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Energy Efficient Dynamic Routing in Wireless Sensor Networks

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ABSTRACT

This paper uses light-weight tree-shaped protocol to handle energy consumption by sensor nodes in Wireless Sensor Nodes (WSNs). The main aim is to improve the life span of the network by increasing energy consumption. In order to resolve routing problems associated with mobile stations in infrastructural networks, the proposed network routing protocol is used. The protocol is so developed that the access to the whole mobile sensor node is avoided by a centralized router or mobile base station. Various results compared to traditional energy efficient algorithms are being tested in the evaluation of the proposed method. The results demonstrate the efficacy of the algorithm proposed against traditional WSN routing algorithms.

Key words: Energy Efficiency, Routing mechanism, Sensor Nodes, WSN.

1. INTRODUCTION

The field points have been allocated randomly since the advent of WSN. Cost of wiring between monitoring station and sensing station conventionally is directly proportional to the distance and maintenance costs. Moreover, due to such wired corrections the complexity of the system increases.

The integration of sensors via a wireless medium has recently improved to a higher level. WSN's main objective is to obligatorily transfer information between the network and the base station, or vice versa. The base station is where information is collected via a link from sensor nodes or sensing sites. This is further analyzed using an algorithm for decision-making. In various applications, the WSN plays a vital role, gathering data, monitoring them and analyzing them from different spatially deployed sensor nodes. In addition, the WSN design comprises several algorithms for the clustering and routing processes [1] [2] to reduce energy consumption.

The energy consumption in the sensor hubs with battery is an important challenge in WSN design. The energy consumption at different protocol stacks can be seen as an improvement in WSN. As the majority of sensor node data is powered by batteries, the limits are even extended to its resources and the ability to acquire data. Consequently, it is not possible to further reduce energy by such sensor nodes. The waste of energy from sensor nodes is often related to the detection of the channel. In addition, energy wastage is the responsibility for packet collisions if the same nodes send packets across the same channel. The other reason for extra energy consumption is its overhead and overhead channel or control.

Different techniques are applied in order to enhance WSN energy performance [3]–[18]. These techniques discuss strategies to enhance node life in WSN. With an increased network life, they achieve better energy efficiency in WSN. Nevertheless, the technique used above uses the same techniques used in conventional literature more or less. The life of the network is significantly less time consuming and transmitting the messages. The proposed method is to use tree-based dynamic mechanism to improve network life with a higher energy efficiency in order to resolve such limitations.

The proposed system therefore uses an improved routing protocol to deal with energy consumption limitations by sensor nodes. This protocol contributes to the efficient use of energy between clusters. The selection of cluster heads, data transmission and data routing is based on parameters such as sensor nodes ' residual energy and their distance between other nodes and so on. The approach is to detect the routing process via tree diagram over the entire network using the Destination Directed Acyclic Graph (DDAG). Similar to the remote vector approach, routing is first resolved using links prior to use of the routes or links, and the method uses table driven routing approach. Therefore, all node entries documented in routing table are kept in a minimal way by memory requirements.

The main contribution is the design of a light-weighted method of routing in order to support mobile sensor nodes for data routing via a formed infrastructural access station. In addition, the problem of routing is solved with this protocol without the participation of a base station.

2. PROPOSED METHOD

In this research, the best efforts can be made to make the use of demand-driven and table-driven routing. The research proposed is designed to solve routing problems and uses a DDAG Tree Diagram discovery process. DDAG is a routing method based on the table that solves the routing in established connections, similar to the remote vector approach. The routing table is used in a minimal manner to prevent all data from the sensor node from being saved. The sensor nodes have to be added into the network by broadcasting and the parent node or cluster head is found. The other nodes that belong to the network also know how many nodes within the clusters are linked to. Figure 1 shows the variable that is stored inside a single node.

Only the cluster head or the node with high power is connected to the network initialization. The linked nodes are called intermediate nodes or infant nodes, and the cluster head is considered to be parents of another hop level. Figure 1 gives a large center circle to the node to which it joins. This node is closer to or from the base station and has a number of other relative child nodes.

2.1 Cluster Formation

The nodes are randomly deployed within the network and the batter nodes are powered to send or receive messages. As a parent node or as the cluster head, i.e. node with higher energy value, the highest energy node will also be selected. All children nodes receive their Id from the parent node. When Id is received through non-cluster head nodes, the signal strengths received are compared and the distance from the cluster head is estimated. This helps the child node to bind to the neighboring parent node or cluster head.

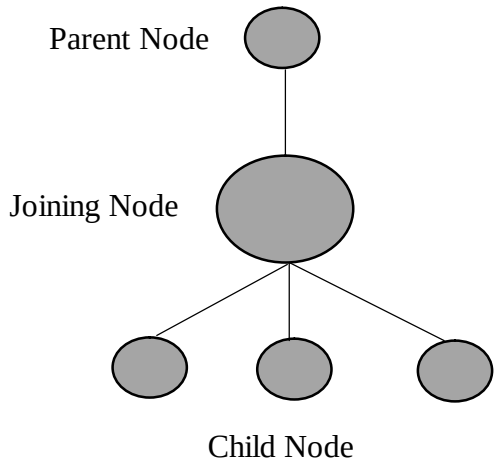

Figure 1: Topology of node

For node access, the routing protocol selected for node access is the RPL protocol. This is done with a hand shaking mechanism in three directions. The node to connect to the network sends a broadcast network per period to every node and listens to the responses via back-off times. The possible cluster head or the nearest head accepts the broadcast and unicasts at the node address. The time offset helps to avoid transmitting from other routers and a router metric, i.e. a unicast router to the connection node, selects the target function to be further estimated.

The fitness function objective or router is divided into the following part. In parent fitness and parent array, the fitness and address of the router is stored. After the reverse time is established by the joining node, all possible parents are taken into account on the basis of the requested response and thus the most suitable base station can be found. Finally, a unicast message is used to inform the parent node that was chosen by the joining node. This node has updated its hop to the sink and parent while another child is added by the base station or the parent node and therefore the child list updates the connecting node. One node between two potential parents is represented.

With healing over a broken link, the same procedure is repeated. As the node is moved in the network and it is susceptible to severe obstacles, there are space-temporal changes. For all knots other than sink or base station, the resolution process during routing is the same. Data collection and processing are carried out on the base sink or sink node and no leaf nodes are present. The node without a child node can be provided at any time for balancing network load as a base station. The problem is often linked to the ability of the node to determine the broken link across this theoretical protocol.

Traffic to or from the basic station to the target node can either be down or upstream. This is a WSN cloud node or a multi-hop node with a topology mechanism for a tree. Both sensor data and messages to devices are usually control message or control signal sent to the base stations or sinks that calibrate the nodes of the sensor. The upstream data messages find the connection status for the DDAG method. If the node does not fall within the network, the gateway node and all child nodes will send a node breakdown message, so that the node is disconnected from the base station and other child nodes.

2.2 Routing Loops

The broken link leads to a cure mechanism problem and is linked to the previous section. The routing problem leads to isolated sub networks, which damage the network by sending

a message in loops. This results in the drainage of battery power and in dynamic WSNs this is very often a problem. This is because the end of the DDAG branch changes to either DDAG's top or center. Therefore the concept of a long node chain is used as a route where the hop closest to the base stations or sink is interrupted. The dynamic network features make the parent node heal by finding its tail node.

The single link routing loops are avoided if the parent node is removed from the new node. This helps prevent the two nodes which support each other's network needs. More complex circuits such as triangles or sq. or hour glass form, or polygonal loops, with increasing nodes, however, are formed.

The bigger nodes in the lower network are loop-size and therefore the solution forms the loop for all nodes. The routing loop between two nodes is thus avoided. Therefore a solution is reached via a unique network identity and is used to test this identity with the nearest base station address. The technique does not play the part of the base station nodes because the nodes are dynamic. A new parent node is part of the WSN cluster's parallel tree branch with the same unique identifier at times. The solution to the counter routing loop is to force the child of the parent to send out a disconnected message and to have it rejoined.

Non-resolving long chains lead to improved network inefficiency, and the efficiency of forced disconnections is further reduced. In addition, network efficiency is improved through the establishment of new connections. The loops are detected and the node is checked to see whether the message is passed from child to child. Such an approach is considered to consume electricity because it uses short messages to be transmitted via the nodes. The use of a short disconnection message is however considered as effective as a branch message that cannot reach the base station node. This is because power is lost or the network connection has been lost through the unidentified routing loop.

2.3 Data Transmission

The sensed data is broadcast at this stage by a node with a non-cluster heading, i.e. a cluster head Id. Once complete information is received from the child node, the cluster head aggregates and transfers data upstream through the cluster head. Cluster heads, on the other hand, add chain-like data collected from children's and downstream parent nodes and forward data to the next node. This process continues to the sink.

3. EVALUATION AND DISCUSSIONS

In the simulator NS2.34, which generates sensor nodes with a battery module, the proposed method is simulated. Dual radio [10] is used to design the sensor nodes of various different layers, and application layers are designed to allow regular data transmission. The whole nodes of WSN can be static or dynamic and the protocol regularly awakens the nodes by broadcasting message from the head of the cluster.

The scenario simulates 24 sensor nodes across a surface of 1000 X 1000 m^2. Four nodes with higher energy are given to act as cluster heads at the initial stage. The sink node is placed from the source nodes at the closest position.

Initially, a broadcast message was sent by the high energy nodes. The sensor nodes set the cluster head on the basis of the highest energy from all four nodes and set the most likely cluster head with highest energy. The identification for the cluster head is therefore assigned and defined as destination node for the transmission of packets and the formation of cluster is therefore established. This approach uses a simple path loss model to simulate the whole scenario and path is developed with the proposed algorithm using a chain creation method, however, it is similar to the flooding mechanism adding hops.

A correct destination Id shall be broadcast by the non-cluster head when the data is delivered. The respective cluster header receives the destination I d and transfers the aggregated message after a certain interval between the other cluster heads.

Therefore, the power of transmission is decreased with the above conditions and mainly in the cluster heads. For all three conditions the non-cluster head node is set at the 0.25mW threshold transmission level. All scenarios are tested with conventional methods for the proposed routing mechanism. Figure 2 illustrates the energy consumption between the proposed and conventional methods. Figure 3 shows the lifespan of the cluster head between the proposed and conventional methods. The results show that the life of the network has increased as energy use has decreased. Due to the tree-based mechanism of the proposed method, node time has decreased considerably than other routing protocols. Furthermore, the observation can also be concluded that the data aggregation mechanism through the cluster head results in high energy consumption as compared to traditional methods in which the cluster head is directly connected to sink nodes. Finally, in Figure 4, the network output is displayed. The results show that the dual-powered system offers higher network performance than the other methods.

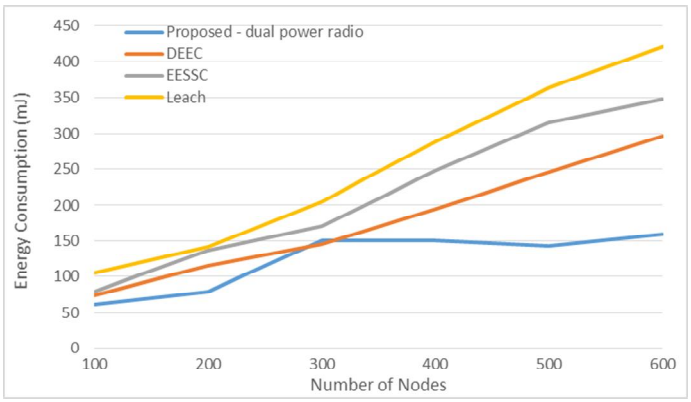

Figure 2: Energy consumption

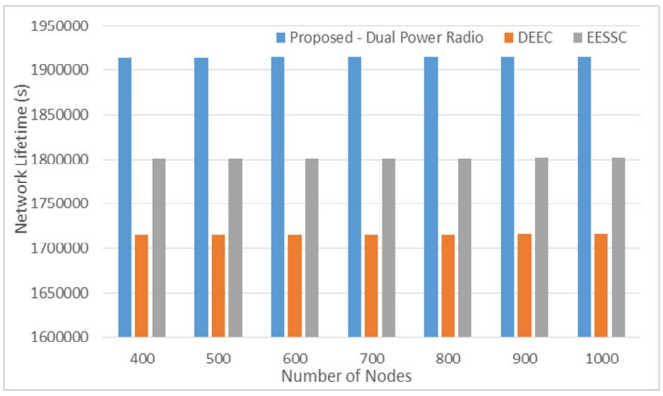

Figure 3: Network lifetime

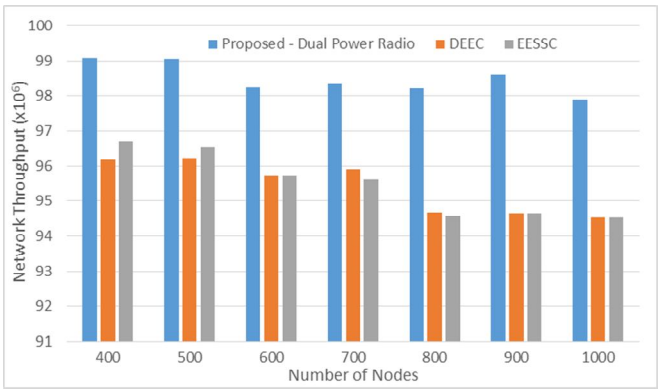

Figure 4: Network throughput

4. CONCLUSION

The purpose of this document is to reduce energy consumption in the sensor nodes by means of a dynamic routing protocol with light weighted tree shape. This mechanism is meant to form roads and then supply data from source to sink nodes. The aggregation of data in the tree structure proposed contributes to a possible energy reduction. Furthermore, tree-shaped dual radio structure reduces energy calculation and increases network life. In addition, test simulation results can be tested with field tests in larger network comparisons to better validate them.

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