Wireless Sensor Network Based on Reduced Packet Loss with Maximum Clusters

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Abstract

Nowadays it is a known thing that wireless sensor network is one of the wide rising field in which the sensornodes are arranged in order to receive and forward the composed from other nodes in the network. The thought of mobility ofnodes is bit disadvantageous. Since they will consume more energy in order to communicate the data to the base station if it islocated far from the nodes. In this paper the mobility of nodes is measured which mainly works on cost value in terms onenergy. Thus it is possible to form more number of nodes in the network. In every cluster, cluster head will transmit the datafrom nodes to base station which is away from the nodes of the network.

Keywords— *Wireless Sensor Network; Clusters; Energy Efficiency; Mobility; PDR*

I. INTRODUCTION

This paper definescompleting minimal energy feeding for wireless sensor network using distributed network protocolsubstantial reductions in energy feeding can be achieved if wireless networks are designed specifically for minimum energy.In order to exploit the total battery life of a wireless network, we must minimize the energy consumption of the entire the network. Though the nodes are predictable to be static throughout, the mobilityof the sensor nodes gives rise to some more cultured applications like better atmosphere monitoring and tracking. The nodeswill collect the data from surroundings.The sensor nodes are energy embarrassed. And it is feasible to renew the battery of the sensor nodes due to hostile situationof the deployed sensor nodes. Hence the protocols and algorithms designed for such networks essential to be energy effective also.A Wireless sensor network (WSN) consists of a large number of battery-powered, resource-constrained wireless sensor nodes,which might be erratically deployed in sensor network for sensing and collecting the data from surroundings.The sensed data are routed from a sensor node back to the sink either complete multi-hop or direct communication architecture. The sink may communicate with base station or satellite via single-hop or multi-hop ways.

II. RELATED WORK

There are many protocols are discovered in wireless sensor network. Among them some of the routing protocols are discussedhere.

network.In many WSN applications, the distribution of sensor nodes is completed in an ad hoc fashion without careful planning andengineering. Once deployed, the sensor nodes must be able to originally organize themselves into a wireless communicationnetwork. Sensor nodes are battery-powered and are estimated to operate without attendance for a relatively long period of timenetwork and also for the successful operation of

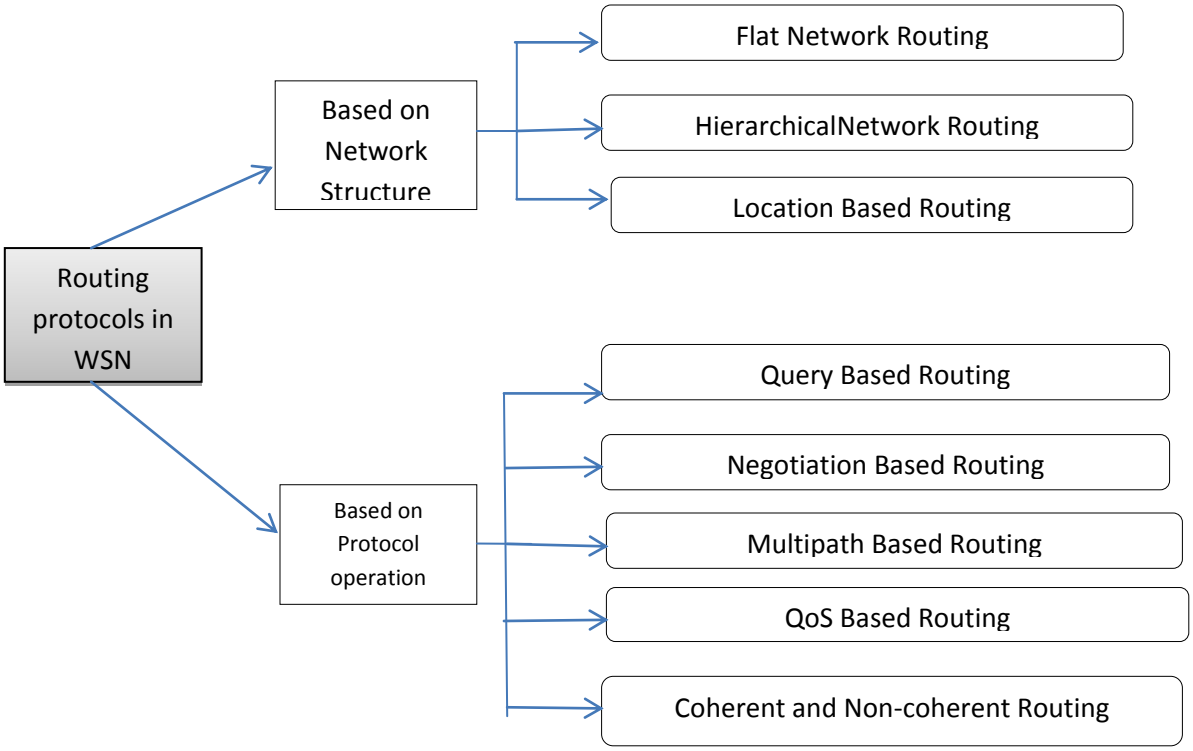

Fig 1. Routing Protocols in WSN

A. Flat Routing Protocol

It is network communication protocol executed by routers in which all routers are each other's peers.Flat routing protocol allocates routing information to routers that are connected to each other without any organization or segmentation structure between them.

B. Hierarchical Routing

Higher energy nodes are used to process and send the information, while low-energy nodes are used to perform the sensing in the immediacy of the goal. The construction of clusters and assigning special tasks to cluster heads can greatly provide to overall system scalability, lifetime, and energy efficiency. Hierarchical routing is an efficient way to lower energy consumption within a cluster, performing data aggregation and fusion in order to decrease the number of transmitted messages to the sink node.

C. Location-based

Sensor nodes are addressed by means of their locations. The space between neighboring nodes can be appraised on the basis of incoming signal strengths. Comparative coordinates of neighboring nodes can be obtained by replacing such information between neighbors or by communicating with a satellite using GPS. To save energy, some location-based schemes demand that nodes should go to sleep if there is no activity.Depending on the Protocol Operationwe can divide routing protocols in,

D. Multipath-based

They use multiple paths rather than a single path in order to increase network performance. For instance the fault tolerance can be augmented by maintaining multiple paths between the source and destination at the expense of increased energy consumption and trafficgeneration.

E. Query-based

The destination nodes promulgate a query for data from a node through the network, a node with this data sends the data that matches the query back to the node that initiated it.

F. Negotiation-based

Use negotiation in order to eradicate redundant data transmissions. Communication decisions are also made based on the resources available. When delivering data, the network balances between energy feasting and data quality through certain QoS metrics as delay, energy or bandwidth.

G. *Coherent –based*

Theobject of local data processing on the nodes discriminate between coherent (minimum processing) and non-coherent (fullprocessing) routing protocols.

Here we are concentrating mainly on hierarchical routing protocols in which higher energy nodes are used for transmission ofmessages. Whereas lower energy nodes are used for only sensing of data in the network.Hierarchical routing protocols are two-layer protocols which mainly increases lifetime of the nodes of the network.

H. *Low Energy Adaptive Clustering Hierarchy (LEACH):*

This routing protocol originally divides the network into clusters. Then a node will be nominated as the cluster head. It is thejob of cluster head to take care of complete network and also accomplish the nodes of the network. The head will receive the datafrom the nodes and passes it to target that is the Base Station. It achieves pre-processing of the data at cluster head.This protocol is not suitable for larger network. Because there is direct communication involved between the cluster head andthe sink that is target node.

I. *Sensor Protocols for Information via Negotiation (SPIN):*

This protocol makes use of three types of messages. Those are ADV, REQ and DATA messages. At the establishment the node thathas data to sent broadcasts the ADV message. Once the node which is in need of that message will accept the broadcasted message and thenreplies back using REQ message.Once the node that receives the REQ message from its neighbor will send the packet using DATA message.The SPIN family of protocols is designed based on,

- ✓ Sensor nodes activate more professionally and conserve energy by sending data that describe the sensor data instead ofsending all the data.
- ✓ To overcome the energy and bandwidth wastage, this was incurred in Flooding and Gossiping.

J. *Energy Balanced Routing Protocol (EBRP):*

It is a stateless routing protocol, which can be used to route data based on the outstanding energy of the nodes. This protocoldistributes the network into different energy bands and then constructs routing paths. This protocol is more appropriate to wirelesssensor networks that create a lot of traffic as it achieves nearly uniform load circulation across all the nodes.The higher energy nodes are in a better position to handle more traffic than the lower energy nodes. By sharing the entirenetwork into energy bands we make sure that the lower energy nodes can be identified thereby making it easy to offer themmore protection.

III. PROPOSED PROTOCOL

In proposed protocol the movement of the nodes is measured. Every node in the network is given with pre-determined amountof energy for the purpose of transmission of message. All the nodes are considered to be mobile whereas the base station is madestatic. In existing protocols it was bit tough to form larger number of clusters. Where as in proposed one this has beenoverridden.Energy of all the nodes is measured as one of the parameter to decide which node is to be designated as the cluster head. So the nodewhich is having highest energy will be selected as head of the cluster. If the energy of all the nodes is almost same then we willconsider a parameter distance. The node which is near to the base station from every cluster is selected as the cluster head for thatactual cluster.

If nodes begin with E_o

Cluster-head nodes	Non-cluster-head nodes
$E_i(t) \approx E_o - X$	$E_i(t) \approx E_o$

$$E_{total} \approx E_o(N-kr) + (E_o-X)kr$$

Where k is system parameter
Eo is node initial energy
Eo-X is energy left after transmission

Phases of protocol

The proposed protocol consists of five phases,

1. Form the virtual grids and deploy the nodes

2. Nodes gathering to form clusters

3. Elect cluster head based on high energy

4. Transmit the data

5. Re-form the clusters

A. *Formation of Virtual Grids and Deploy the Nodes:*

We partition the whole sensor field into grids of cells. In each cell, the node with the most residual energy takes turn to be thecell head, responsible for aggregating its own data with the data sensed by the

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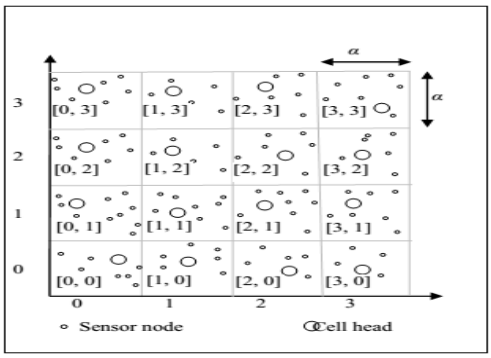


Fig 2. Virtual Grid Formation

We construct a grid-based infrastructure by partitioning the whole sensor field into a grid of cells. Each cell has a head, theone with most residual energy of the cell, responsible for aggregating and disseminating data.

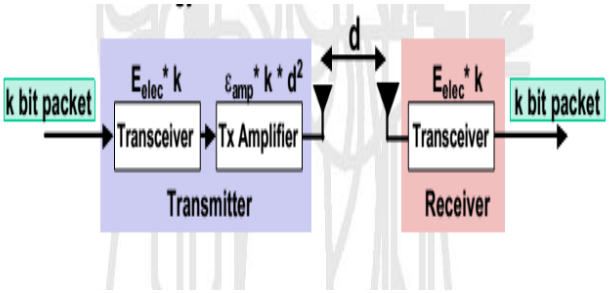
B. Nodes Gathering to Form Clusters:

Once the grids are designed next step is to form the clusters in the network. The clusters are formed based on a threshold value. This value specifies the maximum number of nodes to be present in every cluster.

C. Elect the Cluster Head Based on Energy

Subsequently we are dealing with mobility of the nodes it is understood that the nodes are mobile. Hereafter every time the message istransmitted the nodes may move from one position to another. Thus the available energy of a node is measured. The node whichis having less energy cannot be selected as cluster head because the cluster head has to do most of processing. The cluster nodeshould always be provided with more energy than threshold value. Also it should not be far away from the base station.

D. Transmit the Data:



In order to transmit k-bit message over distance d, energy used is-

$ETx(k,d) = ETx\text{-}elec(k) + ETx\text{-}amp(k,d)$

$ETx(k,d) = Eelec * k + €amp * k * d$

In order to receive the message the energy consumed is-

$ERx(k) = ERx\text{-}elec(k)$

$ERx(k) = Eelec * k$

E. Re-form the Clusters

Once the base station receives the data from the complete cluster heads now it's upto base station and nodes of the clusters to electthe cluster head and re-form the clusters if desirable further communication. Again re-forming the cluster is based on energyalong with distance parameter.

IV. RESULTS AND DISCUSSION

In simulation results we can observe the increased throughput along with optimum energy utilization for data transmission. The below figures shows energy consumption.

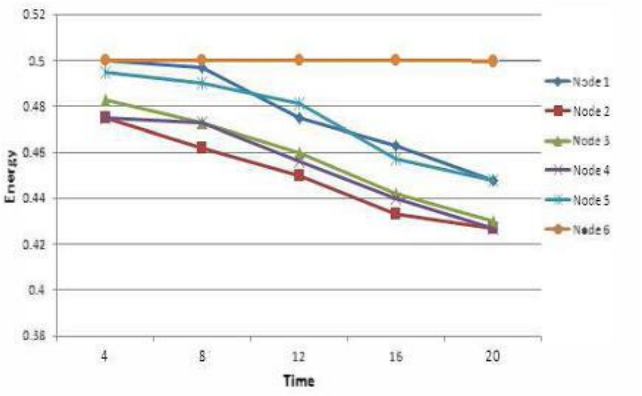


Fig 3. Energy Graph For Some Nodes

V. CONCLUSION

In this paper we are proposing a protocol which deliberates mainly the flexibility of the nodes in the network. Since we arepassing the information from one node to its neighbor node using one hop distance, the amount of packet drops reducedgreatly. The nodes positioned in the network will consume less energy as associated to other nodes which are static. Also

thepacket drops is suggestively reduced. Hence PDR ratio is achieved well. The protocol can be further implemented in orderto make the base station also mobile. Even it is possible to identify the number of clusters deployed dynamically in thenetwork in future work.

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