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SINK RELOCATION WITH FUZZY LOGIC-BASED CLUSTERING ALGORITHM FOR A NETWORK LIFETIME ENHANCEMENT

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ABSTRACT: Wireless Sensor Networks (WSNs) present a new era of embedded systems with limited computation, energy and memory resources that being used for enormous variety of applications. Sensors deployed in a region to sense various types of physical information from environment,considerable amount of energy is dissipated while transmitting the infomation. Lifetime of the battery power and energy conservation is a challenging issue in wsn. suitable cluster head (CH) referendum is one such issue, which reduce the energy conservation dramatically. In this super cluster head (SCH) is referendum among the CHs who can only send the information to the base station by choosing appropriate fuzzy descriptors.In this approach a moving strategy called energy aware sink relocation(EASR) for mobile sinks in WSNs. Sink relocation is an efficient network lifetime extension method, which avoids consuming too much battery Energy, By adding clustering to the topology of the EASR scheme the delay in the transmission can be reduced.

KEY WORDS: [Wireless Sensor Networks (WSNs), Cluster Head (CH), Super Cluster Head (SCH), Sink Relocation (SR), Energy Aware Sink Relocation(EASR)]

1. INTRODUCTION

A WSN consists of spatially distributed autonomoussensors to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, enabling also to control the activity of the sensors. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.The sensor nodes are densely deployed in a hostile environment to monitor, detect, and analyze the physical phenomenon and consume considerable amount of energy while transmitting the information.There is a limitation on the lifetime of the battery power and energy conservation is a challenging issue. Designing energy-efficient routing algorithms to balance the consumption of the battery energy of each sensor node .Appropriate CH election is one such issue,

which can reduce the energy consumption dramatically. Low energy adaptive clustering hierarchy (LEACH) is the most famous hierarchical routing protocol, where the CH is elected in rotation basis based on a probabilistic threshold value and only CHs are allowed to send the information to the SCH, Super-CH (SCH) is elected among theCHs who can only send the information to the BS by choosing suitable fuzzy descriptors, such as remaining battery power and centrality of the clusters. Fuzzy inference engine is used to elect the chance to be the SCH. SCH are allowed to send the information to the sink node.But in this approach sink node is relocated to get the information from the super cluster heads.Only SCHs are allowed to send the send the information to the sink node to number retranmissions performed by the CHs. By adding clustering to the topology of the EASR scheme the delay in the transmission can be reduced. Also the neighbouring nodes of the sink are not always be busy. So the network lifetime can also be increased.

2. RELATED WORK

Researchers are always been conducted to improve the network lifetime of the wireless sensor network of by sink relocation. There are several sink relocation method for conserving the battery energy of the sensor and increase the network lifetime of the network. Wireless Sensor Networks present a new generation of real-time embedded systems with limited computation, energy and memory resources that are being used in a wide variety of applications where traditional networking infrastructure is practically infeasible. Appropriate cluster-head node election can drastically reduce the energy consumption and enhance the lifetime of the network. In this paper, a fuzzy logic approach to cluster-head election is proposed based on three descriptors - energy, concentration and centrality. Improved Cluster Head Selection Using Fuzzy Logic Appropriate cluster-head node I.Gupta et. al [1] election can drastically reduce the energy consumption and enhance the lifetime of the network. In this paper, a fuzzy logic approach to cluster-head election is proposed based on three descriptors - energy, concentration and centrality. Simulation shows that depending upon network configuration, a substantial increase in network lifetime can be accomplished as compared to probabilistically selecting the nodes as cluster-heads using only local information. Central control algorithm in the base stations is many times more powerful than the sensor nodes, having sufficient memory, power and storage.

This paper deals with study and analysis of simulation the investigating power consumption in wireless network and investigating the possible way to reduce the power consumption at Base Station. To overcome this demerit many research approaches have been done. The clustering is the one of the representative approaches. Proper organization of nodes (clustering) is one of the major techniques to expand the lifespan of the whole network through aggregating data at the cluster head. The cluster head is the backbone of the entire cluster. To achieve high energy efficiency, a typical approach is to cluster the sensor nodes in some way so that energy is conserved.

Fuzzy Based Master Cluster Head Election Leach Protocol T.Sharma et al [4] In WSN using a LEACH protocol the clusters are formed randomly on the basis of threshold values; whereas, in the proposed protocol a fuzzy logic approach is used to elect the cluster-head based on two descriptors - energy and proximity distance .Out of these elected cluster heads one Master cluster head has been elected .The cluster head which has the maximum residual energy is elected as Master cluster head. In conventional Leach approach the entire Cluster heads are used to sends the aggregated information to the base station, however in the proposed protocol only Master cluster head sends the aggregated information to the base station. F-MCHEL is similar to the CHEF. The network remains constant. Because, mobility indirectly proportional to

the distance to base station. Sumit Kataria et. al [2] introduced sink nodes relocation method which is performed by using the bio-inspired Digital Hormone Model. Through this method the sink nodes are being guided to move in an intelligent way towards the optimal location, which basically improves the network lifetime and reduces the energy imbalance.

The EASR scheme mainly focuses on when the sink will be triggered to perform the relocation process and where to move. Besides the sink relocation scheme, the entire operation of the WSNs for environment monitoring also needs to incorporate the routing method for reporting the sensed data from the source to the sink, as well as the energy consumption

model. In this section,the energy-aware routing method that is adopted in the EASR method will be illustrated using a numerical example. At the end of this section, some related research works for sink relocation will also be addressed.

3. SYSTEM MODEL

In the EASR method, we incorporate the technique of energy-aware transmission range adjusting to tune the transmission range of each sensor node according to its residual battery energy. In the case of the residual battery energy getting low after performing rounds of message relaying and environment sensing tasks, then its transmission range will be tuned to be small for energy saving. This mechanism consists of two parts. The first is to determine whether to trigger the sink relocation by determining whether a relocation condition is met or not. The second part is to determine which direction the sink is heading in and the relocation distance as well. For the relocation condition ,the sink will periodically collect the residual battery energy of each sensor node in the WSN.

4. PROJECT DESCRIPTION

EASR method against some traditional methods by numerical simulation. which includes the energy model of a WSN, the energy efficient routing scheme that will be incorporated into the EASR scheme, and the related works of sink relocation.

Creating a node without using any cables and more than 40 nodes placed particular distance. Wireless node placed in intermediate area. Each node knows its location relative to the sink. The access point has to receive transmit packets then send acknowledge to transmitter. Sensor nodes are divided into number of groups and each group is called as a cluster. One group leader is elected in each cluster known as Cluster Head (CH). CH is elected in a probabilistic manner and tries to balance the load at each sensor node in a rotation basis. Data aggregation is obtained at the leader node. Among the cluster heads super Cluster Head (SCH) is elected.All CHs sends the aggregated data to SCH and SCH sends the aggregated data to the base station.SCH is elected on basis of fuzzy if-then rules from CHs. Sink collects information regarding location of all the nodes depending on the density and geographical layout of the network. EASR method is applied for sink relocation. The technique of energy-aware transmission range adjusting to tune the transmission range of each sensor node according to its residual battery energy. EASR method increases the network lifetime. The modification is done by adding clustering in the topology. So that delay can be minimized. Each cluster contains a cluster head and this cluster head will collect the datas from its cluster members and then cluster head will send these data together to the super cluster head. Super cluster head will send the datas to the sink.

5. ALGORITHM

/∗ for every round ∗/
1) Select CHs based on threshold value.
2) Select koptimal CHs in each round.
3) Select SCH based on fuzzy if-then rules from the CHs.
/∗ for koptimalCHs ∗/
1) All CHs sends the aggregated data to SCH
/∗ end of for ∗/

```
Energy –aware-transmission-range adjusting
Input:
X:initial transmission range;
B:initial battery energy;
r(u):current resdiual battery energy of u;
t:transmission range adjusting;
{
/*transmission range adjusting*/
While(true){
if (0<=r(u)<B/3)then
   t=X/4;
else if (B/3<=r(u)<B/2) then
t=X;
}// end while (true) loop
}
```

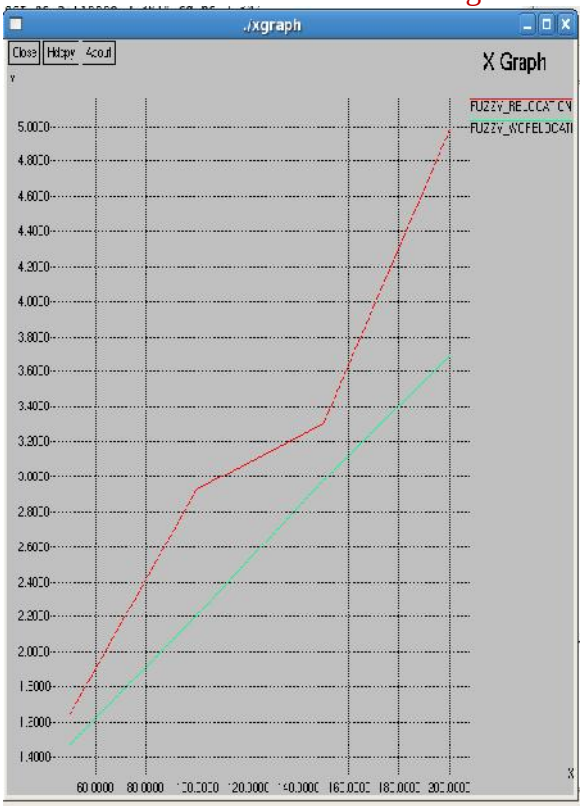
6. SIMULATION RESULTS AND ANALYSIS

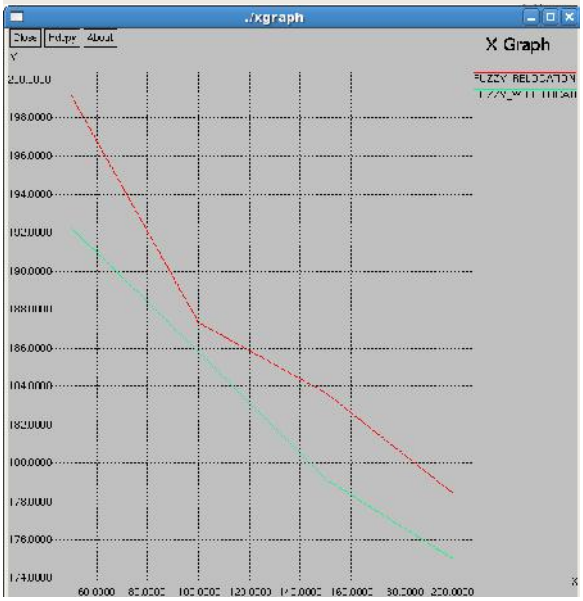
Generally, not only the sink relocation may enhance the network lifetime of aWSN, but the underlying network routing protocol and the applications (abnormal event reporting or constant sensed data collecting) running in a WSN will all significantly affect the performance of the network lifetime.

Thus, the network lifetime modeling of a WSN for sink relocation is very complicated. In this subsection, we will propose a simplified network model to represent the logical view of a WSN.

To check the validity of the proposed protocol, NS-2 simulator (2.34) has been used as the tool to compare the performance metrics of our interest with sink relocation protocol which ensures extended lifetime of the WSN for the proposed protocol.

The performance results for network lifetime comparisons when the initial battery energy varied are given in the EASR also outperformed the other schemes as the initial battery energy varied.





CONCLUSION

Most researchers have aimed to design energy-aware routings to conserve the usage of the battery energy to prolong network lifetimes. By selecting suitable fuzzy descriptors Super Cluster Head is elected among the cluster heads who is the representative for delivering the message to a mobile base station. The idea of sink mobility

along with the fuzzy logic increases the network life time dramatically. An energy-aware sink relocation method (EASR), which adopts the clustering as the underlying routing method for message relaying. it would be more useful in many practical applications like health care, agricultural field, disaster heat areas, military applications etc.

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