IJCSN International Journal of Computer Science and Network, Volume 3, Issue 3,June 2014 **Impact Factor – 0.274**
ISSN (Online) : 2277-5420
www.IJCSN.org

A New WSN Scheme Benefited with Low Cost and Power Efficiency

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Abstract - The Preserving energy or battery power in Wireless Sensor Network is a major concern, as battery capacity is very limited. A node can transmit data to a longer distance if it has sufficient energy level. It had been researched that the power required to transmit data from source to destination is directly proportional to the distance between nodes. So, in order to transmit data we have to find optimal path with optimal power conservation methodology. This work is aim to reduce power conservation for routing in Wireless Sensor Network using Dijkstra's algorithm with set of optimal path and available nodes, threshold value of nodes is assumed to be 50% of maximum energy of nodes. The innovative idea in proposed work is to check the sleeping and awaked nodes, which is necessary in order to reduce data loss.

Keywords - *Wireless sensor network, Dijkstra's algorithm, Optimal Path, Sleeping and Awake nodes*

1. Introduction

Wireless sensor networks are a trend of the past few years, and they involve deploying a large number of small nodes. Sensors in the Wireless Sensor Networks mainly use batteries. Very often these batteries are non- rechargeable or non-replaceable due to the geographical location of those sensors. Therefore, energy preservation of sensor nodes is a crucial issue to reduce the quick exhaustion of the energy of sensor nodes and thereby to prolong the overall network lifetime. The limited resources of the sensor nodes need to be spent judicially so that it requires the minimum energy for this energy-consuming task. Therefore the battery power required to transmit the data from source to destination may also vary since the power consumed is directly proportional to the distance between the source and destination. A node can easily transmit data to a distant node, if it has sufficient battery power. A large battery power is required to transmit the data to a node which is situated too far from source node. After few transmissions a node reaches to its threshold battery level and it may exclude from network path. After some time all the nodes may not be available during data transmission and the overall life time of the network may decrease. Routing is a process of determining a path between source and destination upon request of data transmission. In WSNs the network layer is mostly used to implement the routing of the incoming data. It is known that generally in multi-hop networks the source node cannot reach the sink directly. So, intermediate sensor nodes have to relay their packets. The implementation of routing tables gives the solution. These contain the lists of node option for any given packet destination. Routing table is the task of the routing algorithm along with the help of the routing protocol for their construction and maintenance. An efficient routing technique is required to design a network in a way to efficiently utilize the energy of nodes to prolong the lifetime of the network. Since communication consume significant amount of battery power, sensor nodes should spend as little energy as possible when receiving and transmitting data.

This work aims to reduce power conservation in Wireless Sensor Network using Dijkstra's algorithm with set of optimal path and available nodes Threshold power value of nodes have been assumed to be 50% of the maximum power of nodes . The innovative idea in proposed work is to check the sleeping and awaked nodes, which is necessary in order to reduce data loss.

2. Related Work

In [1] proposed Dijkstra's algorithm that was used to find the routes between anchors. This paper proposes a Dijkstra's algorithm using the network connectivity information and the estimated distance information among the sensor nodes and find out the shortest path between the source node and destination node with low cost. **In[2]** proposed a sleep/wake schedule protocol for minimizing end-to-end delay for event driven multi-hop

wireless sensor networks. the proposed scheme reduces end-to-end delay and maximizes the throughput by minimizing the congestion at nodes having heavy traffic load .The proposed protocol has significantly reduced the end-to-end delay, as well as has improved the other QoS parameters, like average energy per packet, average delay, packet loss ratio, throughput, and coverage lifetime.**In[3]** proposed an energy efficient technique based on graph theory that can be used to find out minimum path based on some defined conditions from a source node to the destination node. Initially, a sensor area is divided into number of levels by a base station based on signal strength. **In[4]** proposed Dijkstra algorithm to find optimal power path in the sensor network environment using concept of idle nodes in order to minimize total energy consumption. **In[5]** Proposed Localized quality of service (QoS) routing that use global network state information to make routing decisions. To achieve good routing performance, localized QoS routing must effectively select the predetermined set of candidate paths. The effective path selection algorithm must consider various factors, including path length and load balancing in the whole network.

3. Proposed Work

3.1 Basic Concepts

Energy and efficiency are always the main concern in wireless sensor network. A mobile network contains huge amount of data transmission over the network. Because of this it is there are more chances of data loss over the network .The work is defined in same area, to propose an algorithm to get the efficiency as well as the reliability. The main advantage of this algorithm lies in its simplicity. Main aim is just to reduce power consumption, to reduce data loss ratio and to find optimal path between the source and destination.

There may be different paths which are available between the source and destination but all of them may not yield the shortest power consumption. Hence a set of nodes should be selected such that they form a path from source to destination and this is the optimal power consumed path. All the nodes in the wireless sensor network are battery operated and the life time of the network is depends upon the available battery good routing performance, localized QoS routing must effectively select the predetermined set of candidate paths. The effective path selection algorithm must consider various factors, including path length and load balancing in the whole network.

3.1.1. Power of a Node

A node after data transmission may reach to a threshold level. If the battery power of a node reaches to threshold value, then node is not in position to either accept the data or send the data to other nodes in the network All nodes start with the same initial transmission power .The nodes have minimum energy called Threshold value below which it cannot transmit data .The sender node checks the nearest suitable node which could further transmit the data. If the receiving node is having energy less than the threshold value then the sender node will not send data to that node, instead it will broadcast a message to all the nearest suitable nodes, the nodes will then reply to that message about their energy level and the node which is more suitable based on its threshold value and Snbr will be selected for further transmission to the next suitable node till destination node. Assuming threshold value of power of nodes is 50% of initial maximum value of the nodes in WSN.

3.1.2. Dijkstra's algorithm

The **Dijkstra's algorithm** calculates the shortest path between two points on a network using a graph made up of nodes and edges. Cost of each node will be calculated according to Snbr .The algorithm divides the nodes into two sets: tentative and permanent. It chooses nodes, makes them tentative, examines them, and if they pass the criteria, makes them permanent.

3.1.3. Sleep/Awake Nodes

The sleep and wakeup concept can be implemented in a Wireless environment. Here source and destination are assumed to be currently active nodes. Whenever, all the nodes are identified according to Dijkstra algorithm to be a part of an optimal power consumed path, a wakeup signal can be send by the source node to make the node aware that it has to switch from inactive or sleeping mode to the active mode. Once the data transmission is over, these nodes can go off to a sleep mode.

The proposed work firstly calculate Snbr(cost of communication between nodes) of each node based on that only Dijkstra algorithm selects the most suitable path between source and destination having least cost. After that threshold value of power of each node is calculated and node which have insufficient power that is have power less than the threshold value is not considered suitable for optimal path and then another alternate node with less Snbr is considered and before data transfer a

wakeup signal is send to all participating nodes in optimal path.

3.2. Algorithm

The algorithm is initially divided into 2 phases:-

3.2.1.Phase 1 (Finding Optimal Path)

STEP 1:Calculate Snbr (cost of communication) for each sensor node

STEP 2:let sender and base station as R1 and R2

STEP 3:Make R1 permanent, label it as P and Assign a cost of 0 to this node

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STEP 4:Examine each neighbor node of the node that was the last permanent node.

STEP 5:Make each neighbor of last permanent node as tentative node and insert them into list if they are already not in list.

STEP 6 :Find the node with the smallest Snbr cost and mark it as permanent. Go to step no 4 till destination node is reached.

3.2.2. Phase 2 (Transmission Policy)

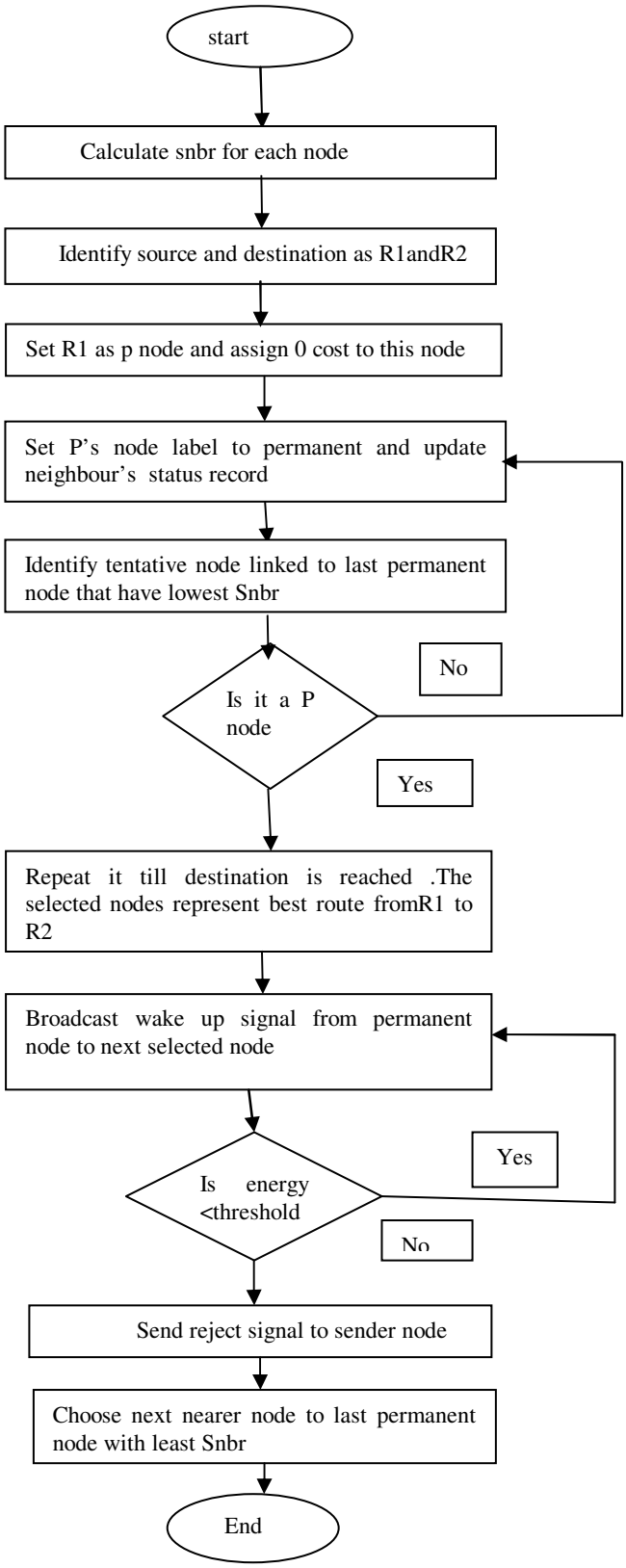
STEP 1:If next node is not base station then give awake signal to this node

STEP 2:sensor node is getting awake signal then it compare if its energy < threshold value then Send reject signal to sender node

STEP 3:else accept data go to step no 1 of phase 2

STEP 4:Sender sensor node after getting reject signal and will choose the nearest neighbor with least Snbr excluding node which had sent reject signal go to step no 4 of phase 1.

STEP 5:Repeat step 1 of transmission policy till base station is reached.



4. Conclusion

This paper basically focuses to decrease the energy consumption of nodes and to increase network lifetime. Here basically an algorithm is proposed to find a set a of optimal path to reduce power consumption .A wake up signal is send to the selected nodes of the optimal path to reduce data loss. The main advantage of this algorithm lies in its simplicity and battery life of nodes gets increased to great extend.

5. Future Scope

More work can be carried out when the number of nodes increases in the network. Also to find an alternate path when multiple dead nodes or nodes which are been select for optimal path having power lower than threshold value comes in the selected path.

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