Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 6, Issue, 03, pp.5946-5949, March, 2014

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

ENERGY BALANCING ROUTING PROTOCOL FOR WIRELESS SENSOR NETWORKS

***Prof. M. S. Chaudhari, Amol Medhane, Sandip Sonar and Abhaysinh Patil**

Department of Computer Engineering, Sinhgad Institute of Technology, Lonavala, Maharashtra, India

ARTICLE INFO

Article History:
Received 20th December, 2013
Received in revised form
18th January, 2014
Accepted 14th February, 2014
Published online 31st March, 2014

Key words:
Sensor network,
Energy balanced network,
To reduce high cost of transmission,
Fault tolerance.

ABSTRACT

Energy has always been an issue since Wireless Sensors came into existence (WSN). Any of the WSN systems consist of number of small and low cost sensor nodes. These sensor nodes powered by small batteries. Usually, for many applications, once WSN is deployed in such areas where human cannot reach on daily basis. Sensors gather required data and send to the sink node. As WSN works on batteries there is need of system which preserve the energy and balanced the overall usage of network. This system offers Energy optimization by using various technologies like load balancing, Sleep scheduling.

INTRODUCTION

A Wireless Sensor Network (WSN) consists of hundreds or thousands of sensor nodes equipped with various sensing devices to observe events in the real world. Sensor nodes usually communicate among themselves seamlessly using wireless media only. Also they are usually depends on small battery, and therefore have limited energy. Besides each sensor node has limited computation power and memory again due to same constrain that is the available supply of energy. The major function of WSNs is to observe and record events in the environment and report them to the sink node if necessary. In the process, the sink node may also need to broadcast messages to each node of the WSN, and sensor nodes may need to communicate with each other as well. Wireless sensor network are usually deployed, possibly in extreme conditions such as mountainous region, and left unattended to function for long time. In order to prolong the network life, it is necessary to minimize the consumption of energy by individual nodes. In addition, it is also necessary to ensure that the average rate of consumption of energy by each node is also the same. This would ensure that the connectivity needed to transmit data from a sensor node to sink can always be maintained

Worry 1: If data transmission is done on same path as it is a shortest path, network is not optimized

Worry 2: If traffic causes on a node bottleneck can be happened on that node.

Worry 3: In case of load distribution must be done on the basis of battery attribute.

In general the aforementioned worries can be summarized into three requirements namely

1) Network optimization,
2) Load distribution and
3) Shortest path.

Network optimization refers to the terms like network flow, shortest path problem, transport problem, critical path problem. All such things should able to handle by a system. Critical path issues occur when a most traffic happens at a single node at that time bottleneck can be happened. Solution for bottleneck problems is to find alternative path for a transmission. When to find another path it is important to find a path with low-cost. For finding shortest path with minimum cost algorithm like dijkstra can be used.

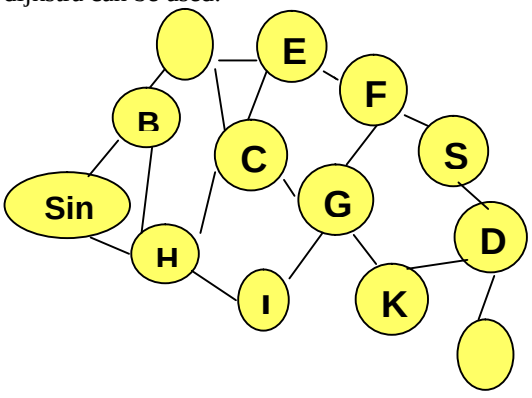

Figure 1. Basic network

Corresponding author: Prof. M. S. Chaudhari,
Department of Computer Engineering, Sinhgad Institute of Technology, Lonavala, Maharashtra, India.

Consider this is a basic wireless sensor network. in this every nodes has to communicate with sink node when it sense some activity. Suppose 'C' wants to send data to sink node so 'C' node has a shortest path which is through H node but when WSN comes in a scenario along with shortest path we have to consider a battery level of each and every node. So in this case H have very low battery level so instead of sending through H only as it is shortest have to find another alternative efficient path. Another path which is C-Z-B-SINK has a full battery usage left, so that must be utilized for transmission. Because of this load distribution can be easily implement. This helps to prolong the lifetime of entire network.

Proposed system

This system is proposed to work as on following methodology

1) We are going to develop the project in java simulator. In which we are developing a virtual network of WSN. The concern network will contain dynamic no of node there will know any kind of limitation on no of node in the network.
2) Ones we have created the network we have to define the packet forwarding policy and routing methodology.
3) Our paper proposes on enhanced protocol for it by using sleep wake cycle of the node.
4) Node will broadcast the packet in regular protocol. It search list of neighboring node using the geographical neighbor.
5) After getting the list it will check for status of the node i.e. sleep or wake. If it is wake then it will got selected for forwarding array and if sleep then it will check waiting time to wake the node.
6) After applying the threshold it will select the node at largest distance and minimum wait time and will forward the packet to the final selected node.
7) We will get the result as maximum hope count, max time required, delay time etc.

Working Mechanism

This works as follows: We first construct a broadcast tree, during construction of tree following things must be ensured for minimize the energy consumption during construction of tree.

1) Broadcast should be as minimum as possible
2) There should be two paths from each node of a tree to the sink node of tree to achieve fault tolerance.

After constructing tree, each node of tree must be identical whether it is internal node or leaf node of a tree. A node wishing to make transmission should initialize a path having highest remaining energy. While sending from that node the nodes which are comes under utilization, kept on and other nodes must be goes under sleep to preserve the energy. Because of this balance between entire networks can be achieved.

For sleep scheduling consist of following:

1) Construction of a broadcast tree must be done at the beginning of a every time period
2) Transmission of data from source to sink node whenever required.

We use dijkstra algorithm to find shortest path from each node to sink node from that we construct broadcast tree.
Each node store ID's of two parent node or neighboring node along with least cost path. Those node which are directly reachable from sink node have both parent node set to the sink node. Each node also stores its ID and its remaining energy. For an algorithm following variables are used

CFi,1=value of first cost field of node i
CFi,2=value of second cost field of node i
PFi,1=value of first parent field of node i
PFi,2=value of second parent field of node i
Ni=i'th node
REi=Remaining energy of Ni
Ci=1/REi=each node cost added to the path

Now let see in a brief how actually this algorithm works
Broadcast tree construction of routing protocol for WSN consist of two phase.

In the first phase the sink node broadcast an advertisement message ADV1.Upon the receiving of ADV1 message, each node wireless sensor network executes the algorithm of first phase. Store the parent field so the least cost path to sink node are store. After completion of first phase sink node broadcast the second advertise message i.e. ADV2 message. When all the nodes receives the ADV2 message each node in the wireless sensor network executes the phase2 algorithm. Then set the second parent field with the least cost path.

ADV message have following parameters
ADV1=(Ni,CFi,1,PFi,1),ADV2=(Ni,CFi,1)

This algorithm constructs the initial tree as given in first phase of algorithm and performs following task.
At the beginning of first phase each node except sink node sets it's both the cost field to infinity and parent field to -1 and at beginning no changes to parent field.
Then sink node sets it's both the cost field to 0 and sets its cost field with its own id.
At the beginning of this stage sink node broadcast ADV1 message but it don't broadcast its own ADV1 message. Before sending ADV1 message to its neighbors following steps are must be executed.

1) When a node receives ADV1 message it immediately sets a timer
2) If the msg comes from sink node, then the node stores sink node ID in 2 PF node and then it computes new cost.
3) Again new msg comes from neighbor then again computation of new cost field

Now let's see the algorithm. Algorithm works in 2 states as follows.
Stage1:
begin
CFj,1 = CFj,2 = ∞;
if*(First period)* then
PFj,1 = PFj,2 = −1;

end
isActive = isBroadcasted = false;
timerFlag = RESET;
while*(node j receive* ADV 1(Ni,CFi,1, PFi,1) *message from node i)* do
if*(timerFlag = RESET)* then
Set backoff timer to ;
timerFlag = SET;
end
if*(isBroadcasted=false)* then
if*(*Ni *is sink)* then
CFj,1 = CFj,2 = CFi,1 + Cj ;
PFj,1 = PFj,2 = Ni;
else if *((*PFj,1 *is sink* and CFj,1 = ∞*)* or *(*PFj,1*is not sink))* then
if*((*CFi,1 + Cj) < CFj,1*)* then
CFj,1 = CFj,2 = CFi,1 + Cj ;
PFj,1 = PFj,2 = Ni;
end
end
else
if*((*Nj = PFi,1*))* then
is Active=true;
end
end
if*(Backoff timer expire* and *is Broadcasted=false)* then
is Broadcasted=true;
Broadcast ADV 1(Nj ,CFj,1, PFj,1) message;
end
if*(Construction phase completed)* then
Break;
end
end
if *(isActive)* then
Nj is an internal node;
else
Nj is a leaf node;
end
end

After completion of this state 1 of this protocol state 2 does the following task

1) If the any node receives the ADV2 msg from sink node then it computes the new cost. The new cost is computed by adding its remaining energy to the received cost after that it sets 2 cost field to the new cost field and store the sink node id to the both PF
2) If the PF of the node and receiving node are equal, then it store new cost value that we were computed in state1 and do the same as above.
3) If both PF of receiving node are unequal then it compares new cost with cost store in second CF, then it stores new computed CF in second CF and do the same as done above i.e. storing of id part.

Second stage of a protocol:

begin
timer Flag = RESET; is Transmitted = false;
while*(node j receives* ADV 2(Ni,CFi,1) *message from node i)* do
if*(timerFlag = RESET)* then
Set backoff timer to;
timerFlag = SET;
end
if*((*PFj,1 = Ni*)* or *(*PFj,1 *is sink))* then
Discard ADV 2 message;
else
if*(*Ni *is sink)* then
CFj,1 = CFj,2 = CFi,1 + Cj ;
PFj,1 = PFj,2 = Ni;
else if *((*PFj,1 = PFj,2) or
*((*PFj,16= PFj,2*)* and
*((*CFi,1 + Cj) < CFj,2*)))* then
CFj,2 = CFi,1 + Cj ;
PFj,2 = Ni;
end
end
if*((isTransmitted = false)* and *(*Nj*is an internal node))* then
isTransmitted=true;
Broadcast ADV 2(Nj ,CFj,1) message;
end
if*(Backoff timer expire)* then
Break;
end
end
if*(*Nj*is a leaf node)* then
Nj goes to sleep mode;
end
end

Simulation and Result

This makes a completion of a protocol with 2 stages. Upon this protocol i.e. An Energy Balancing Routing Protocol For WSN make some simulations they are as follows

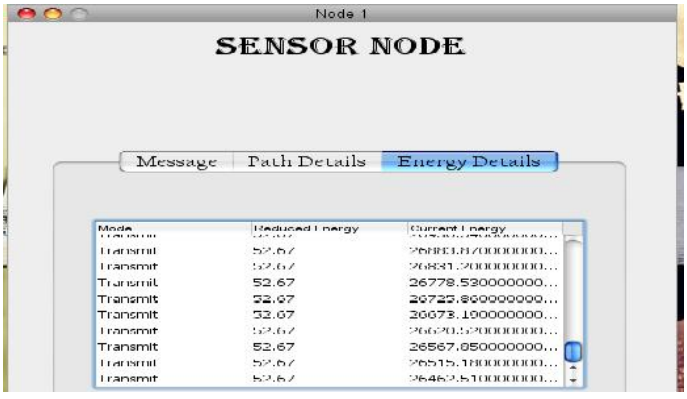

Figure 2. All the nodes with their energy

Figure 2 shows when the path is even a shortest but energy level of that path is minimum then alternate path is chosen for data transmission and energy is balanced among all nodes to achieve longer lifetime of a WSN.

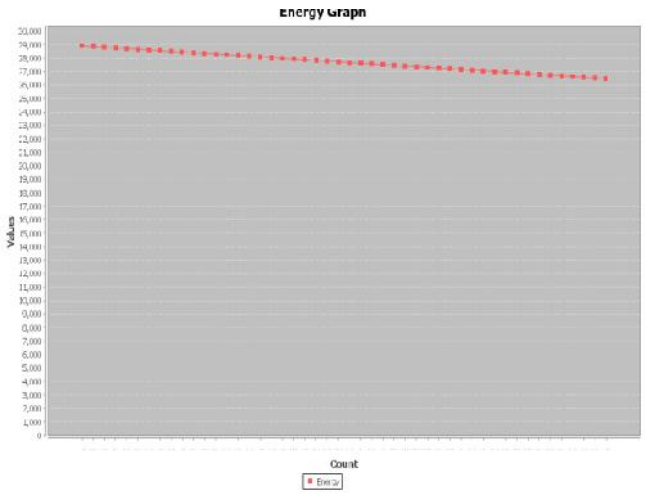

Figure 3. Energy GRAPH Of nodes

Conclusion and Future Work

In this we have presented how energy of each node is preserved and how network is balanced means how the load distribution of energy is done. In this we also concluded how the lifetime of network can be achieved using this Energy Balancing Routing Protocol for WSN. For enhancing in future the next possible change that can be done is providing the mobile alerts in case of node failure. This will make the system fault tolerant. This is done by using Intrusion Detection System that finds out whether any failure occurred at any of the node in the network, allowing the user to know the location of the fault thus helping to make the system fault tolerant.

REFERENCES

Chakchouk, N., B. Hamdaoui, and M. Frikha, "Wcds-induced routing for data-aggregation in wireless sensor networks," in Communications and Networking, 2009. ComNet 2009. *First* International Conference on, Nov. 2009, pp. 1–6.

Choi S.-C., S.-L. Gong, and J.-W. Lee, "An average velocitybased routing protocol with low end-to-end delay for wireles sensor networks," Communications Letters, IEEE, vol. 13,no. 8, pp. 621–623, August 2009.

Hou X. and D. Tipper, "Gossip-based sleep protocol (gsp) for energy efficient routing in wireless ad hoc networks," in Wireless Communications and Networking Conference, *2004.*WCNC. 2004 IEEE, vol. 3, March 2004, pp. 1305–1310.

Wang L. and Y. Xiao, "A survey of energy-efficient scheduling mechanisms in sensor networks," Mob.Netw. Appl., vol. 11, no. 5, pp. 723–740, 2006.

www.wikipedia.org

Zamalloa N., Marco Z´u K. Seada, B. Krishnamachari, and A. Helmy, "Efficient geographic routing over lossy links in wireless sensor networks," ACM Trans. Sen. Netw., vol. 4, no. 3, pp. 1–33, 2008.

****