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Energy Opportunities Theory used for Relay Node in Wireless Sensor Networks

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Abstract
Abstract-In wireless sensor network the major concern is energy saving concept is used during transmits of data long distance. The main objective of project is optimize the energy efficient and it is required to extend a prolong an network lifetime. The routing protocol design we implement an sensor node have a limited battery power and non-rechargeable power, this paper achieve an multipath routing in one dimensional network and it is depend on multihop decision method is used to optimized an energy efficient among several sensor nodes interns of residual energy and path to sink. We implement an energy opportunities algorithm to provide a lower cost and also protect the node with low energy, finally the proposed solution of energy opportunities routing is improves an network performance in wireless sensor network.

Keywords
Wireless sensor network, 1-Dimension network, energy opportunities Algorithm, Relay node, energy efficient routing

I. Introduction

Wireless sensor network allows for sensing larger geographical area with higher accuracy, the function of transferring data is provide an sensor node are requires an protocols routing design. The sensors are deployed more numbers and small in size, there are operated in environmental condition such as temperature, pressure and etc, The sensor node are very limited non rechargeable battery power, the wireless sensor network is provided by an application are like controlling traffic, centres and military application, medical care and agricultural surveillance.

In wireless sensor network are embedded anthousands of sensor nodes are distributed and it is not replenish an energy via replacing battery. The main function of sensor node is collect and transfer an data in network .here the collection of data is consuming less data compare to transmission of data because it is consume more data in network. To improve a performance of energy efficient for transmitted data.

The replenish battery powered by an finite energy source such as some capacities is restricted in sensor networks , the energy source are battery is integrated with sensor nodes and recently for longer operation. However it is efficient a network taken into account to an network operation. During routing protocol design we use an multifold method in an network , it involves to find an minimum path from single a source to destination and also balance an distribution of residual energy of whole network . The most of existing protocol is also determine an distance in between source and destination to achieve an optimal energy consumption.

An unreliable link may cause an retransmission in already selected path and packet loss, retransmit an packet over path is induces an power cost, therefore we develop an trade off between minimum energy consumption and maximum network lifetime. The main fact in wireless sensor network is security and it is concentration on authentication data transmission between sensor nodes and it is also provided an hop by hop authentication in an network.

In an individual sensor node have cost that is similarly variable and it is depending on complexity on source such as memory, speed, bandwidth and energy, the main fact behind multipath transmission with efficiency of energy context with wireless sensor network . The usage of resource is reflect an usage of energy and bandwidth, we focus on 1-Dimensional network is design for civilian application such as electrical power and intelligent traffic . Most of existing traffic information system based on 1-D queue network are implement without power saving management ,hence the small traffic information solution is used to extend an lifetime of network is need of energy saving in sensor network.

Multipath routing is balance an traffic and increase data transfer rate in wireless sensor network, the previous methods are used flooding for route and transmit data with less power. In this work on sleep mode in wireless sensor network foe node coverage and awake nodes to requires an each square measures to select an deployed field. In the paper we implement routing algorithm energy opportunities routing theory is adopts a new idea called energy equivalent node, which selecting a relay node based on opportunities algorithm used to optimal distance foe an improves network lifetime and optimal distance for energy saving in network, The sensor node are unique information it is collect a data in static way and it is determine an optimal transmission distance to find an distance of sensor node to sink and residual energy, EOR selects a forwarder set and prioritize nodes and here forward set contain an node are close to energy equivalent node hence it consume more energy than sender can select forwarder candidate to address the problem of unbalanced distribution of residual energy in an new opportunities routing is based on optimal energy strategy.

II. Litertuare Survey

In wireless sensor network we use an severalrouting parameter are density of distribution of nodes and connectivity of node in network [1] and sensor nodes are fixed during transmission with independent distribution of an energy , there is a tradeoff between using high power and long hop lengths and using low power and shorter hop lengths. The most forward within range [2] routing approach has also been considered in 1-D queue networks, which chooses the farthest away neighbouring node as the next forwarder, and eventually results in less multihop delay, less power consumption. Energy savings optimization is realized by finding the minimum energy path between the source and sink in WSNs. Another method proposed in [3] reduces the total consumed energy based on two optimization objectives are path selection and bit allocation. Packets with the optimum size are relayed to the fusion node from sensor nodes in the best intermediate hops.

The unreliable wireless links makes routing in wireless networks a challenging problem efficient QOS-aware geographic opportunistic

routing (EQGOR) [4], take advantage of the broadcast nature of the wireless medium, and allow multiple neighbours that can overhear the transmission to participate in forwarding packets. An introduced an energy-efficient opportunistic routing strategy called energy-efficient opportunistic routing (EEOR),which selects a forwarder set and prioritizes them using energy savings optimization solution of forwarding data to the sink node in WSNs.

The main idea[5] of these types of networks is collecting data around the network's sensors. Since the sensors nodes work with the battery and there is no possibility to change or recharge these batteries, the life time of these networks depends on the sensors energy. In the proposed algorithm, to reduce energy consumption of the path, it was tried to consider the shortest path between the source node to the destination node with the highest average energy of nodes participating in the route. The need to establish an appropriate balance between energy consumption and increase the average remaining energy in routing nodes participating is considered effectively in the fitness function of harmony search algorithm.In WSN large number of node organized into a cooperative network[6]. In WSN nodes are battery powered devices, they have limited transmission power, communication ability storage capacity. For effective transmission of data to receiver we go for design of routing protocol.

Energy consumption is important factor in the design of WSN, there are two approaches to accomplish the data collection. They are direct communication and multi hop forwarding. In direct communication, the sensor node directly transmits the data to the sink, this method increase the communication distance and degrades the energy efficiency of the sensor nodes. In multi hop forwarding sensor node transmit the data to the sink through multiple relays and thus communication. Generally the node closer to the sink has high traffic load, this is due to the node closer to the sink has to forward the packets all other farthest node. Traffic load also depends on the type of routing protocol, Based on these we propose a energy balanced routing method that balances the energy consumption and increase the network life time.

The traditional routing protocols in wired networks choose the best sequence of nodes[7] between the source and destination, and forward each packet through that sequence. On the other hand, the loss and dynamic wireless links make it difficult for traditional routing protocols to achieve stable performances. One challenge is that multiple nodes may hear a packet and unnecessarily forward the same packet. EXOR deals with this challenge by tying the MAC to the routing, imposing a strict scheduler on routers access to the medium.

Existing work exploits multipath routing to guarantee both reliability and delay QOS constraints in WSNs[4]. However, the multipath routing approach suffers from a significant energy cost. In this work, we exploit the geographic opportunistic routing for QOS provisioning with both end-to-end reliability and delay constraints

in WSNs. Unreliable wireless links, and data-centric communication the challenges in the area of QOS provisioning in WSN and Q0S aware routing in WSNs mainly focus on one QOS requirement, either delay or reliability. In opportunistic routing, at the network layer a set of forwarding candidates are selected while at the MAC layer only one node is chosen as the actual relay node. These routing methods to improve the energy efficiency of individual node or the whole network can minimize energy consumption.

III. System Architecutral

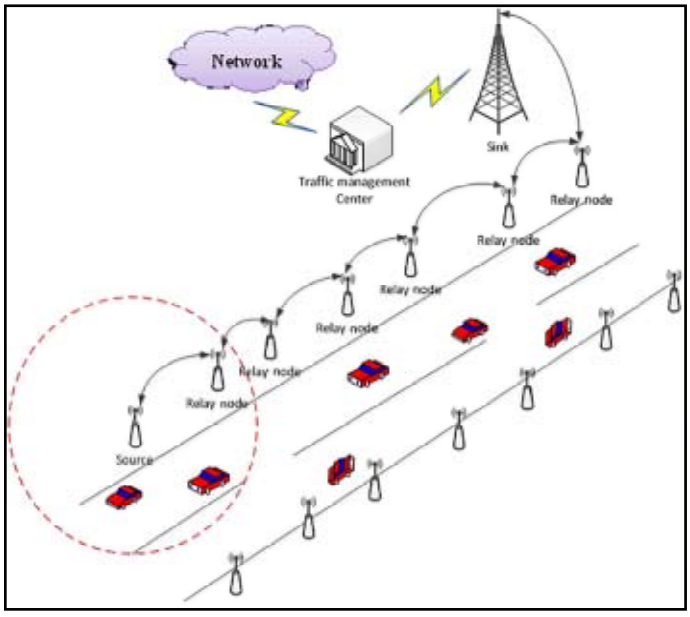

Fig 1: Traffic Information System

Fig. 1 shows anexample, illustrating a pervasive traffic information acquisitionsystem based on 1-D queue network platform, where the nodesare linearly deployed along the road. Most of the existing traditionaltraffic information acquisition systems are implementedwithout power-saving management. an energy savingoptimization solution for smart traffic information acquisitionshould be taken into account. In our solution, when a motionsensor node detects a vehicle in its sensing range, it will acquiretraffic information, such as traffic volume, vehicle velocity, andtraffic density. Sensor nodes will send the collected data torelay sensor nodes, and then the relay sensor nodes forwardtraffic information along the energy-efficient path to the sinknode that is one or more hops away. Finally, comprehensivetraffic information will be established by the sink node andsent to the traffic management centre. Traffic managementcentre will select appropriate information and offerit to the clients via the network. This smart traffic informationacquisition solution can be used to extend the lifetime of1-D queue network in the need of energy saving in WSN.

IV. Network Module

We consider an 1-D network, each relay node has plenty ofneighbouring nodes. Nodes have some knowledge of the locationinformation of their direct neighbouring nodes and theposition of the source node and the sink node. Every wirelesssensor node has fixed maximum transmission range R andminimal transmission range $d$min. The 1-D queue network isthen constructed by a connected graph $G = (V, E)$, where $V$is a set of sensor nodes aligned on a single line and E is aset of directed links between communication nodes.

Energy consumption can be expressed as follows:

$ET = (E\text{elec} + \varepsilon\text{amp}d\tau)B$

where$E$elec is the basic energy consumption of sensor boardto run the transmitter or receiver circuitry, and εamp is itsenergy dissipated in the transmit amplifier. $d$is the distancebetween transmitter and receiver, τ is the channel path-lossexponent of the antenna, which is affected by the radio frequency(RF) and ET denotesthe energy consumption to transmit a B-bit message

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in adistance *d*.

V. Modules

1. Choose an awake or sleep node

The sensor nodes area unit created at the foremost sensitive vary once sensing, however exploitation powermanagement to regulate the sense vary are going to be able to attain the effectiveness of saving power. During an transmission one of the sensor node is capable to delivers an data and alternative node is responsible to receive data but it is not transmitted to them. This can cause the consumption of power, therefore commonly the close to nodes are going to be created to sleep node.

2. Optimal Transmission Energy Strategy

The concept of EEN to conduct energy optimal strategy at the position basedon the optimal transmission distance . However, the optimalenergy strategy does not explicitly takes care of the residualenergy of relay nodes in the network, in the caseof hop-by-hop transmissions toward the sink node, the relaynodes lying closer to the EENs tend to deplete their energy. We should readdress the optimal energy strategyfor large-scale network.

3. Scheduling theory for selecting an forwarder set

There are 2 geographic-distance-based connected-k neighbourhood sleep programming algorithms. The Primary one is that the geographic distance based connected-k neighbourhood for first path program. The other is that the geographic-distance-based connected-k neighbourhood for all paths sleeps programming methods.We can achieve optimal energy strategy by choosingoptimal hops to determine optimal transmission distance. In addition, factors such as energy-balanced of a networkand the residual energy of nodes are also considered whileselecting the available next-hop forwarder.

4. Energy Opportunities Routing Algorithm

To select and prioritize the forwarder set using optimal energy strategy on eachnode, and how to choose the optimal relay node among potential forwarders that respond in a priority order. we introduce EOR algorithm forenergy saving to select the next relay node which has the highestpriority in forwarder set to forward the incoming EORalgorithm.

Step1 : Start timer
Step 2 : Using neighbours nodes and choose an forwarder set
Step 3: If node distance is less than an optimal distance of sender node then
add node to forward set
Step4: Select priorities forwarder set using an optimal energy strategy
Step5: Broadcast the data packet
Step 6: If node present in Forwarder Set then
itreceives data packet
Step7: Check the sender ID & timer
Step 8: If node which is receives higher priorities then
itreceived the data packet
Step9: Replay ACK to sender
Step 10: If node is lower priority then
it is discard packet
Step11: When priority timer expires then
higher priority node equals to lower priority node
Step 12: Finally there is no forwarder candidate is received the packet
If retransmission timer is expires then drop the packet
Step13 :go to step2
Stop

VI. Performance Module

We define four main measurable metrics to evaluate the effectiveness of EOR algorithm for data forwarding in 1-D queue networks.

1. Average of residual energy

Relay nodes left with more average residual energy indicates that all the relay nodes are alive for longer time, which would help to prolong network lifetime.

2. Residualenergy

The characteristicof the routing protocol, we have noticed that high standard deviation intheestimationsof residualenergy impliesthe unbalanced energy dissipation among sensor nodes, and lowering RE is important for the routing protocol.

3. Receivingpacketsratio

It is describe the amount of packets received by the sink to the total amount of packets sent by the source. In order to effectively avoid the network partition, the sink should receive most of the packets sent from the source, and eventually results in a good connectivity of the network

4. First dead node

It is the influence of the network connectivity. As the first energy exhausted node appears, the probability of network partition increases, and the connectivity of the network.

5. Network lifetime

The network lifetime of a 1-D queue network is defined as the time when the sink is unable to receive packet sent from the source. The higher the network lifetime is, the more effectively the balance of energy consumption willbeachieved

VII. Conclusion

In routing protocol design the major fact is an Energy savings optimization in the WSN. In this paper, we focus on minimizing energy consumption and maximizing network lifetime of 1-D queue network where sensors' locations are predetermined and unchangeable. we borrow the knowledge from opportunistic routing theory to optimize the network energy efficiency by considering the differences among sensor nodes in terms of both their distance to sink and residual energy of each other, we design an energy-efficient opportunistic routing strategy that ensures minimum power iscost and protects the nodes with relatively low energy based on optimal transmission.the proposed solution EOR makes significant improvements in energy saving and network partition to achieve an prolong the network lifetime.

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