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Proposed Energy Saving Scheme for Wireless Ad-hoc Sensor Network

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ABSTRACT-This paper presents a power saving technique by suggesting an energy model for multi-hop Ad-hoc wireless sensor networks that reduces energy consumption without significantly diminishing the capacity or connectivity of the network. Our work builds on the observation that when a region of a shared-channel wireless network has a sufficient density of nodes, only small No. of them needed to forward traffic for active connections.
(Our proposed Energy model) it is the modified version of the basic model of wireless sensor network in which by the help of routing it decreases the energy consumption in transmission as well as receiving, which affects the overall performance of the network. Additionally, the proposed model also improves QoS parameters: communication latency and capacity.

1. INTRODUCTION

1.1 Description of Wireless sensor Network

A sensor network is an assembly of specialized transducers with a communications infrastructure intended to monitor and record conditions at different locations. Normally monitored parameters are temperature, humidity, pressure, wind direction and speed, illumination intensity, vibration intensity, sound intensity, power-line voltage, chemical concentrations, pollutant levels and vital body functions.

A sensor network consists of several detection stations called sensor nodes, each of which is tiny, lightweight and manageable. Every sensor node is operational with a transducer, microcomputer, transceiver and a power source. The transducer generates electrical signals based on sensed physical effects and phenomena. The microcomputer processes and stores the sensor output. The transceiver, which can be hard-wired or wireless, receives commands from a central computer and transmits data to that computer. The power of each sensor node is originated from the electric utility or from a battery.

1.2 Description of Ad-Hoc Network

A **wireless ad-hoc network** is an infrastructure-less type of wireless network. The network is Ad-hoc because it does not depend on a preexisting infrastructure, such as routers in wired networks or access points in managed (centralized) wireless networks. Instead, each node itself participates in routing by forwarding data to other nodes, and so the determination of which nodes forward data is done dynamically based on the network connection. As Compare to classic routing, ad-hoc networks can use flooding for forwarding the data.

An Ad-hoc Network normally refers to any set of networks where all devices have alike status on a network and are free to associate with any other Ad-hoc network devices in link range. Very often, Ad-hoc network refers to a mode of operation of IEEE 802.11 wireless networks.

1.3 Description of Energy awareness

It means reducing the consumption of energy which can be further used for any beneficial purpose

II LITERATURE REVIEW OF SENSOR NETWORK

2.1 New Energy Model: Prolonging the Lifetime of AODV

In [1] a new energy model that prolongs the lifetime of Ad-hoc On-Demand Distance Vector Routing Protocols which are modified to improve the network's lifetime in MANETs is proposed.

The objective of [1] is to propose an efficient routing algorithm for finding a routing path that minimizes the total transmission energy consumption and maximizes the minimum residual energy capacity of any node in the path. According to energy, the shortest path may not be the best path. The network node energy-limited routing protocol EA_AODV is a central issue in this paper.

To ensure that every node of the network is uniform in its energy consumption, on the various paths, the total energy consumption is set to a lower limit. BL, $\beta>1$ (positive number) L for a minimum number of hops on the path, and Fv (θ) represent the maximum energy consumption from the source to the destination. By setting a threshold θ, each node of energy consumption rate $< \theta$ $0 < \theta < 1$. To ensure that the excessive energy consumption of some nodes. On the basis of the above conditions, this Algorithm model can be achieved as follows:

Objective function:

$$F_{v_j}(\theta) = MIN\{F_{v_i}(\theta) + Kd_{i,j}{}^{\alpha}\}$$

Constraint condition:

$$(1)\ \frac{P(v_i) - Kd_{i,j}{}^{\alpha}}{E(v_i)} \geq \theta$$

$$(2)\ F_s(\theta) = 0$$

$$(3)\ F_D(\theta) \leq \beta L$$

Pu (VI) power to send packets to neighbor nodes. The nodes Vi and Vj are directly connected.

The proposed approximation algorithmic model is simulated on the NS2 simulator to compare two parameters as follows: total energy consumption and network lifetime of the network situation. The simulation is performed by taking 25 nodes using different initial energies and other common parameters.

2.2 E^2RCP for WS N

In [2] Ying Liang, proposed a reliable energy-efficient cross-layer routing protocol (E^2RCP). The goal is to

maximize the lifetime of the entire wireless network. This article includes the evaluation of the cost evaluation function, including the two parameters .$N_{Energy\text{-}cost}$ and N_{Link_cost}.

In wireless sensor networks, if the path contains too many links between nodes, then the probability on the link will lead to more errors, leading to more data retransmissions because only the number of hops between nodes are used and evaluated.

Since the transmission frequency of each link is independent of other links, is a geometric series distribution, and there may be the case of heterogeneous nodes [2]. Therefore, the routing node routing cost for a particular. $N_{Energy\text{-}cost}$ The following formula can be defined :

$$N_{Energy\_cost} = \frac{rE_{T(i)}}{E_{r(i)}^{\alpha}(1-P_{Error(i)})^{\beta}}$$

$E_{T(i)}$ Node i to the unit cost of packet transmission (E_T = Erecv+Etrans), Er(i) for the left energy for the node $P_{Error(i)}$ is the link packet error probability between Node i to node j, α、 β Non-negative weight factor, γ Adjustment coefficient for the heterogeneous node energy is the key of the algorithm parameters (the simulation process, in order to reflect the heterogeneous node randomly assigned the initial value), These parameters are in [0,1] range, calculation and selection of the minimum function is equivalent to select a node to the cluster node from the i minimum cost paths. The routing cost function is completely localized, calculated only to its neighbor nodes involved, $N_{Link\_cost(i)}$ is the sink node hop count cost.

In the simulation experiment using the NS-2, the success of transmission reliability of the algorithm and related parameters is evaluated. The initial energy of each node is taken 2J. The simulation environment settings of control region extended from 100m x 100 m to 1000m x 1000m, with varying node numbers i.e. 100 to 1000.

2.3 Intra-cluster in Hierarchical Routing Protocols Power Management for WSN

As proposed in [3], the hierarchical routing protocol for wireless sensor networks is recognized as a technique that can reduce energy consumption of the networks and thereby increase their efficiency. Cluster head rotation is used to balance the energy consumption and time scheduling of the sensor node operation is carried out to achieve energy saving. In the paper cluster-based WSN using different CH selection algorithms is practically implemented and analyzed on an existing wireless sensor node hardware platform.

In this, the numbers of nodes alive over the operating time of the network by using different CH-selection schemes are compared to a three and six node network.

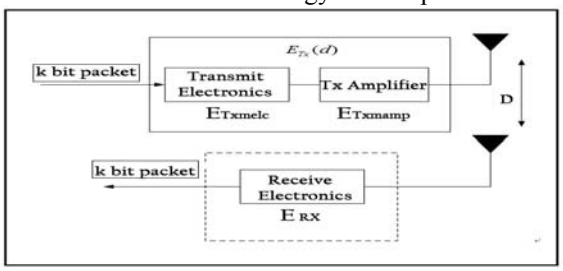
The network lifetime is prolonged when a dynamic voltage-based CH node selection scheme is used for energy conservation as compared to the other algorithms.

2.4 Multipath Routing Protocol with Load Balancing in WSN Considering interference

In [4] a multipath routing protocol is proposed that considers energy saving and wireless interference. A linking cost function that considers node remaining energy and the number of hops to the destination node is suggested.

Two paths are established between source and destination nodes, by using the path discovery process that finds the next hop node which minimize the linking cost. In the proposed routing protocol, interfering nodes of the discovered path are marked out and not to take part in subsequent routing.

This paper used first-order wireless model, namely wireless communication module energy consumption model.



E − is the energy consumption of the transmitter, $E_{Tx\ amp}$ − is the energy consumption of the amplifiers and $E_{Rx\ elec}$ is the energy consumption of the receiver.

$$E_{Tx}(k,d) = E_{Tx-elec}(k) + E_{Tx-amp}(k,d) = E_{elec} \times k + \varepsilon_{amp} \times k \times d^{n} \quad (1)$$

$$E_{Rx}(k) = E_{Rx-elec}(k) = E_{elec} \times k \quad (2)$$

The proposed protocol is simulated in NS2 software. The simulation is done on randomly arranged 50, 100 and 150 fixed sensor nodes. The energy of each normal node is set to 2J. The energy consumption of transmission and reception is computed according to the formula (1) and (2). By simulation experiments in the ns2

The conclusion is that by using the proposed routing algorithm has less energy consumption and better performance to extend the network lifetime compared to I2MR algorithm.

2.5 Energy Efficient Secure Routing in Wireless Sensor Networks

In this work , an energy efficient secure routing for wireless sensor networks in which the weight of a route is decided by four factors: the speed of the nodes, the power level of the battery and the Bandwidth. The communication between sensor and the sink takes place at the three levels: sensor to c1uster head and sink. Energy consumption of the network is reduced since routing is done through the cluster head. Each node can establish the cluster key by combining the master key with a cluster head's identifier. The establishment of keys to implement Security to the network consists of three phases, including initialization, pairwise key establishment and cluster key establishment.

To simulate the algorithm, MATLAB is used. The performance analysis comparison is done on the basis of the following parameters:

1. Hop count, 2. Energy and 3. Throughput

Energy is needed for sending a file or data, with the consideration of the size of the packages. Practically it is

not possible to replace the batteries of a large number of deployed sensors in the hostile environment. Therefore there is a need to reduce the Energy consumption of the network. By using the Weight Based AODV Protocol and the Cluster Head formation, the energy consumed by the network can be reduced.

III. PROPOSED CONCEPT:

- Step1: Initialize the Threshold of the Network
- Step2: Selection of the node in the communication Path
  - Broadcasted the route request in the network
  - Shortest Route selected.
  - Establish Communication path

If (NODE Energy > Threshold energy of node)
Then "Node is Selected "
Else
"Node is rejected on the communication path"

- Step 3 : Re computation of Path

For all nodes do:
If(NODE Energy < =Threshold energy of node or node moves out of the network range)
- "Send minimum energy error towards the source and source starts finding new routes towards the destination.

If (new route set by is having less no of hops than route is selected
If (Recomputed Path is of less Distance (hops))
"Power at each node in transmission and receiving is Reduced"
Else
"Previous path followed for the communication or go to Step 2"
End

Step 1: Initialize the threshold of the network depend on the network

Step 2: Broudcast the route request in the network and set the for the communication . Node selected on the path depend on the condition that , if node energy is greater than the threshold of the initialized network then nod is selected in the communication path otherwise rejected

Step 3: It may be possible node moves out of the network than it send a route error towards the source and find the new route for the communication . For the recomputation of the path another case is added that is the energy of the node is less than the threshold energy of the network then in that condition it also send route error packets towards the source but . At that time source started finding a new route towards the destination but in that case communication between the sender is still going until it gets new route for communication , if it gets new path with less no. Of hopes then path is selected otherwise it follow the old path for the communication. It gets the advantage because , it may be possible node moves towards the source. So After Recomputation of the path , path is set up less no. Of hopes and energy in the communication is saved for example black is the destination nodes after some time it moves towards the destination as shown in the figures3. 1 and 3.2.

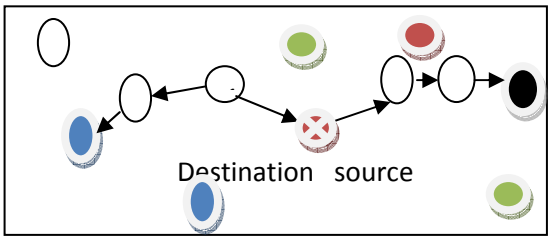


Fig 3.1

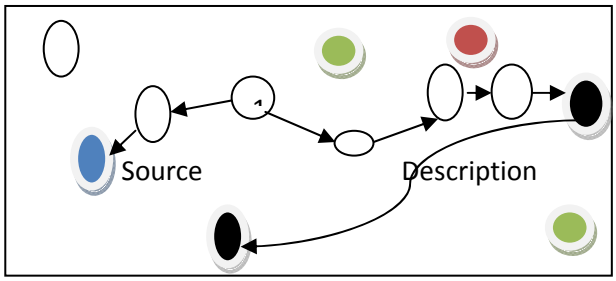


Fig 3.2

IV CONCLUSION AND EXPECTED RESULT ANALYSIS:

In the wireless sensor Ad-hoc network energy saving is the main issue of Research. By the help of our proposed work we have tried to reduce energy constraint required in wireless sensor network as well as in Ad-hoc network because if energy is saved then network can sustain in long time. Our proposed model will definitely improve QoS Parameters of the network. In future we are going to implement this concept in network simulator NS2. If we get satisfactory result then we will also apply this technique on different networks like vehicular networks. Also we will give to check this energy saving scheme in larger networks (no. of nodes are large).

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