

An Expansion Cluster Routing Algorithm based on RSSI for An Efficient Data Transmission

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Abstract— in this paper, we are propose the RSSI cluster routing method for multi-hop data transmission. The proposed the RSSI cluster routing method be generate the cluster a random to between nodes of similar positions using the RSSI of each node to the sink node in the cluster-based wireless sensor network. And it is to the data transmission to the sink node to the multi-hop through header decision. In this paper, efficiency test results of proposed RSSI cluster routing method was reduced energy consumption when increase the size and traffic in the sensors network by compared with LEACH protocol.

Keywords— Cluster, Routing, Multi-hop, Forwarding, RSSI, LEACH, DDACM

I. INTRODUCTION

WSN (Wireless Sensor Network) is a network for the data communicating by placing sensor nodes of a plurality to a particular area and configure the network. However, because lightweight and small size, it was transmit/receive to the data using the limited energy by due to as the impossibility characteristics that can't the battery replace or charge. And it have been studied a cluster-based sensor network routing method by considering the energy consumption. [1].

The representative hierarchical routing protocol based on clustering is LEACH (Low-Energy Adaptive Clustering Hierarchy), TEEN (Threshold sensitive Energy Efficient sensor Network protocol), and APTEEN (Adaptive Periodic Threshold-sensitive Energy Efficient Sensor Network Protocol) etc. The LEACH protocol is a hierarchical method for distribute evenly to energy assignment to the sensor node. In a general clustering algorithm, if any node is selected as the cluster head then increases the energy consumption by receive the data from all the nodes in the cluster. And the cluster head node is reduced performance by happen failure in a short period of time. If the previous sensing data and the current sensing data same, there is a problem in that unnecessary energy consumption by sent to the cluster header. In addition, because the cluster header is selected by probability, the energy consumption is increased when the member node to transmit data. [1-3].

In this paper, we are propose a cluster routing algorithm based on RSSI (Received Signal Strength Indication) for an energy efficient multi-hop data forwarding than existing LEACH cluster algorithm for to solve the problems such as

forwarding problems and headers selection. In this paper, we were analysis about LEACH for verified to the effectiveness of the RSSI-based cluster routing algorithm. And were conduct to the comparative experiment by analysing the energy consumption according to a round increase as focused of the LEACH clustering algorithm and the proposed RSSI-based cluster routing algorithm.

II. AN EXPANSION CLUSTER ROUTING ALGORITHM

The RSSI cluster routing method for multi-hop data transmission proposed in this paper is the routing method for a multi-hop transmission using the sensor nodes for reduce power consumption and extend the lifetime of the sensor network. And it create a small cluster nodes between near node using the RSSI of the sensor node so that the member node do not transport data to header far away as geographically by selecting a random header, was used method of selecting the header into internal of the cluster. Figure 1 depicts an RSSI-based cluster routing algorithm.

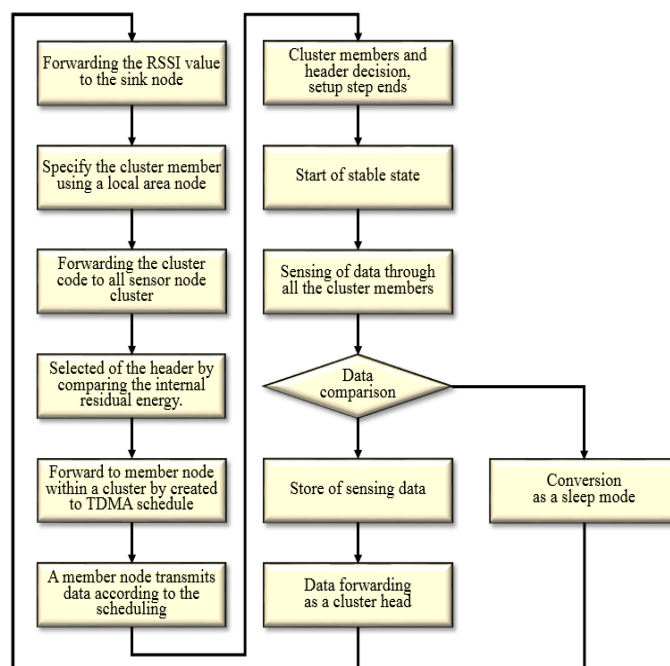


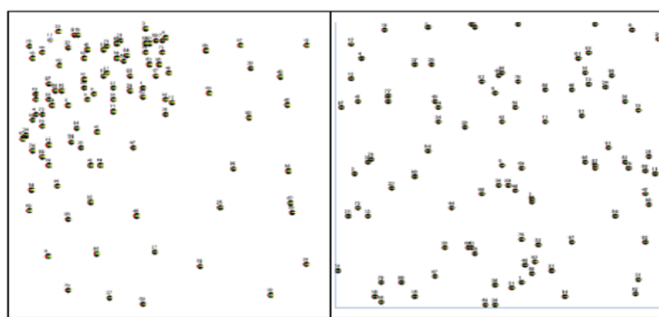
Figure 1. An expansion cluster routing algorithm

All sensor nodes that are in the field for created of the clustered are forwarding the RSSI values from the sensor node to the sink node. And the sink node is specifying the cluster on a small scale using geographically near nodes through receives the RSSI values of all the sensor nodes. The sink node transmits the cluster code assigned to the cluster to all sensor nodes. Sensor node is receives a code from the sink node, the specified nodes as cluster select a header by comparing the residual energy from the inside. The header is forwarding a schedule to member node of inside the cluster by create a TDMA-based scheduling of a member node, and the cluster member nodes in the transmitting process is transmits the sensed data according to schedule. The cluster members and the header are determined, and the member nodes of all cluster is maintain a stable condition that data transmission is possible when you exit the set-up phase. The cluster routing algorithm is sensing data for sending to the header through the member nodes into all cluster to solve the data de-duplication reception problems with LEACH. Data obtained by starting sensing at the first time is transmitted to the CH with store in the memory of the sensor node. As followed, the sensing data in the sensor node is subjected to comparison process with the previous data. At this time, if equal or trash value, member node is reducing the energy consumption by switching to sleep mode without going through the data storage process. Otherwise, the sensing data is store to the memory, and it transmits data as the cluster header.

III. EXPERIMENTAL RESULTS

In this paper, were used MATLAB for efficiency verification of the proposed RSSI-based cluster routing algorithm. Experimental conditions were arrangement using any arrangement method that the sensor nodes of 50 is has energy initial value 100, and it was set up to confirm the energy consumption by until 30 round to increase the round for process of energy reduction.

Figure 2 shows the experimental environment of densely (a) and random placement (b) that node used at an existing algorithm.



(a) Dense placement (b) Random placement

Figure 2. Node placement experimental environment

Figure 3 shows the experimental environment of random node placement for simulation in progress. In this paper, all nodes were judged as random placement, and it were used random placement technique. The simulation was performed

by reducing the number of node, because the number of nodes was not required to many nodes that clustered of small amount nodes geographically near.



Figure 3. An arbitrary placement experimental environment

Figure 4 and Figure 5 shows energy consumption comparison of each round when applying DDACM and LEACH, the proposed RSSI cluster routing method. The dotted line is LEACH graph, and the solid line is DDACM graph. The Y axis of the graph indicates the energy consumption, and the X axis has been represented to 25 rounds. In 5, 6, 14, 19, 25 rounds, the DDACM protocol was less the energy consumption than proposed method. In 5, 6, 14, 19, 25 rounds, the DDACM protocol was less the energy consumption than proposed method, but in the other rounds, proposed method was less energy was consumed.

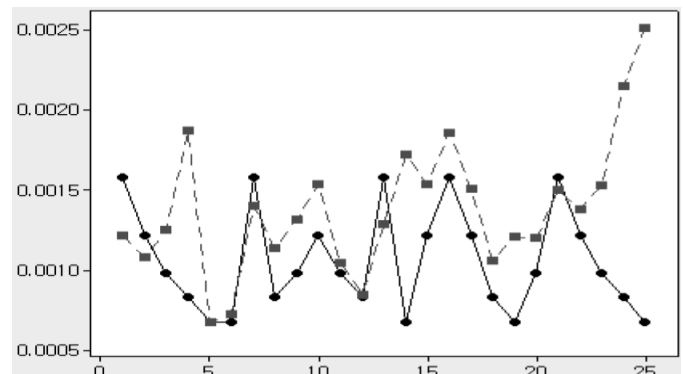


Figure 4. Apply of LEACH and DDACM

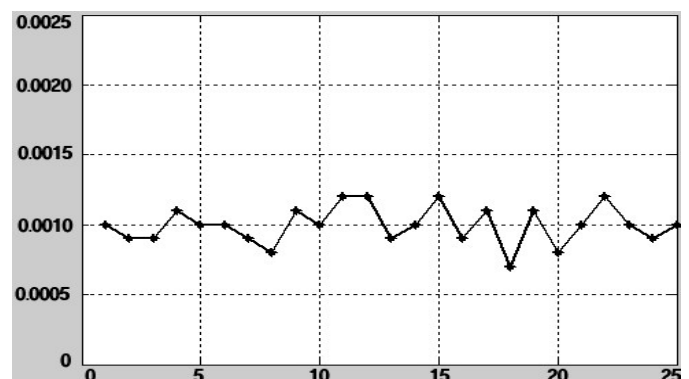


Figure 5. RSSI cluster routing method

Figure 6 and Figure 7 shows a comparison of energy consumption according to a round increase of method of existing LEACH and DDACM, and the cluster routing algorithm proposed in this paper. As the result of the simulation in randomly placement situation of a sensor node, the cluster routing algorithm reached 0.025J on 25 rounds. But the existing LEACH and DDACM method are reached 0.025J on each 20, 23 round. As a result, the proposed method than method of existing LEACH and DDACM are could be obtained result that the energy consumption of about the 2-5 rounds is reduced.

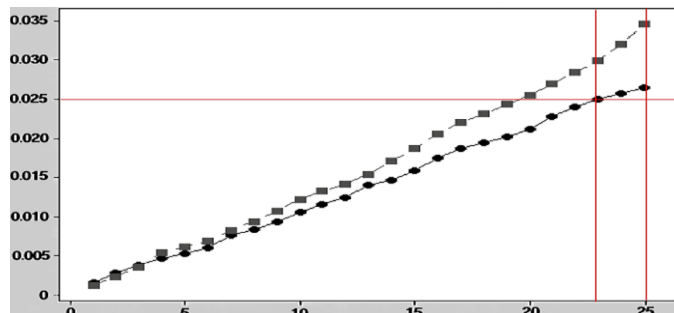


Figure 6. Energy consumption of LEACH and DDACM

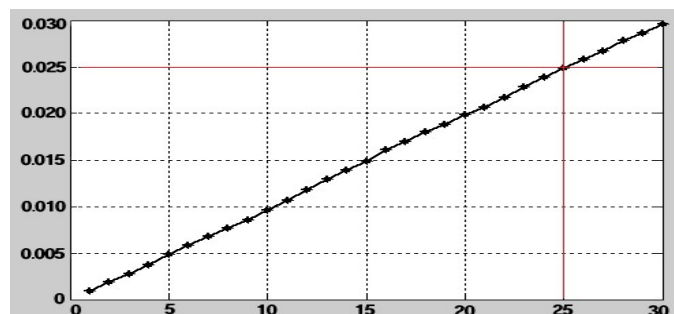


Figure 7. Energy consumption of Cluster routing algorithm

Figure 8 shows the energy-consumption state of the entire sensor node. The comparative results of the energy consumption status, the LEACH was used 0.0347J, the DDACM was used 0.0265J, and the proposed method was used 0.0248J. As a result, it could be obtained result of energy consumption reduced of 28% than the LEACH and 6% than the DDACM.

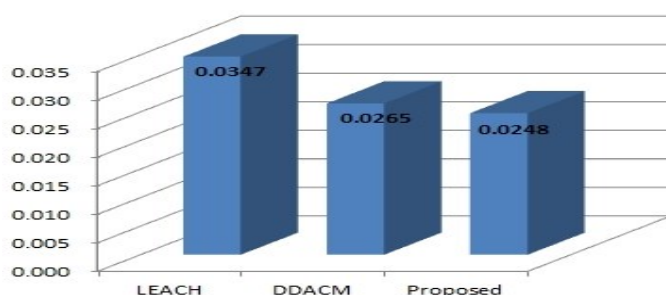


Figure 8. The energy-consumption state of the entire sensor node

IV. CONCLUSIONS

In this paper, we were proposed a cluster routing algorithm based on RSSI for efficient multi-hop data forwarding. The existing LEACH cluster algorithm will occur failure within a short time when random node is selected as the cluster head, because increases energy consumption with receives data from all nodes in the cluster. However, the proposed cluster routing algorithm could be confirmed to increase the lifetime of the WSN by maintain multi-hop method and LEACH protocol properties about to energy consumption problems caused as traffic increased.

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Lighting Control System.

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