Crow Search BEENISH Routing Protocol to Increase the Lifetime and Stability of Nodes in WSN

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Abstract

Routing protocols are utmostneeded for communication between source nodes and sink node, least disruptive & more efficient. The performance of the network and reliability is generally determined by selecting appropriate routing protocol. Since energy consumption has become crucial problem in WSNs, therefore Energy Efficient (EE) routing protocols have been introduced such as balanced energy-efficient network-integrated super heterogeneous (BEENISH), improved-BEENISH and enhanced-BEENISH. Optimization techniques are mandatory for achieving desired goals, minimizing energy depletion and maximizing network's life. The aim of this article is to extend the network's life and stability of sensing nodes through the use of heterogeneity factors such as alive nodes, dead nodes, throughput and average residual energy by using the cross-search based balanced energy efficiency network integrated super heterogeneous(CR-BEENISH) optimization technique.

Keywords

Alive Nodes, Crow Search, Energy Efficiency, Residual Energy, Throughput, Wireless Sensor Networks.

1. Introduction

Routing protocol is a device that sends the data packets towards sink from source are selected accordingly. The path selection is based on type of network. Datadetected by nodes is usually transmitted towards a sink-node, connecting sensor network to the other networks. The task of developing the protocols for WSNs is very difficult due to several characteristics that make them distinct from wireless infrastructure [1, 2].In WSN's there are many major design challenges as shortage of assets such as capacity, bandwidth and handling power [3] The basic elements required for designing new routing protocols by a network engineer are as follows: [4].

- Scalability
- Energy Efficiency
- Complexity
- Delay
- Robustness

In WSNs, the energy consumption of nodes is very critical problem. In order to extend WSN's lifespan and tomaximizenode's energy efficiency, a static clustering algorithm is used to minimize head overhead by sending multi-hop data and splitting the area into multiple areas for reduction of the energy consumption of cluster heads [5, 6, 7, 8].

Optimization is a method to construct an ideal, functionally suitable design. The optimal goals of reducing energy efficiency and optimizing network life are assisted by network optimization. The aims of the projected work are:

1) Performance analysis of Crow Search-based optimized EBEENISH routing protocol.

International Conference on Emerging Technologies: AI, IoT, and CPS for Science & Technology Applications, September 06–07, 2021, NITTTR Chandigarh, India
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2) To compare the proposed (crow search) optimized E-BEENISH performance for number of alive /dead nodes, network lifespan and throughput with the previous work.

2. Crow Search BEENISH to Increase the Lifetime of Nodes

A heterogeneous 4-level network conceptwith alive/dead nodes, advanced, super and ultra-super nodes are used in the CR-BEENISH protocol. The following flowchart indicates the process of choosing cluster head using crow search optimization technique:

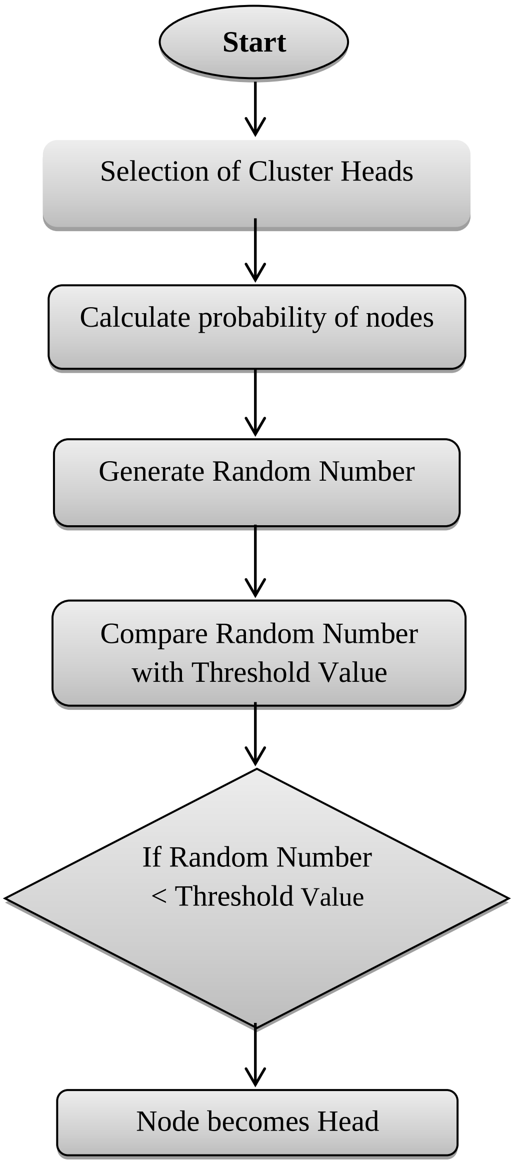

Figure 1: Flowchart for the selection of cluster head (CH) in CR-BEENISH

If a node has determined which cluster it belongs to, the cluster head must notify its status as a cluster node. Each node uses this information to be returned to the head cluster. For this, all CH nodes must retain their recipients. The cluster head node mustmaintain the source to gather all data from the cluster's node set. When the cluster is set up, every round begins with a steady state process where the information is transferred to the Base Station. Then, a heterogeneous four-layered wireless network threshold is described as:

$$T(s_i) = \begin{cases} \frac{Pi}{1-Pi\,(r.mod\,\frac{1}{Pi}} & if\ si\ \in \{S, S', S'', S'''\} \\ 0 & esle \end{cases} \quad (1)$$

Firstly, when a cluster is formed, each node first determines if it is the head of the recent round. The network's current CH percentage (prior determination) is based on this decision and the total CHs assigned to a particular node. If threshold T(si) is more than the random number, the node will becomethe cluster head (CH) of the present round.

The CH is chosen based on the amount of energy send by node to the sink as well as the number of frames. The crow search optimization algorithm works with fusion factor (FF), as depicted in equation 2 only in the current state.

$$FF = \gamma\left(\frac{d0}{Distance\ to\ base\ staion}\right) + \emptyset\left(\frac{Remaining\ energy\ of\ CHs}{Initial\ energy}\right) \quad (2)$$

3. Results and Discussions

The performance of CR-BEENISH protocol is evaluated in thissegment in MATLAB Software. The sensor nodes are randomly deployed having 100m * 100m area (x and y-coordinates) and Base Station (BS) at the center. The proposed CR-BEENISH protocol is compared to current E-BEENISH protocol. The simulation results are given below:

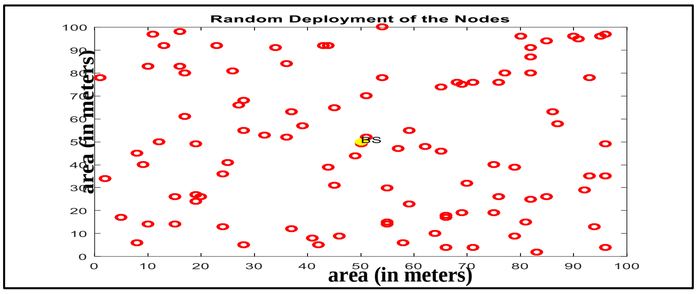

Figure 2: Random Deployment of Nodes

The above figure represents that the sensing nodes are organized randomly in a 100m*100m area including member nodes;cluster heads (CHs) and base station (BS) in the middle or center.

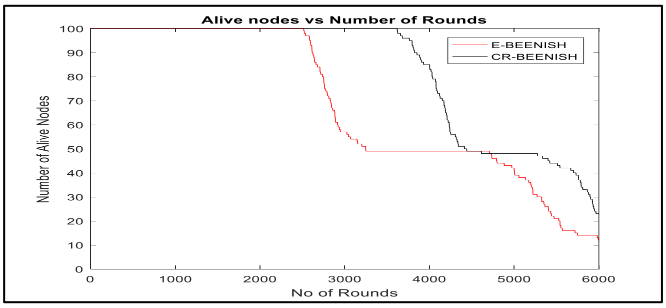

Figure 3:c Alive Nodes versus Number of Rounds

In figure 3, the Enhanced BEENISH protocol clearly shows better performance in the earlyphase, but it decreases gradually as the number of rounds increases. Above simulations show that the performance of proposed CR-BEENISH protocol increases with the given total rounds.

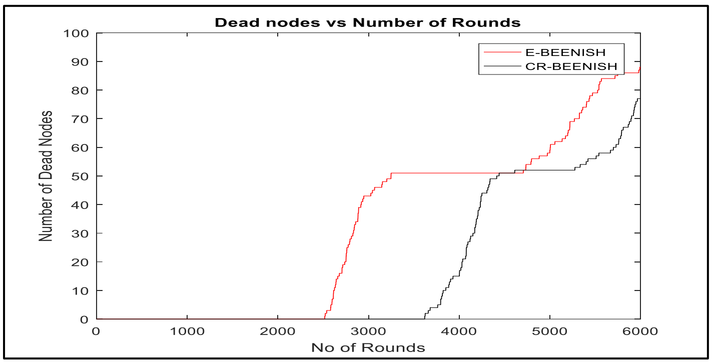

Figure 4: Dead Nodes versus No. of Rounds

From fig. 4, it has been clearly analyzed that the dead nodes have been decreased in CR- BEENISH than the existing E-BEENISH. Hence, the lifetime of the network has been increased.

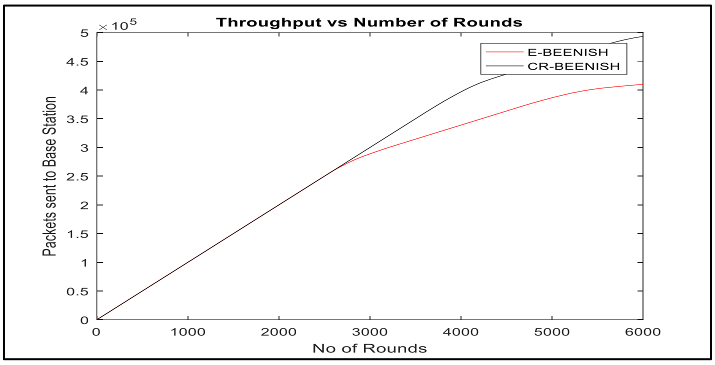

Figure 5: Throughput versus Number of Rounds

Figure 5 depicts the network's aggregate residual energy. The throughput increases as the number of data transmissions decrease, where throughput is defined as thenumber of packets successfully transmitted to the total packets transmitted.The more efficient the algorithm, the more accurate it will be.

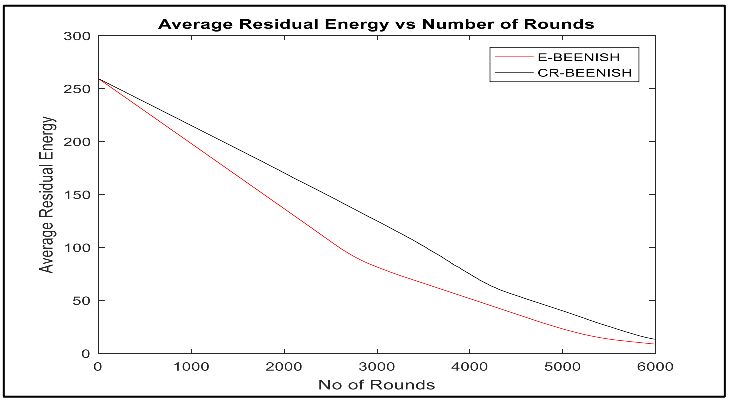

Figure 6: Residual Energy versus Number of Rounds

The results of the average left behind energy for the existing (E-BEENISH) and proposed (CR-BEENISH) approaches are shown in figure6. This clearly shows that the existing technique has steeper drops in average residual energy than the proposed algorithm, where steeper drops indicate faster energy depletion.

4. Conclusion

The proposed CR-BEENISH uses multi-hop communication while the previous method (E-BEENISH) uses single-hop communication. The numerical results indicate that the algorithm exceeds the network lifetime,average residual energy and throughput. In addition, by selecting parameters carefully, for the proposed protocol, the life cycle can be extended further. Finally, more improvement in performance can enhance the CR-BEENISH adaptability.

5. References

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