path then the step goes back to establishment of reliable path then it automatically find out the alternate reliable path towards the destination or if there is no link failure in any part of the network then the data can be transmitted to the destination.so that the expected result must be low energy consumption and higher the packet delivery ratio.(PDR). And low delay as compared to the previous approaches.

IV. PARAMETER BASED RELIABLE ROUTING (PBRR) ALGORITHM

In the proposed system, Parameter Based Reliable Routing (PBRR) algorithm is used to find out the path to the destination based on some Parameters. This algorithm uses a multi-level routing process to reduce the time required to Algorithm is designed to achieve the following objectives as mentioned below:

1) Packet Loss: This algorithm tries to reduce the number of packets being dropped due to No Energy in the node to transmit the packet, or insufficient buffer size to store the packet in the node and forward it to next node.

2) Reduction of hop count: Algorithm tries to reduce the number of hop count, which will in turn reduce the number of nodes the data has to pass through to reach the destination. By achieving the above parameter, we can reduce the energy utilization of the whole network.
3) Packet Error: Is the error that will be introduced in the packet to during transmission to next node.

A. Parameter Based Reliable Routing Algorithm:

It is a multilevel routing algorithm, as the main objectives of this algorithm are the reduction of packet loss and Drop of packet, we select the best quality path of the network for highly reliable data transfer.
In this algorithm we consider the parameters during the selection of path from the source to destination.

1) Hop count.
2) Energy Level.
3) Free Buffer Size.
4) Distance between.

[Optimal route] = algorithm (N, Src, Dst)

1) Step 1 Identification of Source node, Destination node
2) Step 2: Define the transmission Range, Initial Energy
3) Step 3: Apply greedy Method and calculate the distance using Euclidian distance formula

Dist =
In the Euclidean plane, if p = (p1, p2) and q = (q1, q2) then the distance is given by

$$\mathrm{d}(\mathbf{p},\mathbf{q}) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2}.$$

4) Step 4: Calculating and displaying initial energy of the nodes
5) Step 5: calculating node states with highest parameter
6) Step 6: check if the dest lies within the Range? 1:0Update source and destination location
7) Step 7: if destination dist <= transmission range Update the source and routers
8) Step 8: Finding the nodes distance, which are all within the transmission range And update in range Nodes_dist.
9) Step 9: Select the node within transmission range which is near to Destination based on the threshold value

If dist < threshold
Threshold = dist
Src = NextSrc
Goto step5
End

V. BLOWFISH ALGORITHM

Security is the most important challenging aspects in Wireless sensor networks, the solution to protecting the data against the data intruder's is one of the interesting challenge in WSN. Encryption and decryption technique of data by using blowfish algorithm we can easily secure the data in wireless sensor network. Encryption is the procedure to convert the normal text into unreadable format. And decryption is the procedure to convert the encrypted text into the normal text or readable form steps required in customary encryption and decryption modelA sender needs to send a Hello message to recipient .

- The original message, likewise called plaintext, is changed over to random bits known as ciphertext by utilizing a key and an algorithm. The algorithm is being used can deliver a different yield every time it is used, in view of the value of the key.
- The ciphertext is transmitted over the transmission medium.
- At the recipient end, the ciphertext is changed over back to the first content utilizing the same algorithm and key that was utilized to encrypt the message.

VI. PROPOSED SYSTEM

In this paper, I have proposed an appropriated calculation for building a tree structure. This structure would be appropriate for growing just the MAC or steering protocol which are composed on top of any various leveled structure. The proposed structure enhances information unwavering quality amid information exchange from source to sink. Keeping in mind the end goal to give effective energy utilization to WSNs, the proposed approach permits a lesser number nodes to be chosen with the most noteworthy remaining energy as interior nodes of the proposed tree structure which would partake for transmitting the information from any source to sink. In the proposed approach, we accept that the sensor hubs are consistently conveyed, and every sensor node has a remarkable ID and correspondence is symmetric and bidirectional with a set number of assets. The proposed algorithm comprises of the accompanying four stages:

1) Level finding stage,
2) Energy finding stage,
3) And Data Transmission stage.

1) Level Finding Stage:

In this stage, we choose the level of every node relying on their position from the sink. Here, we consider that the sink node has level 0. The nodes which are one jump far from the sink, have level one. Essentially, every node gets its level contingent on the quantity of bounces it is far from the sink node. So as to execute this stage, at the absolute starting point, the sink node is introduced with level zero and alternate nodes are instated with level ∞ (interminability). Initially, the sink node sends a level disclosure message containing its level number to every one of its neighbors. Once a node gets this message from the sink, it sets its level to one. Subsequent to adjusting the level number, every node shows their level revelation message with their own particular level number to their relating neighbors. The neighbors can set their level according to the level number that they have gotten through the level revelation message from the others. A node can upgrade its level number gave the level number that it has gotten ought to be no less than two not as much as its present level number. What it means is that if a node with level number 8 gets a level disclosure message with level number 6, then it can change its level to 7. Despite the fact that we assert that the proposed methodology is conveyed, this level disclosure stage is totally successive. Among all these four stages as specified over, this is the main stage, which is executed just once at the absolute starting point soon after the arrangement. All different stages are executed occasionally which are totally executed in a circulated design. Since the principal stage is executed just once in the entire lifetime of WSN, and the quantity of bundle transmission is not all that high, it would not influence a considerable measure in vitality utilization. Despite the fact that this level disclosure stage is executed just once, there is still a plausibility of progress of level number of every node even after the finishing of the level revelation stage. The adjustment in the level number of a node would happen when a node gets any parcel from its neighbors in some other stages, which are executed occasionally, and the level number that it gets is no less than two not as much as its present level number.

2) Energy Finding Stage:

After level disclosure stage gets over, every node finds broadcasting so as to remain energy of its neighbor a "energy revelation" parcel that comprises of the node ID, level number, and remaining energy. Taking into account the remaining energy data got from the neighbors, every node stores two neighbor nodes data from the same level and two more neighbor nodes data from its quick lower level contingent on the greatest energy of its neighbors. For instance, if a node is available in the nth level, then it stores two neighbors having greatest remaining vitality present in nth level and two more neighbor nodes having most extreme vitality present in $(n-1)$th level. For any node in the system, the neighbor data that a node stores amid this stage will be utilized for choosing the ideal guardian for that specific node.

3) Data Transmission Stage.:

Once every node sets its guardian amid the parent discovery stage, every node might transmit the detected information to the sink through some dynamic nodes or moderate nodes chose in the proposed chain of command. since every node has two parents, at once a node can pick any of its guardian to send its information to the sink. Amid the information transmission stage, picking a guardian node should be possible from numerous points of view. It should be possible in an option way as proposed in [8], or relying on current most noteworthy remaining vitality, and so forth. The determination of these methodologies totally relies on the higher layers necessity. The benifits of keeping two parents at every node is that there will be constantly various ways from source to sink. Also, another favorable position of keeping various guardian is that regardless of the fact that one guardian node goes down, there is still some plausibility of getting away from source to the sink.

VII. RESULTS

In this section, we can evaluate the performance of simulation. We are using the Plot function for evaluate the performance. We choose the three evaluation metrics:

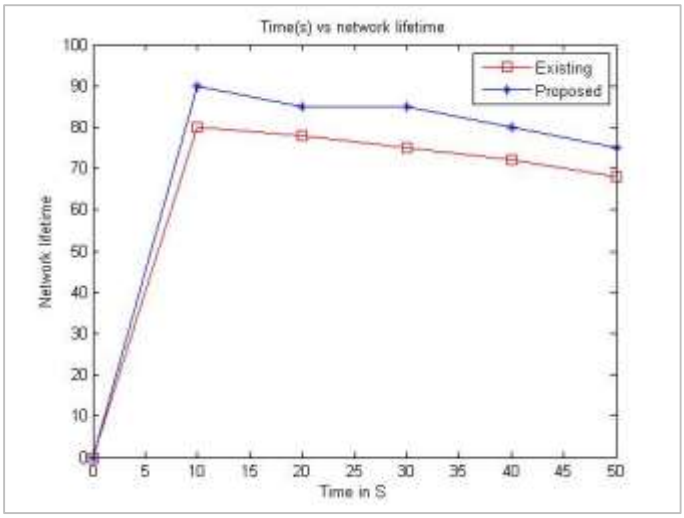


Fig. 1: shows that the network lifetime of proposed methodology and existing methodology

A. Network lifetime:

Figure 1 shows that the network lifetime of proposed methodology and existing methodology. compared to the existing methodology network lifetime of proposed methodology is high, hence the consumption of average energy is low compared to the existing methodology.

B. Power Consumption:

A network consists of communicating nodes. In MANET, these nodes are mobile and there is no fixed topology. The network size is varied form 5 nodes to 25 nodes. The graph shows regularity as energy consumption decreases with increase in number of nodes. This behavior is observed because as network density increases, less power is consumed to transmit data to a nearby neighbor than a faraway node. So multi hop communication needs less transmission power than unihop communication.
The power consumption level of a node at any time of the simulation can be determined by finding the difference between the current energy value EC and initial Energy value Ei. If an energy level of a node reaches zero, it cannot receive or transmit anymore packets. The amount of energy consumption in a node can be printed in the trace file. The energy level of a network can be determined by summing the entire node's energy level in the network. The average Power Consumption of the application traffic n, which is denoted by PC, is obtained as

$$PC = \frac{1}{n}\sum_{i=1}^{n} E_i - E_C$$

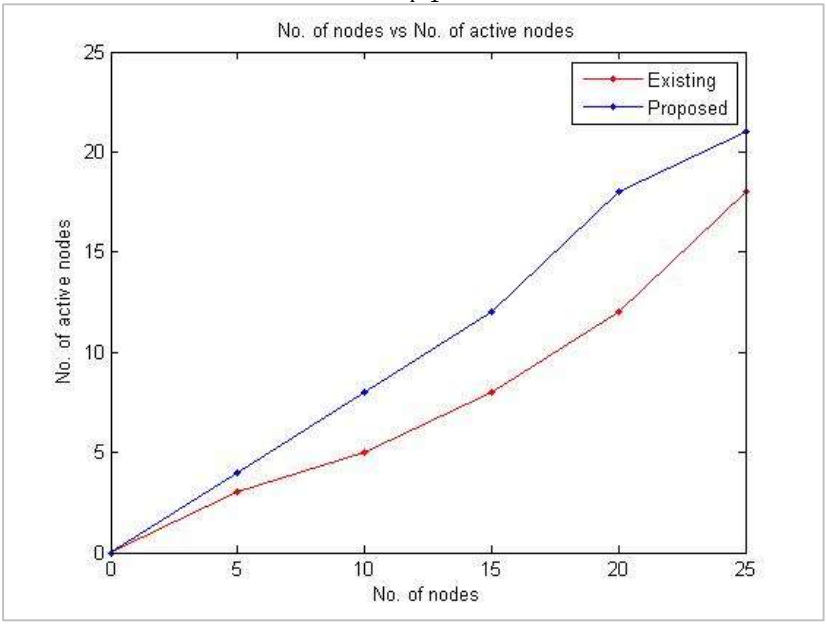


Fig. 2: shows that the number of nodes present in a network versus number of active nodes in proposed methodology and existing methodology

C. Average End-to-End Delay:

This is defined as the average time taken for a packet to be transmitted from the source to the destination. The total delay of packets received by the destination node is dr, and the number of packets received by the destination node is pktdr. The average end-to-end delay of the application traffic n, which is denoted by E, is obtained as,

$$E = \frac{1}{n}\sum_{i=1}^{n} \frac{d_r}{pktd_r}$$

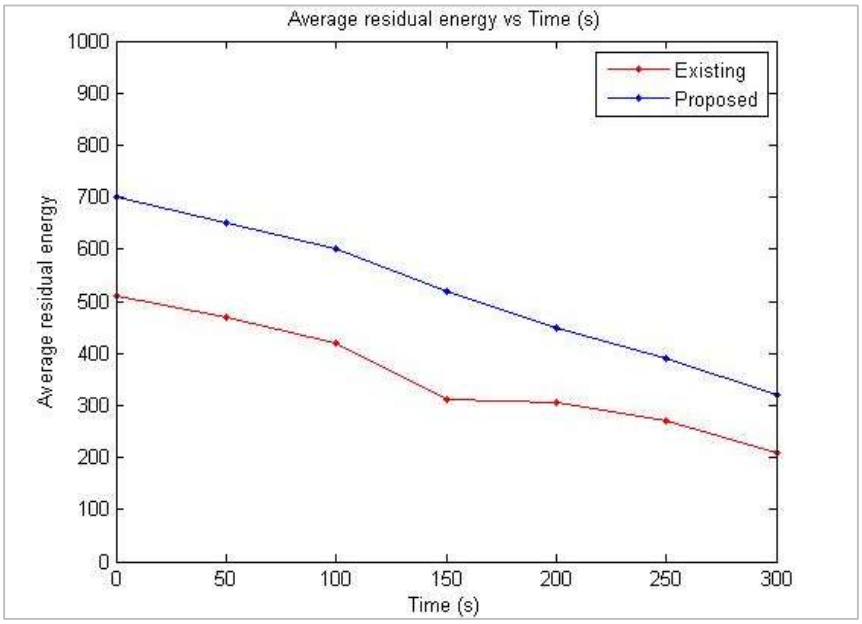


Fig. 3: shows that average residual energy versus time (s) comparing proposed methodology with existing methodology

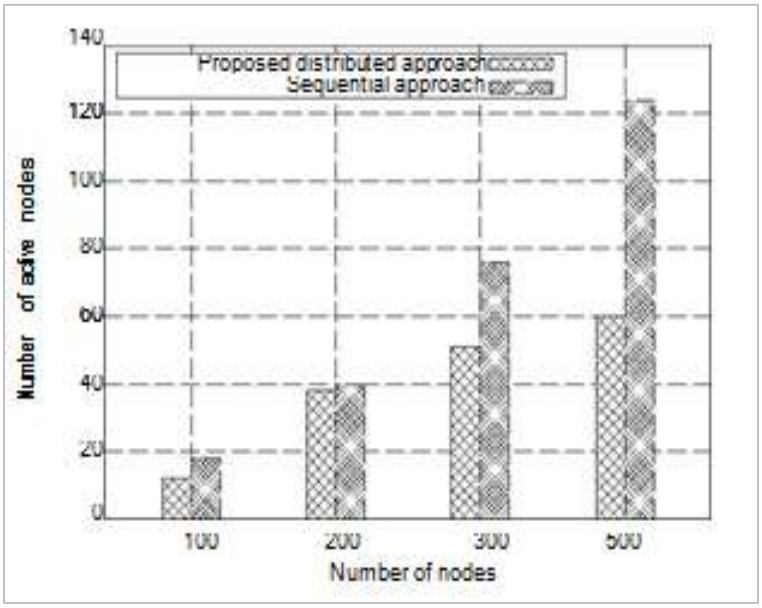


Fig. 4: shows that number of active nodes in average error in proposed approach and in sequential approach.

VIII. CONCLUSION

In this paper, I proposed an approach for building hierarchical leveled structure and a routing protocol on top of the proposed progressive structure that prolongs the lifetime of the wireless sensor network. The proposed PBRR (parameter based reliable routing) algorithm reduce the number of packets being dropped due to No Energy in the node to transmit the packet. the proposed approach is more enough to find out the alternate path when the node failure condition while transmitting the data towards the destination, proposed routing approach is less time consuming compare to the previous sequential approaches and also blowfish algorithm is more enough to secure the data from the intruder's by using encryption and decryption technique

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