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Load Balancing Technique in Body Area Network by Utilization of Smart Node

Jatinder Singh[1*], Navjeet Saini[2], Sandeep Kaur[3]

[1]Department of Computer Science, SSGI, Amritsar, Punjab, India
[2]Department of Computer Science, SSCET, Pathankot, Punjab, India
[3]Department of Computer Science, SSGI, Amritsar, Punjab, India

**Corresponding Author: bal.com75@gmail.com*

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Abstract— There are many techniques used to enhance the network life time each depends upon the number of nodes deployed, a parent node, path followed, energy of the nodes and the forward nodes. The selection of forward node is based on cost equation, the total load to this node is maximum and there is a chance of path loss because the distance between the nodes is in feet which may cause data loss. In this paper we proposed model having a forwarder node, which selection is based on cost function and two fixed data transfer nodes. The purpose is to implement the concept of multilevel, multi-hop and a smart node which divides the load and helps to smooth transfer of data with high stability. The major benefit of this new designed methodology is to increase the network life time by enhancing the throughput, by minimizing the path loss or data loss and maximum packet delivering to the sink.

Keywords— WBAN, Forward node, cluster Head, Energy consumption, lifetime,Hetrogenous Sensors Network.

I. INTRODUCTION

Wireless body sensor network also called body area network is an emerging technology in wireless sensor network which has a great importance in medical application. The origin of WBAN was early started in 1975, after then number of number of wearable devices are developed and are used to monitor the activities on human body ranging from simple pulse monitoring to expensive sensors. These devices are used to detect the some chronicle diseases like asthma, heart attack, blood pressure, diabetes etc. A typical body area network kit can encompass sensors, a Processor, a transceiver and battery. The function of these sensors are to monitor the human body activities by collecting particular data depending upon the node type, and then send the collected data to the sink. To accomplish it some protocol are used in that body area network. The network protocol used should have to increase the network life time by enhancing the throughput, by minimizing the path loss or data loss, maximum packet delivering to the sink. There are many techniques used to enhance the network life time each depends upon the number of nodes deployed, a parent node, path followed, energy of the nodes and forward nodes. The selection of the forwarder nodes is based on cost equation having minimum distance from the sink and maximum energy. In this paper we proposed model having a forwarder node, which is based on cost function, two fixed direct data transfer nodes to sink and concept of advanced nodes. The purpose is to implement the concept of multilevel multi-hop and a smart node which divides the load and helps to smooth transfer of data with high stability.

The objectives of the work is to design and simulate the proposed approach for achieving the minimum energy consumption with minimum path loss and maximum network stability using multilevel multi-hop with a forwarder node and a smart node.

The major benefit of this new designed methodology is to increase the network life time by enhancing the throughput, by minimizing the path loss or data loss and maximum packet delivering to the sink.

II. RELATED WORK

The paper titled "Multilevel Multi-Hop Technique for more than one Forward Node to increase the Stability of Wireless Body Sensor Networks" defined the heterogeneous model for the deployment of sensor nodes on human body. This paper mentioned the architecture composes of 8 nodes and a sink planted on different parts of human body, the node on the upper part of the body called EGC node and node 7 called GLUCOSE node is fixed[1], 4 nodes are deployed on lower parts of body, and two on wrist as shown in figure 1.

The working of this model is in phases with multilevel multihop scheme for the selection of some advance nodes called forward nodes [1] planted on lower part of body as shown in figure 1. This helps to reduce path loss and to increase throughput by implementing two forwarding nodes on each side of lower part of body[1]. The distance between nodes are measured in feet's which is quite difficult to enhance the performance of small area, to accomplish this we can use distance in meters by implementing smart node.

In phase first the location of the sink and sensor nodes are defined in deployed network.

In second phase the multilevel multihop scheme is used for the selection of forwarder nodes based on cost function. Which divides the load among two forwarder nodes[1][2].

$$C.F(i) = \frac{d(i)}{R.E(i)}$$

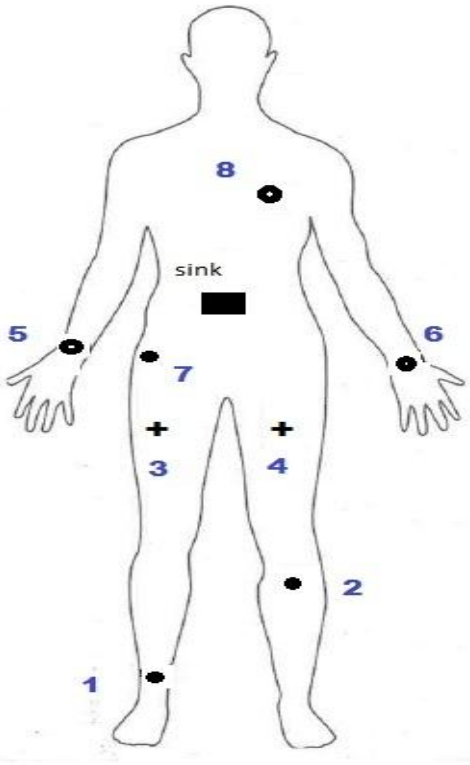

Figure 1. Deployment Model [1]

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III. METHODOLOGY

The proposed model is designed having 9 sensor nodes in a Heterogeneous mode and a sink which is deployed at the waist, some nodes are deployed at upper part of body and some at lower part of the body. Node 8 is ECG node and Node 7 is Glucose node which are fixed as shown in figure 2.

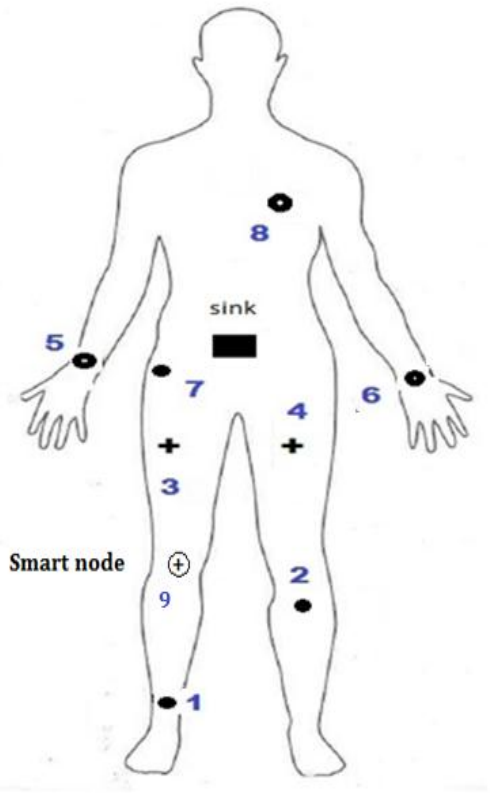

Figure 2. Proposed Deployment Model

1) The selection of the Forward node or forwarder node is based on cost function.

$$C.F(i) = \frac{d(i)}{R.E(i)}$$

2) Node 3 and node 4 are called advance nodes.
3) Glucose node 7 & ECG node 8 are direct nodes called direct data transfer nodes.
4) Node 9 deployed below the sink are called smart node.
5) All the other nodes called normal nodes sends data to the forwarder node, SINK or smart node on the basis of distance i,e closest node.
6) Forward node can also send the data either to smart node or SINk on the basis of distance.

The different performance parameters calculated to increase the performance of network are:

7) *Network lifetime:* This parameter defines the time during till last node dies. This is the key factor to keep the nodes alive.
8) *Throughtput:* To transfer all the data packets during communication without loss is another challenge for a protocol. This parameter defines the total number of packets dilivered sucessfully.
9) *Stability Period:* This defined the time period of the network untill first node in the network dies.

10)Path loss: To keep the power of tramsmiting node and receiving node same is the key factor for any protocol, this defines the loss of the network power of transmiiting and receiving node.

11)Residual Energy: It defines the consumotion of the node energy during each round. So minimum consumption of energy of node keeps the node alive for maximum time.

IV. RESULTS AND DISCUSSION

To implement the proposed method MATLAB is used as test bed to obtain the objectives of proposed work. The performance parameters, number of Dead nodes, packet received at CH (cluster head), here forwarder node play the role of CH, packet received at Sink, Path Loss and residual energy are calculated by comparing them with previous methods or previous base paper results[1].

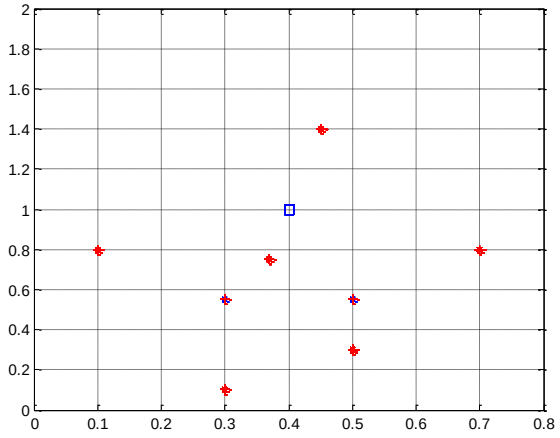

Figure 3. Network Model Layout

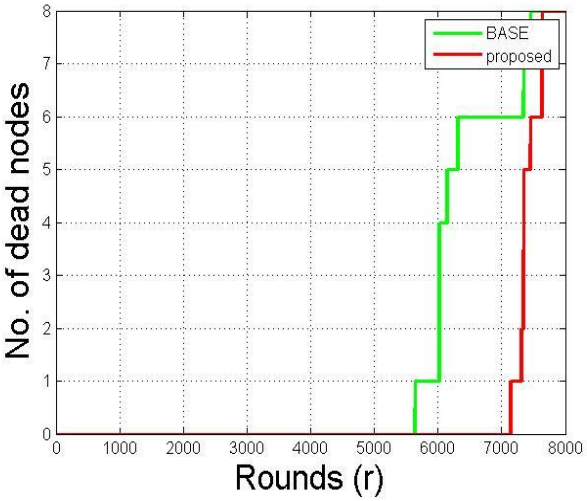

Figure 4. Analysis of Network Lifetime

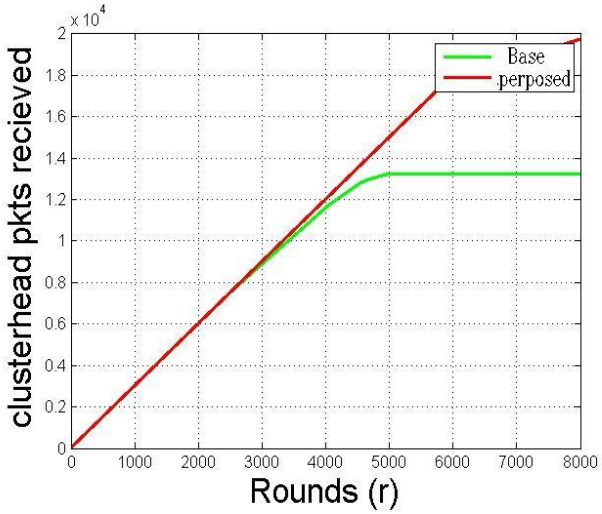

Figure 5. Performance of Forwarder nodes

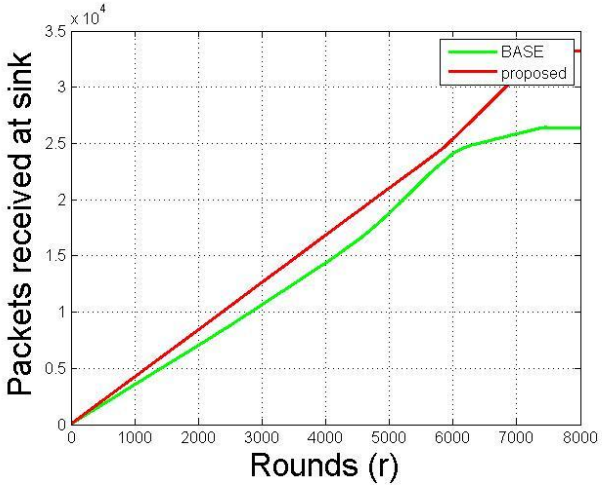

Figure 6. Analysis of Throughput

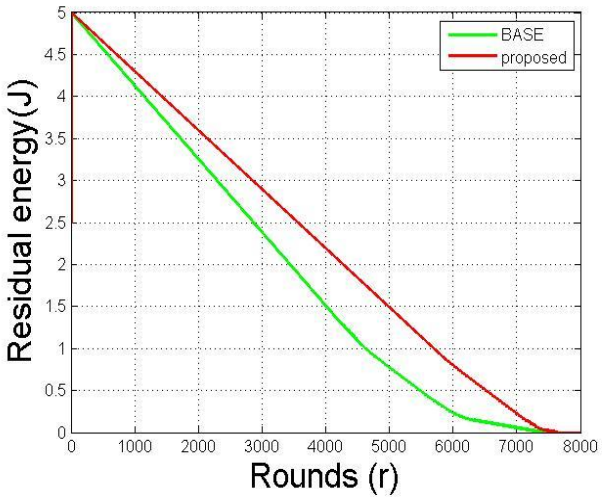

Figure 7. Analysis of Remaining Energy

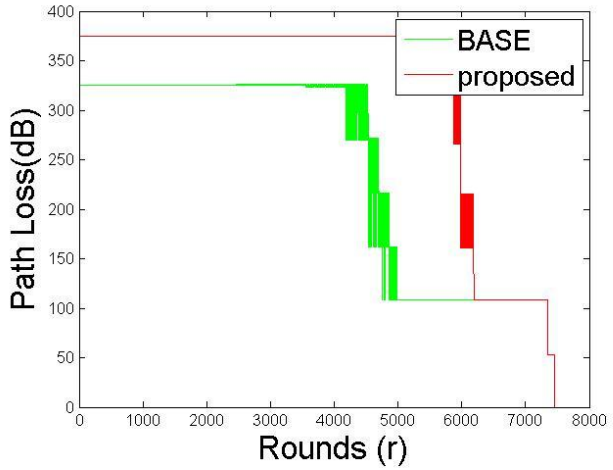

Figure 8. Analysis of Pathloss

V. CONCLUSION

By implementing the concept of multilevel multihop and the smart node, which divides the load and helps to smooth transfer of data with high stability. The major benefit of this new designed methodology is that it increases the network life time by enhancing the throughput, by minimizing the path loss or data loss and maximum packet delivering to the sink. In future, it will help to implement the movement of hands and legs of human for further improvement.

ACKNOWLEDGMENT

The above contents and survey we mentioned is true to my knowledge.

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Authors Profile

Mr. Jatinder Singh is pursuing M Tech in computer science from Punjab Technical University. He is working on Body Sensor Networks and her main focus is to impliment the concept of smart node to minimize the dataloss of Wireless Body Sensor Networks.

Mr Navjeet Saini pursed Bachelor of Engineering and Master of technology from Punjab technical University. He has worked as Assistant Professor in Department of Computer Science, SSCET Pathankot. He has published many research papers in reputed international journals. His main research work focuses on wireless sensor network. He has teaching experience and more than 3 years of Research experience.

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Mrs Sandeep Kaur pursed Bachelor of Engineering and Master of technology from Punjab technical University. She is working as Head of Department in Department of Computer Science, SSGI Amritsar Punjab. He has published many research papers in reputed international journals. His main research work focuses on wireless sensor network. He has many years of teaching experience and Research experience.

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