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Survey on Development of Energy Efficient Routing Path in Wireless Sensor Network

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Abstract — The WSN (Wireless Sensor Network) in an exceedingly is capable to afford communication between sensor nodes in a restricted area of communication. This communication is healthier and really low-cost as compare to wireless or cellular communication. However open network and restricted battery power are some constraint because of that their full deployment is not possible. In WSN all the nodes are operating in a very open surroundings with none interference of any authority that's why security is usually conjointly affected. In WSN nodes are power forced, for the reason that nodes has operated with limited battery energy or power. If some nodes die early because of lack of energy, they cannot communicate with one another. Therefore, immoderate consumption of nodes energy ought to be prevented. In reality, node energy utilization ought to be balanced so as to extend the energy awareness of networks. As we have a tendency to mention the most constraints in sensor networks is a lot of chance of node failure is due to energy uncertain depletion. So, if some nodes die early then these nodes {are conjointly affected to other nodes due to lack of energy also they cannot communicate with one another. Therefore, excessive consumption of nodes' energy ought to be prevented through completely different proposal of authors that employment on reduces energy consumption for better utilization in communication. In this synopsis really we tend to review the some latest and effective analysis work of some authors that offers the contribution in analysis are for rising the life time of WSN. The proposed energy efficient routings reduces the energy consumption and reduces energy consumption. The previous proposed nodes energy consumption should be steadiness so as to increase the network period of time.

Keyword — component; formatting; style; styling; insert

1. INTRODUCTION

The wireless network is that the network during which the communication between the sender and receiver is feasible with none physical link. The signals are flying on the air and also the devices that settle for it perform their operation. The signals are broadcast in a very limited range if the causation or receiving device is on the far side the restricted vary then communication isn't doable [1]. The wireless signals also are affected from natural effects of seasons like processing of fast wind and significant rain. There are two kind of wireless networks, i.e., infrastructure-based wireless networks and Wireless Sensor Networks with back bone and without back bone. A WSN is deliberated to trounce the natural limitation of wired backbone networks and infrastructure based mostly wireless networks. The network may be a collection of sensor nodes share a wireless channel and dynamically forming a short lived topology while not the existence of network infrastructure or centralized administration. The wireless and wired networks don't seem to be attainable to make rapidly in essential circumstances like serious flooding earthquake etc. the most advantage of WSN is to simply established at anyplace for communication to next node or detector. Due to the restriction of transmission range, every sensor node will solely communicate with neighbor nodes inside its radio coverage space besides, forwarding packets for different nodes; it conjointly acts as a router for taking routing selections and forwarding packets to destination or different neighbor. WSN also are known as multi-hop wireless networks as a result of any message or data transmitted from a source node to a destination node unfeasible directly communicate. It's going to also possible through many intermediate nodes, which needs multiple interconnected hops. A Wireless Sensor Network (WSN) may be an assortment of nodes that come together to form dynamically network with no fixed infrastructure support or centralized supervision [1]. For a supply to send data packets to a destination that's not in its direct range of transmission, the packets should be relayed through one or a lot of intermediate nodes [2].

In wireless sensors networks because of potentially uncertain and dynamic environments, there are general challenges in data processing, communication, and sensor management. Also with energy and bandwidth constraints, sensor networks have additional technical challenges in network control and routing, data processing, querying, and tasking.

The WSNs must deal with resources like energy, bandwidth, and the processing power, which are dynamically changing, and the system should operate autonomously, changing its configuration as required [3].Since communication links are unreliable and shadow fading may eliminate links, the software and system design should generate the required reliability [4], [5]. This requires research into issues such as network size or the number of links and nodes needed to provide adequate redundancy. In the routing protocols depending on the applications, the communication distance and energy must be well managed.

CLASSIFICATION OF WSNs ROUTING PROTOCOLS

Routing is a mechanism of discovers a path at the time of data transmission from source node to destination node. Mostly the network layer of WSNs is applicable to perform the transmission data routing. In the multi-hop network, generally, data from the source cannot reach directly to the sink node. Thus, the intermediate sensors broadcast and transmit data packets. The performing of routing tables [7], which including the list of preference nodes for transmit data to the destination, gives the solution. Structure and development of routing table is the role of routing algorithms.According to organizing the of routing protocols of WSNs can be categorized in

- **Proactive routing protocols [6]** are accurate and keep up certain routing tables of all network sensors, with broadcasting nodes at the fixed time intervals. Before any requirement of nodes information, all tables are updated. In the both type of flat and hierarchical network architecture can use proactive routing. This type of routing is capable to estimate optimal path, so, hierarchical proactive routing is applicable for large networks. But there is disadvantage of overhead for this amount of estimation.

- **Reactive routing protocols [6],** according to the request, the compute route take place and do not keep up the information of all nodes of network. Depend on the query concerning the route is discovered, and reverse path is used for transfer information from destination to source. In case of any failure path, re-computing the route will be solution. In this type of routing protocol, communication overhead decrease by flooding on networks.

- **Hybrid routing protocol [6]** is used for large networks. It adapts clustering techniques and uses both ideas of proactive and reactive protocols. The network divides into several dynamic clusters, and there is possibility of adding or leaving nodes from clusters. The proactive routing performs within the clusters, and establishes reactive routing across the clusters for communication between nodes. This type needs clusters managing.

ENERGY AWARE ROUTING

The main aim of using this technique is to conserve power and ensure increase in the node and network lifetime by carefully sharing the cost of routing packets. This can be achieved by considering different metrics such as minimizing energy consumed, maximizing time to network partition, minimizing variance in node power levels and minimizing cost or packets.

- **Minimize energy consume/packets:** it can be easily calculated that this metric will minimize the average energy consumed per packet. It can also be checked that the routes selected will be identical to that of routes selected by shortest hop routing while using this metrics for light loads [8]. But this metric may tend to route packets around the congested areas when one or more nodes are heavily loaded in the shortest path. This may lead to drawback of this metric by having widely differing energy consumption profile.

- **Maximize time to network partition:** This may not be the optimized metric to use if it is to maintain low delay and high throughput simultaneously [8]. This metric depends on the max-flow min-cut theorem, where the minimal set of nodes that would cause the network partition could be found. Therefore the routing technique should divide among these nodes to maximize the life of the network. We should make sure that these nodes drain their power at equal rates failing which causes the in maximizing network partition time while minimizing the average delay since nodes in different partition determine routes independently.

- **Minimize variance in node power levels:** this metric treats all nodes in the network equally and avoids penalizing one more than other. The goal of the metric can be achieved by using the policy called 'join the shortest queue' as this helps in solving the similar problem of load sharing in distributed systems. However if all the packets are of same length then equal power drain can be achieved by choosing next hop in round-robin fashion.

- **Minimize cost/ packets:** This metric helps to achieve the goal of maximizing the life of all nodes in the network. The care should be taken while using this metric that the paths selected and nodes in that path with depleted energy reserves should not depend on many paths [8]. The advantage of using this metrics is we can increase the time of network partition and reduce variation in node cost, effects of network congestion can be incorporated and it is possible to

use the battery characteristics directly into routing protocol.

ENERGY EFFICIENT ISSUE

In a cellular network, a reduction in the number of active mobile nodes will reduce the amount of signal interference and channel contentions. However, the mobile nodes in Wireless Ad hoc Network need to relay their packets through the other mobile nodes toward the intended destinations, a decrease in the number of participating mobile nodes may lead to the network disconnected, thereby hurting the performance of the network. To prolong the lifetime of each mobile node in the network [9] as well the entire network itself, an ad hoc routing should take into account both the energy consumption at each mobile node and the total energy consumption for each connection request carefully. The effect of using it for a longer period is that the energy of the nodes along the chosen path may be quickly exhausted. If the node's energy is quickly exhausted that may result in the network being partitioned affecting the information delivery even though there might still be enough energy to some of the nodes. Therefore, energy should always be considered during energy-awareness routing that confirm the guaranty of nodes with low energy in the network stay alive. The energy consumption parameters [9] are drain the network energy is as follows:

a. Energy drains when packet sends in network.
b. Energy drains when packets receive in network.
c. Energy drains when nodes are sensing in network.
d. Energy drains when nodes are in idle mode.

Energy consumption measurements studies, determine the power consumption patterns in the different active modes. However, these studies did not directly address cases of repeated resending of control packets that may happen due to glitches in the transmission operations over the wireless communication channels. The retransmission is not in the favors of idle battery consumption.

Energy saving is important and necessary. Therefore it is imperative that at any moment some specific number of nodes be a live (sufficient energy for communication) and the rest remain is in sleep mode. We keep number of live nodes in desirable way, so network lifetime will be prolonging by far. If live nodes can cover desirable level of network, less number of live nodes will be required in total network and will not be the empty space of live node [9]. The balancing of energy consumption of nodes are aware the network about the energy status of nodes. Therefore the energy consumption is reduces.

2. LITERATURE SURVEY

Adnan Ahmed, Kamalrulnizam Abu Bakar, Muhammad Ibrahim Channa, Khalid Haseeb, and Abdul Waheed Khan [1]"TERP: A Trust and Energy Aware Routing Protocol for Wireless Sensor Network" In this title we present a trust and energy aware routing protocol (TERP)that makes use of a distributed trust model for the detection and isolation of misbehaving and faulty nodes. Moreover, TERP incorporates a composite routing function that encompasses trust, residual-energy, and hop counts of neighbor nodes in making routing decisions. This multi-facet routing strategy helps to balance out energy consumption among trusted nodes, while routing data using shorter paths. The simulation results demonstrate reduced energy consumption, improved throughout and network lifetime of TERP when compared with the existing work.

Stefanos A. Nikolidakis, Dionisis Kandris, Dimitrios D. Vergados and Christos Douligeris [2] "Energy Efficient Routing in Wireless Sensor Networks through Balanced Clustering" in this title a new protocol called Equalized Cluster Head Election Routing Protocol (ECHERP), which pursues energy conservation through balanced clustering, is proposed. ECHERP models the network as a linear system and, using the Gaussian elimination algorithm, calculates the combinations of nodes that can be chosen as cluster heads in order to extend the network lifetime. The performance evaluation of ECHERP is carried out through simulation tests, which evince the effectiveness of this protocol in terms of network energy efficiency when compared against other well-known protocols.

Sangita Khatkar[3] "Routing Protocols for Wireless Sensor Networks: A Study" In this title we are presenting a survey of routing protocols in WSN. Broadly, Routing protocols are classified in to three categories namely: Data Centric protocol, Hierarchal Routing protocol and Location Based routing protocol. We also study the trade-off between energy and communication overhead savings along with the advantages, disadvantages and performance issues in comparison to each other. In this title, we first discuss the system architecture of the sensor network, then describe the some routing protocols for the sensor networks and finally give the comparison between them.

Monica R Mundada, Savan Kiran , Shivanand Khobanna, Raja Nahusha Varsha and Seira Ann George[4]"a study on energy efficient routing protocols in wireless Sensor networks" In this title we present a survey of state-of-the-art routing techniques in WSN sender all the three categories. We epitomize these routing techniques and bring out the advantages and disadvantages followed by their application domain. The title concludes with issues open for research.

Shitao Yan, and Mianrong Yang [5] "Research on analysis routing protocol for wireless sensor networks" This title discusses the analysis and evaluation of routing protocols in wireless sensor network, routing protocol for wireless sensor network based on the topology structure can be divided into planar and hierarchical. WSN communication protocol stack can be divided into

physical layer, data link layer, network layer, transports layer and application layer. Finally this title introduces the typical algorithm for planar and hierarchical routing protocols and experiment and Simulation of routing protocol for wireless sensor networks.

Honey A. Soni, and Ashish D. Patel [6] "Energy Efficient Routing Protocols for Wireless Sensor Networks: A Survey" In this title, Energy is the vital resource in the life of a wireless sensor node. So, its usage must be optimized to extend the network life. Routing protocols should also be concerned about the overhead energy which is wasted at each hop during data transfer. Main Feature of routing protocol, I n order to be efficient wireless sensor networks, is the energy consumption and the extension of the network's life. There are many routing protocols such as flat based, location based, multipath based, hierarchical based etc. Clustering issued to increases the lifetime of the wireless sensor networks. Clustering is the process where sensing region is divided in groups to balance the energy level of clusters. Energy is the main consideration when we analyze routing protocol of wireless sensor network. A review on popular hierarchical based routing protocols such as LEACH, PEGASIS, TEEN etc considering the various aspects of Wireless Sensor Networks.

Yasir Arfat, Riaz Ahmed Shaikh[7] "A Survey on Secure Routing Protocols in Wireless Sensor Networks" in this title, our contribution is threefold. Firstly, we have summarized the network layer routing attacks on WSNs. Secondly, we have provided taxonomy of secure routing protocols of WSNs. Thirdly, and we have provided a qualitative comparison of existing secure routing protocols. Results show that most of the existing secure routing schemes are not very efficient due to various reasons like high-energy consumption, and large communication overhead.

3. PROPOSED SCHEME

The energy at the network layer can be conserved by reducing the energy consumed for two main operations, namely, communication and computation. The communication related power consumption is mainly due to transmit-receive module present in the nodes. Whenever a node remains active, that is, during transmission or reception of a packet, power gets consumed. Even when the node is not actively participating in communication, but is in the listening mode waiting for the packets, the battery keeps discharging. The computation power refers to the power spent in calculations that take place in the nodes during routing and power adjustments.

Proposed Solution for Energy Consumption in WSN

Wireless Sensor Networks are power constrained since nodes operate with limited battery energy. If some nodes die early due to lack of energy, they cannot communicate with each other. Therefore, inordinate consumption of nodes' energy should be prevented. In fact, nodes energy consumption should be balanced in order to increase the energy awareness of networks. Here we proposed a new energy aware deterioration scheme in WSN. In this scheme we set a threshold value for energy consumption by mobile nodes in our network. If the energy level of any node/s in the network reaches to threshold level that are not participated in communication means it will be inactive in the network. According to our proposed approach a new energy aware deterioration routing to make aware our network about the energy of nodes by that we remove the problem of suddenly loss of session to recognize the unfaithful nodes and extend the life cycle of network. Energy aware deterioration routing scheme deals with efficient utilization of energy resources. By controlling the early depletion of the battery, adjust the power to decide the proper power level of a node and incorporate the low power strategies into the protocols used in various layers of protocol stack. There are little issues and solutions which witnesses the need of energy aware routing in Sensor wireless networks.

As we have shown earlier, idle energy consumption constitutes a significant percentage of the overall energy consumed by the wireless interfaces of network nodes. Therefore, reducing this energy should be a cornerstone in any energy conservation efforts. As will be seen, our proposed algorithm, addresses the issue of idle energy consumption in a manner fair to all network nodes. Different nodes are given equal opportunities to conserve idle energy. When idle energy is addressed, another factor remains that may still affect energy fairness within the network. The main objective is to extend the useful service life of a Sensor network. We are using the following formula to solve the problem of finding a route ,at route discovery time t, such that the following cost function is minimized:-

$$C(\pi,t) = \sum_{(i\in\pi)}[\![C_i(t)]\!]$$

Where $C_i(t) = \rho_i[\![F_{i/Ri(t)}]\!]^{\gamma}$

$\rho_{i=}$ Transmit power of node i.

Fi = Full charge capacity of node i

Ri= Remaining battery capacity of node i at time t.

γ= Transmit connection request to all reachable neighbour nodes.

The route discovery for Function with AODV is described below.

The proposed algorithm helps address these issues. It provides the underlying routing protocol with the capability to make and implement routing decisions that take into consideration the energy state of the nodes that can be used for routing traffic. This can transform the existing routing algorithm into an energy-conscious one. This strategy helps to maximize the lifetime of network nodes and hence the network operation as a whole.

The main goals of the proposed energy Scheme can be summarized as follows:

- Fair energy conservation via:
  - Rotating sleep periods equally among network nodes thus giving nodes equal opportunity for reducing energy consumption
  - Assisting routing algorithms in making routing decisions based on energy fairness
- Little impact on network operation, for example, EADR introduces slight or no additional traffic or energy cost.
- Distributed processing of the algorithm which ensures robust operation that is not affected by the failure of one or more nodes.
- Modular nature which facilitates integrating it with existing routing algorithms.

4. CONCLUSION

The nodes in WSN are really freely moves in an exceedingly close area and at any time any other node leaves or is a part of the dynamic network without any restriction of administration or centralized authority. The sender nodes are forming dynamic link with surrounding nodes that are forwarded or receive the data with destination. The nodes are completely doable to move in the network inside or outside the network. Every communication in WSN consumes lot of energy and this energy is wasted because of noise, link breakage and out of range. The proper energy of mobile sensor nodes are mustn't exhaust till and unless without any problem in internal circuit. In this synopsis discuss the overview of routing protocol with completely different energy consumption theme of previous authors. The right energy economical routing provides the less dropping of information packers and by that the retransmission of information packets are minimizes and energy is utilized properly. The proper energy economical routing provides the less dropping of information packers and by that the retransmission of information packets are minimizes and energy is employed properly. This synopsis also point out various analysis during this field is provides the fundamental concepts of innovative analysis in field of WSN. These analysis work is provides the data regarding the work in field of energy efficient issue. Each analysis contribution in field of energy is effective and enhancement and modification also may be provides better results as compare to existing analysis or previous analysis in WSN. The highlight of recent and helpful analysis is useful for building some new analysis in vast networking area.

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