ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Energy Efficient Short Tree Routing In Wireless Sensor Networks

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Abstract:

A typical wireless sensor network (WSN) consists of many small and low-power sensors that use radio frequencies to perform distributed sensing tasks. Minimizing the energy consumed whereas guaranteeing the property of a network is a very important issue to be self-addressed in WSNs as a result of the batteries powering the sensors might not be accessible for recharging typically. Agglomeration in WSNs is a good technique for prolonging the network lifespan. In this paper, initially a cluster technique in WSNs named energy-efficient homogeneous clustering technique thena route optimization technique in clustered WSNs is presented.

The EHC-ROT technique can increase the employment within the network to pick the various styles of cluster heads;therefore,an increased tree primarily based route optimum techniquefor WSNis proposed.The ultimate goal of this paper is to boost the network life time with higher Quality of Service parameters. Here the domain of Energy Management in WSN is chosen. This work determines to diminish energy consumption, packet delay, hop count and improve the network lifespan of WSN among obstacle.

Key words:

Sensor, energy, route optimizing, tree based communication.

1.Introduction:

In any application of WSNs, property is taken into account to be a vital metric to measure the standard of service of WSNs.

A network is claimed to be connected if all sensors within the FoI will reach to the sink. Geographic routing [15] – [21] has been thought of as a pretty approach in massive scale WSNs as a result of it doesn't need the world topology of a WSN. A sensing element will build routing selections supported the geographic position of itself and its neighbors. The sensing element forwards the sensory information to a neighbor that is neighbor to the sink. This reduces the common hop count. However, geographic routing cannot optimize the amount of hops once a sensing element has no neighbor nearer to the sink. This drawback is understood as native minimum drawback within the literature [15]. The prevalence of the matter may be caused by several factors, like distributed readying of sensors, physical obstacles, and sensing element failures.In this paper, an energy-efficient homogenised route optimization technique in WSNs among obstacles is proposed. the most important contributions add this space square measure as follows:

1) An Energy-efficient homogenised clustering (EHC) technique is projected in WSNs that selects the Devices to form a connected backbone network. EHC could be a distributed technique, wherever sensors build native selections on whether or not to affix a backbone network as a CH or to a member of a cluster. The choice of every sensing element relies on their remaining battery energy an estimate of what number of its neighboring Devices can take benefit of it being a CH. It givesa distributed technique where Devices rotate with time, demonstrating in what way localized sensing element selections result in a homogenized connected global topology.

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2)A Route Optimization Technique (ROT) in WSNs among obstacles is proposed. ROT forms associate degree energy-efficient path between the Devices elite by EHC technique and also the sink. ROT uses shortest path algorithmic rule. What attracts is that it doesn't amend the underlying forwarding strategy of existing geographic routing [16]. ROT works underneath the routing layer and higher than the MAC and physical layers in WSNs.

2.Literature survey:

There is a difficulty in recharging batteries due to limited battery power in an unfriendly environment. So for a long lifespan of WSNs, sensors need to be deployed with a high density. The clustering techniques which are distributed are more convenient in WSNs.Low Energy Adaptive Clustering Hierarchy (LEACH) [11]selects Devices based on a fixed probability so that the CH role can be rotated among the sensors, leading to the balance of residual energy.Based on the idea of LEACH, anumber of protocols have been existing in theliterature [9], [10]. Hybrid Energy-Efficient Distributed (HEED) [13] clustering selects the Devices based on theresidual energy of sensors and a secondary parameter, suchas nearness to its neighbors. SPAN selects Devices based onthe residual energy and number of neighbors [14].

The Devicesform a connected network that is used to forward the data.An Energy Efficient Clustering Scheme allocateslessamount of sensors to clusters with lengthier distances to the sink.A Fuzzy-logic based clustering approach is proposed in [2]. Numerous geographical routing protocols have beenanticipated in recent years to report the local minimum problem in WSNs. For the local minimum problem,perimeter routing technique (PRT) [16], [19], [20] is used in many current solutions. In PRT, as soon as greedy forwarding fails at a local minimum, i.e.,no neighbors closer to the sink, packets have a tendency tobe transmittedalong the hole boundaries. In Greedy Perimeter StatelessRouting (GPSR), greedy forwarding is used initially and when a local minimum problem isreached [16],it shifts to perimeter routing mode. Perimeterrouting mode uses the right hand rule, where packets are sentalongside the edgeanticlockwise on the surface of a planar graph. Theawareness of Hole Avoiding inAdvance Routingprotocol (HAIR) is presented by Jia et al. [19] to go around holes in advance. Packetsare generally routed from sensors to a sink in WSNs. Once a sensoridentifies itself as a local minimum, it requests its neighborsensors to spot itself as a hole sensor. When possible,data packets are directedto non-hole sensors. Li et al. [20] projected aninnovative geographic Hole Bypassing Forwarding (HBF) procedureto discourse the hole diffusion problem in WSNs. This protocol models a hole via a virtual circle whose radiusis flexible within a certain range and is considered on aper-packet basis.

The datarelated with the virtualcircle is castoff for choosing an anchor point to sidestep thehole in order for a packet to reach a specific sink sensor.Anew routing protocol titledGreedy Forwarding with Virtual Destination (GFVD) approach is presented byNguyen et al.The basic idea is that throughout the transmission of a packet, anovel destination termed virtual destination is placedwhen the packet is sent to a fixed sensor. The abstractedholes protocol in [15] usages a disseminated convex hull algorithmto accomplish a persistent path stretch with lesser communicationand storage overhead.

Summary of Existing System:

A number ofgeographic routing protocols have been suggested in recent years to report the local minimum problem in WSNs. To overcome the local minimum problem,most of the current results practice perimeter routing technique. Grouping in WSNs is an effective method for extending the network period. In most of the traditional routing in clustered WSNs assumes that there is no obstacle in a field of interest.

3.Proposed system:

In this paper, first a tree technique in WSNs named energy-efficient homogeneous techniqueis proposed, that selects the routesconferring to a hybrid of their remaining energy.

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Nodes with more residual energy can lead to efficient data transmission. In tree based communication, selection of the route is done based on the residual energy and the hop count.If a route is having higher residual energy and less number of hops,then that route is selected and data is transmitted to the destination through the selected path.A route optimization technique is presented in WSNs among obstacles by means of shortest path algorithm.A network comprises of N sensors, positioned at randomconsistently in a FoI amid obstacles. The sensors arestatic and power-driven by the batteries. In binarydisc communication model,it is presumed that thesensorrepresented by s,can join with furthersensors within the disc of radiusC positioned at s, indicated by A (s, C), where A (s, C) = πC2.Therefore, C signifies the communication range of s. Binary sensorsi and j can connect with each other directly and are recognized as neighbors if the Euclidean distance in the middle of themis less than C.

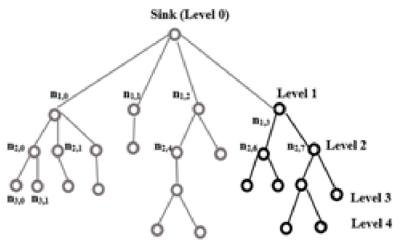

Fig.1 tree based communication model

In this paper, the period from thestart of the network process to the expiry of the first sensorin the network is the lifetime of WSNs. To balance the energy consumption among sensors,the lifespan of WSNs is distributed into rounds. Eachround involves of two stages: decision stage and working stage. At the start of a round, whole sensors take partin the decision stage to form a clustered WSN by means of theEHC technique. In the working stage, the sensory data fromthe sensors in a cluster are transferred directly to their CHwhich then groups and forwards data to other Devices, whichen-route to the sink using ROTs.Tree based communication consists of the following

•Energy updating

•Calculating hop-by-hop energy

•Route selection

•Database management

3.1.Energy Updating:

The sensor devices share their residual energy with all the nodes that are participating in the network.

On the basis ofthis energy, nodes will select the path which is reliable.

3.2.Calculating Hop-by-Hop energy:

As soon as the source node sends RREQ, nodes will check the energy of all its one hop neighbor nodes.Then the node selects the next node, the one having high energy value.All the nodes do the same process.

3.3.Route Selection:

Finally,Destination (final sensor) node receive the RREQ and it knows the energy cost of both hop-by-hop and end-to-end communication.After validating these factors sensor will send Data packet through the high energy path.

3.4.Database management:

In this module, each node stores the available route information and failed node information into the memory.

4.Experimental setup:

This sectionconfers the results from a simulation study of the proposed EHC -ROT and TB implemented in ns 2.34 simulator [22]. Our simulation runson uppermost of the 802.11.4 MAC layer and our simulation parameters are almost alike to those in [17]. There are 100 static sensors, randomly set upin a 1500m ×1500m square-shaped FoI. The sink is placed at the position (932, 111). Initially energy of a sensor is assumed to be 100 J and simulation time is 50seconds.

5.Results:

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Both EHC-ROT and TB work have been tested by using the ns2 simulator and thus,various parameters are verified.

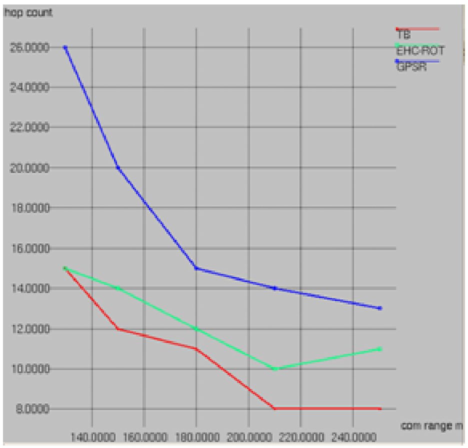

Fig.2 Hop count comparison

The above figure shows the relation between hop count and communication range. The number of hops decreases with increasing coveragearea of sensors, ranging from 130 to 250m and results in a shortest path. Compared to GPSR model, the EHC-ROTand tree based routing(TB) provides less hop count shortest path transmission (Fig.2).

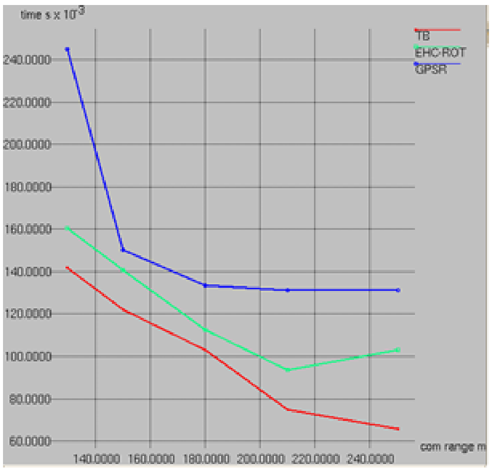

Fig.3 Delay comparison

As a result of less hop count in EHC-ROT and TB, packet delivery delay is significantly reduced,leading to efficient data transmission(Fig.3)

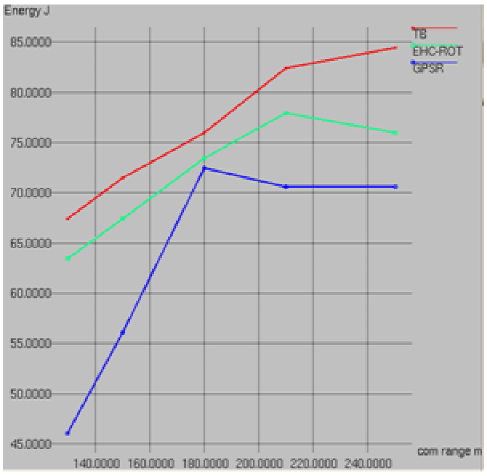

Fig 4 Energy comparison

Figure(Fig.4) shows how much energy is consumed with varying communication range.The nodes can save the energy leveldue to less hop count in EHC-ROT and TB. So the ultimate remaining energy is more than GPSR (Fig.4) and life time is increased (Fig.5)

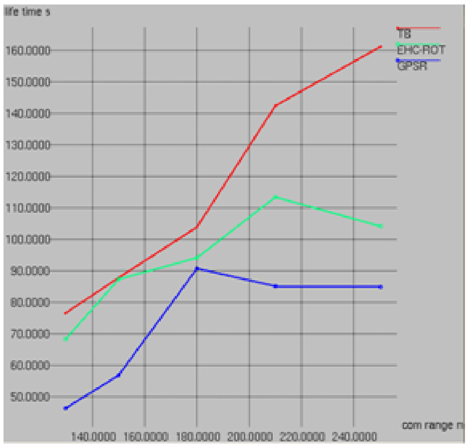

Fig.5life time comparison

The figure (Fig 5) indicates thatas more energy is saved, lifespan of network increases when the communication range increases.

6.Conclusion:

In this paper, a tree technique in WSNs named energy-efficient homogeneous routing techniqueis proposed, that selects the routes according to a hybrid of their residual energy and hop count. The performance of the

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proposed EHC-ROT and TB is simulated forvarious network scenarios and demonstrated that energy consumption, packet delay and hop count are reduced.Therefore, increasing the network lifespan of WSN.The results proved that the geometry and position of the obstacles should be considered to work out an enhanced routing path. Compared to existing GPSR model and the EHC-ROT model, this method worked efficiently. In the future work,mobile sensor devices can be introduced to improve the sensor network life time.

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