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A Review of Energy Efficient Routing Protocol In WSN

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Abstract— This paper provides energy efficient for Multipath routing in wireless sensor network in order to improve the energy efficiency and network lifetime. In the existing system single path routing schemes may not be optimal to maximize the network lifetime and connectivity. Energy Efficient Routing Protocol (EERP) algorithm is used in Multipath routing technique, which improves the network lifetime by selecting the multiple paths to deliver data from source to destination. When a node detects the target it broadcasts the alarm message to its neighboring nodes. The results show that proposed system improves the efficiency and network lifetime which is better than recently developed algorithm.

Index Terms—Energy efficiency, target prediction, multipath routing, Energy Efficient Routing Protocol (EERP)

I. INTRODUCTION

In wireless sensor networks, many reasonably priced and small sensor-rich devices are deployed to monitor and control the environment. Sensor networks (WSNs) are increasingly being envisioned for collecting data, such as environmental properties, from a geographical region. WSNs are composed of a large number of low cost sensor nodes, which are typically capable of sensing, computing, and communication. The applications of WSNs can be found in diverse areas such as military (e.g., battlefield surveillance), environmental protection (e.g., habitat monitoring), healthcare and home automation.

Target tracking is the one of the most important applications in wireless sensor network. Since nodes often run on batteries that are generally difficult to be re-energized once deployed and energy efficiency is a critical feature of WSNs for extending the network lifetime. Inoperative listening is a major source of energy waste in target tracking applications. To reduce the energy consumption for the duration of idle listening, duty cycle is one of the commonly used approaches. In duty cycling to put the nodes in sleep state and only wake them periodically. In sleep scheduling nodes forced to sleep or awakened on demand. Tracking performance loss caused by duty cycling and sleep scheduling, here the proactive awake up for awakening nodes proactively to prepare for approaching the target.

Target prediction scheme based on both kinematics based prediction and probability based prediction. Probability based prediction predicts a target's next location and it moves along all the directions. In this paper, present an energy-aware for Multi-Target Tracking and Multipath routing protocol. Multi-target tracking is a representative real-time application of sensor networks as it exhibits dissimilar aspects of sensor networks such as event detection, communication, sensor management, sensor information fusion, and real-time decision making. The applications of target tracking using sensor networks include surveillance, disaster response system, pursuit evasion games, distributed control and other location based services.

Improve the energy efficiency throughout a sleep scheduling move toward that is conscious of concurrently tracking multiple targets. In the practical wake-up mechanism for objective tracking, a node that detects a target it broadcasts an alarm message to activate its neighbor nodes toward preparing them to track the forthcoming target. Once the routes of multiple targets interfere with

each other, some nearest nodes of a root node may have already been activated by another root node's alarm broadcast.

Improve the network lifetime in Energy Efficient Routing Protocol to minimize and balances the energy consumption well along with the sensor nodes. Multipath Energy Efficient Routing protocol its main goal is to consume energy optimally.

The paper makes the subsequent contributions:

- A multipath search algorithm to discover multiple paths between sources and sink nodes.
- Keep a set of good paths and choose one based on node state the cost function of this path.
- The path selection is done using the minimum energy communication over the network nodes.

A. Issues and Challenges of WSN

1) Energy Efficiency

Efficient energy use, sometimes simply called energy efficiency, is the goal to reduce the amount of energy required to provide products and services.

2) Accuracy

The accuracy of a measurement system is the degree of convenience capacity of an amount to that quantity's actual value.

3) Scalability

It is the ability of a computer application or product to continue to function well when it is changed in size or volume in order to meet a user need.

4) Security

Security is the degree of resistance or protection from, harm. It applies to any valuable asset, such as a person, residence, community, nation or organization.

5) Deployment

Deployment means setting up an operational sensor network in a real world environment.

In Wireless Sensor Network there are many challenges in which energy efficiency is the most important. In the existing system the energy efficiency is less because all the sensor nodes are mostly in active mode. Hence multiple target tracking method and Energy Efficient Routing Protocol method is proposed that would improve the performance and network lifetime of wireless sensor network in terms of energy efficiency.

The rest of the paper is organized as follows: Related work is discussed in section 2. In section 3, more details about the methodology of the proposed system are described. In section 4 experimental results are described. Conclusion presented in section 5.

II. RELATED WORKS

Y. Zhuang, J. Pan, and L. Cai proposed an Minimizing Energy Consumption with Probabilistic Distance Models [5]. The energy consumption has a prolong lifetime of wireless sensor network and minimize energy cost .In grid-based clustering model calculating average distance between two communicating sensors. Once the grid structure is established nodes can communicate locally with their grid head and reach the data processing center, or the sink node, through neighbor grids. Distance distribution model based on geometric properties of grid-based clustering. The grid size is

closer to the sink and smaller of the cluster. The drawback of this method is forwarding the node can communicate not only with the nodes in their immediate neighbor grids, but also the nodes further away towards the destination and also reduces the number of hops needed to reach the destination.

S. Saqaeeyan, M. Roshanzadeh proposed a system for IEATH: Improved Energy Aware and Two Hop Multipath Routing Protocol in Wireless Sensor Networks [3]. In Wireless sensor networks in terms of energy sources are restricted, due to this type of network infrastructure wireless communications and channel errors not possible to reach the correct packet to the destination. Energy-efficient route discovery and relaying of data from the sensor nodes to the sink the lifetime of the network is maximized. The proposed algorithm is to improve the quality of services in these networks and sending packets. Multipath forwarding method is used to ensure that a packet of information sent to the destination. Routing decisions based on information nodes are located in the two jumps. Enhancing the reliability of data transmission by using a hybrid method. The results show that the rate of release of data packets reduced in this way and thus the reliability of packet is increased, also the energy efficiency of sensor nodes effectively improved. Therefore this algorithm increase overall lifetime in wireless sensor networks.

C. Sengul, M.J. Miller, and I. Gupta proposed an Adaptive Probability-Based Broadcast Forwarding in Energy-Saving Sensor Networks [1]. In Probability-Based Broadcast Forwarding (PBBF), can be used in conjunction and it exploits the redundancy in broadcast communication and forwards packets using probability based approach. The goal of performance is to evaluate the PBBF in terms of its ability to tune latency, energy, and reliability of broadcast .The main goal of PBBF is to provide application designers tradeoff knobs, p and q, to achieve the desired operation points in terms of energy, latency, and reliability. The drawback of this method is to minimize resource usage to optimize performance metrics such as latency and reliability and reduce the energy consumption for proactive wake up and in duty cycling puts nodes to sleep and wake periodically.

Y.M. Lu and V.W.S. Wong proposed an Energy-Efficient Multipath Routing Protocol for Wireless Sensor Networks [6]. In multipath routing protocol is used to find multiple disjoint paths between a pair of sink and source nodes. Multi path routing has three phases, the initialization phase, the paths search phase, and the data transmission and paths maintenance phase. In initialization phase, each node will have the sink table and the neighboring node table updated. Each node then broadcasts a connectivity message to its immediate neighbors. The path search phase is initiated when a set of nodes detect the incentive and the selected source node begins to send the aggregated data to the sink node. In Data Transmission and Paths Maintenance Phase after multiple paths are discovered, the source node begins to transmit data packets with the assigned rates on each path. The node energy consumption measures the average energy dissipated by the node in order to transmit a data packet from the source to the sink. The drawback of this method is to improve the integration of data aggregation and support the node with limited mobility and to improve the scalability and increase the energy efficiency in multipath routing protocol.

Saira Banu, R.Dhanasekaran, proposed A New Multipath Routing Approach for Energy Efficiency in Wireless Sensor Networks [4].In Wireless Sensor Networks (WSNs), sensors nodes are ordered randomly. Routing in the wireless sensor networks is a challenging assignment. This assignment may lead to a number of routing protocols which effectively use the limited resources available at the sensor nodes. Here all the routing protocols are attempt to find the optimal path. In order to determine the alternative path quickly, there is need to reduce energy path and time. The New Multipath Routing Approach (NMRA) is used to increase the energy efficiency in WSNs. It consists of three phases. In first phase, the multipath routing is constructed to create a set of neighbors that address all nodes that are able to transmit data from the source. In second phase, the optimal energy path is established to estimate minimum energy consumption that aim is to maintain the data packet

flow in the wireless sensor network unobstructed. In third phase, the energy consumption model is developed where residual energy consumption is increased using energy model. The proposed NMRA achieves better delivery ratio, improved network lifetime and less delay.

Ming Tao, Dingzhu Lu, Junlong Yang, proposed an Adaptive Energy-aware Multi-path Routing Protocol with Load Balance for Wireless Sensor Networks [2]. An adaptive energy-aware Multi-path routing protocol with load balance (AEMRP-LB) introduces a concept named direction-angle to overcome the deficiency of broadcast and takes into account the tradeoff between the residual energy and hop count to establish multiple node-disjoint paths. The traffic load is balanced over the selected paths by using a weighted traffic scheduling algorithm considering their transmitting capacity, and then AEMRP-LB uses the advantages of Multi-path Source Routing to report the acquired data as saving the computing and storage resources of the sensors. In the scene with multiple Source-Sink pairs, AEMRP-LB can adaptively adjust the available residual energy of shared nodes so as to make reasonable use of them. AEMRP-LB performs the two comparative schemes, and the sensors consume the energy in a more equitable way which ensures a more graceful degradation of service with time.

III. METHODOLOGY

To design a system which provides energy efficient multiple target tracking in wireless sensor network in order to improve the energy efficiency. In Multiple Target Tracking method the Markov Chain Monte Carlo algorithm is used to improve the efficiency. Multiple Target Tracking method can track multiple nodes simultaneously and detect the target. When a node detects the target it broadcast the alarm message to its neighbour's nodes. These neighbour nodes awaken the nodes and keep them active. After reducing the number of awakened nodes, the energy efficiency can be enhanced. In this scheduling all awakened nodes would be in active state and efficiency of proactive wake up would be enhanced.

Multi-target tracking is a real time application of sensor networks such as event detection, sensor information fusion, multihop communication, sensor management, and real-time decision making. In Multiple Target Tracking method, the current state of the node is calculated using target prediction method. Target prediction method is based on both kinematics based prediction and probability based prediction. Kinematics based prediction calculates the expected displacement of the node and probability based prediction calculates the probability models and deviations. After calculating the target prediction, a Multiple Target Tracking method is used to detect the target and it broadcast alarm message to its neighbor nodes. Some of the neighbors can only detect the target with low probability, and some of neighbors can never detect the target. Then, energy consumed for being active on these nodes will be wasted. MTT then precisely selects the nodes to awaken, so as to improve the energy efficiency for proactive wake.

A Flow diagram shows the sleeps scheduling and awakened node reduction in Figure1.

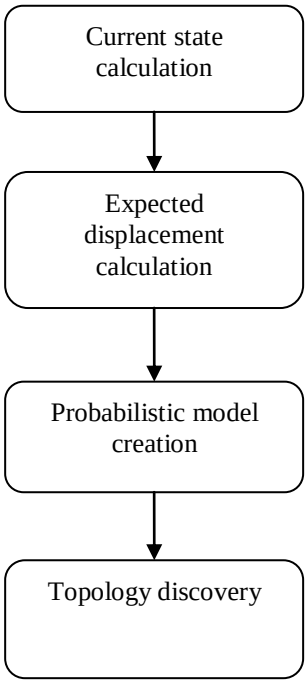

Fig.1 Flow Diagram

To increase the network lifetime Energy Efficient Routing Protocol minimizes and balanced the energy consumption well among the sensor nodes. Multipath energy efficient routing protocol its main aim is consume the energy optimally. And Energy Efficient Routing Protocol keeps a set of good paths and chooses one based on the node state and the cost function of this path. Multi path routing is an alternative routing technique, which selects the multiple paths to deliver data from source to destination. Multiple path routing technique that combine transmission energy reduction and the distribution of this energy over the entire network.

A. Current state calculation

In current state calculation, the current state of the node is determined. When a node detects a target, the node check its own status to determine whether it is an awakened node in an existing awaken region. If yes, the node leaves from the current awaken region. If no, previous awaken region would exists. Calculating the target movement status is a continuous function of time but the estimation for a target movement status is a discrete time process. The surveillance system can only estimate the target status at some points, and predict the future motion of the target.

Ad hoc on demand Distance Vector (AODV) routing protocol is used to calculate current state of the node. AODV protocol is intended to accommodate networks that are large as several nodes. These nodes are communicated with sink nodes. And the current state of the node is calculated and it includes hello message exchange in local time synchronization.

When a node detects the target, the target moves close to the edge of the current awake region and broadcasts an alarm message to wake-up neighbors. Then the nodes keeps active without sleep scheduling operations, and an awaken region remains unchanged. In sleep delay, the target may move away from the alarm node to another node within a distance to wake up. After reducing the number of awakened nodes, energy efficiency can be enhanced by scheduling the sleep patterns of awakened nodes.

B. Multiple Target Tracking

Multiple-target tracking method is used to find tracks from the noisy measurements and the sequence of measurements associated with each target. It reduces to a set of state estimation problems. Markov chain Monte Carlo algorithm can track an unknown number of targets in real-time. It has been shown that MCMC is computationally efficient compared to the Probability based Prediction and Sleep Scheduling method. It is suitable for sensor networks since it can autonomously initiate and terminate tracks. Since transmission failure is another form of missing observation, MCMC is robust against transmission failures. Multi target- tracking algorithm for sensor networks can systematically track an unknown number of targets in the presence of false alarms and is robust against transmission failures.

Compared with the AODV protocol and multiple targets tracking method for MCMC algorithm is improved the performance loss. Here the experimental results show that MCMC achieves the better efficiency with Ad hoc protocols.

C. Topology discovery phase

In topology discovery phase the sink node initiates the connection by flooding the network in the direction of the source node. The flooding occurs in order to generate network topology and find all the routes from source to destination and their energy costs, and built up the neighbor information table for each node. It also set distance field to zero before sending the signalization packet.

4. EXPREMENTAL RESULTS

In Multiple target tracking method the current state of the node is calculated. The mobility nodes are created first in the scenario. Fig.2. Routing path of data (source to sink) running scenarios of 30 nodes for improved the performance of node.

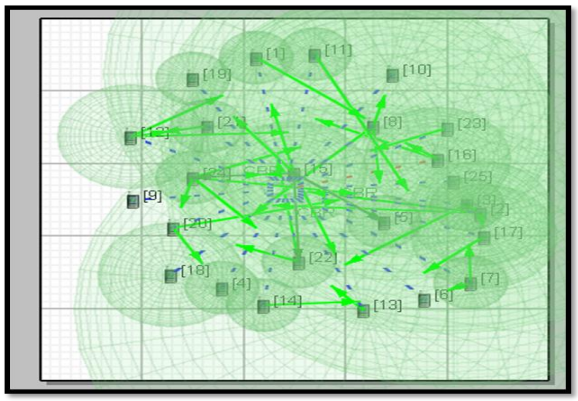

Fig. 2. Running stage

In Multipath routing method to select multiple paths to deliver data from source to destination. The mobility nodes are created first in the scenario. Fig.3. Routing path of data (source to sink) running scenarios of 40 nodes for maximizing the lifetime of node.

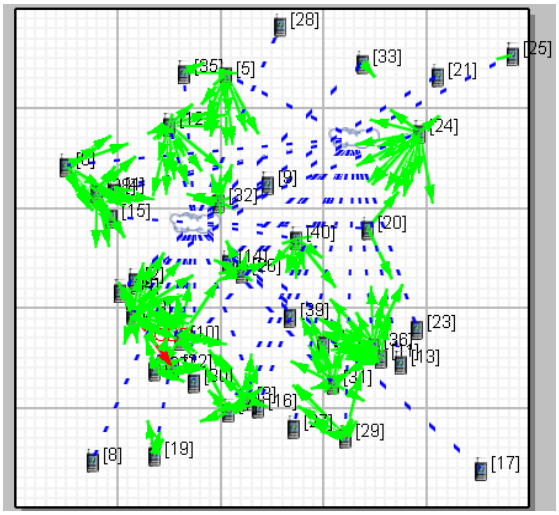

Fig.3 .Running stage

Compared to the AODV method, MCMC algorithm provides more effeciency and Energy Efficiency Routing Protocol improves the network lifetime of node. Then calculate the packet delivery ratio to the number of packets send in client side and the number packets received in sever side.

The packet delivery ratio is the ratio of the number of delivered data packet to the destination to the number of data packets send. This illustrates the level of delivered data to the destination shows the Fig.4.

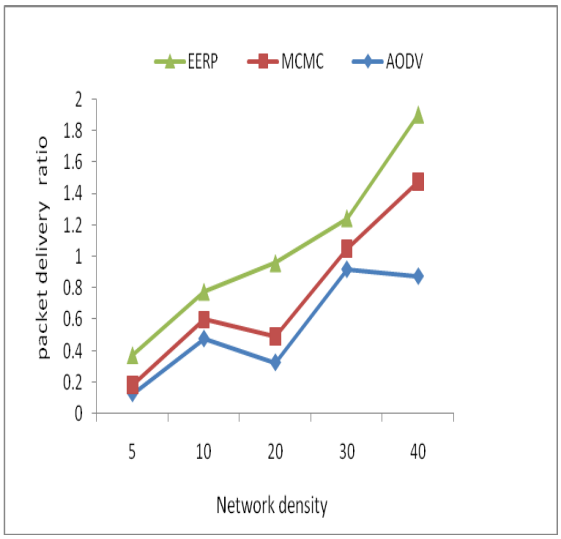

Fig.4.Packet delivery ratio

Fig.4 shows that the packet delivery ratio of the AODV is less compared to the packet delivery ratio of the MCMC and EERP.

Fig.5 calculates the Jitter is the variation in latency as measured in the variability over time of the packet latency across the network.

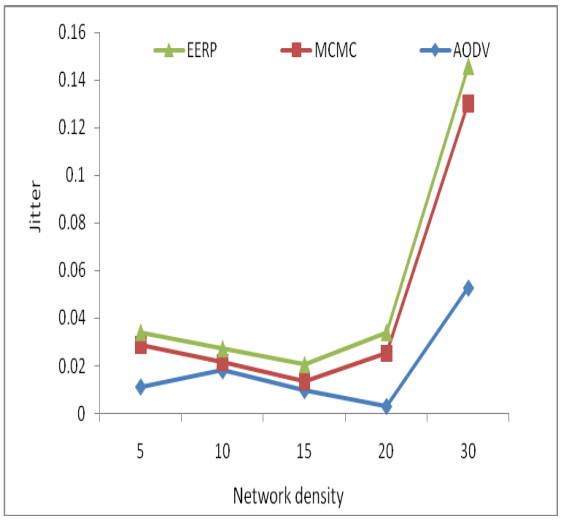

Fig.5.Jitter

Fig.5 shows that the average Jitter of the AODV is less compared to that of MCMC and EERP.

Fig.6 shows the End to End delay : the average time taken by a data packet to arrive in the destination. It also includes the delay caused by route discovery process and the queue in data packet transmission. Only the data packets that successfully delivered to destinations that counted. ∑ (arrive time – send time) / ∑ Number of connections

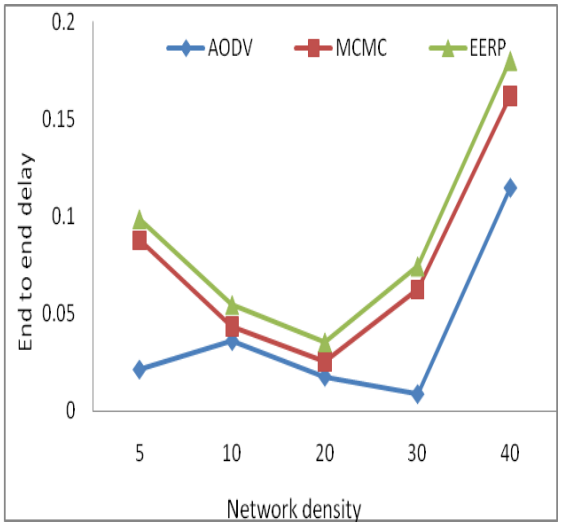

Fig.6.End to End delay

Fig.7 shows the Throughput of the packet Measuring the maximum data throughput in bits/sec and transfer a large file from one system to another system and measure the time required to compete the transfer or copy file

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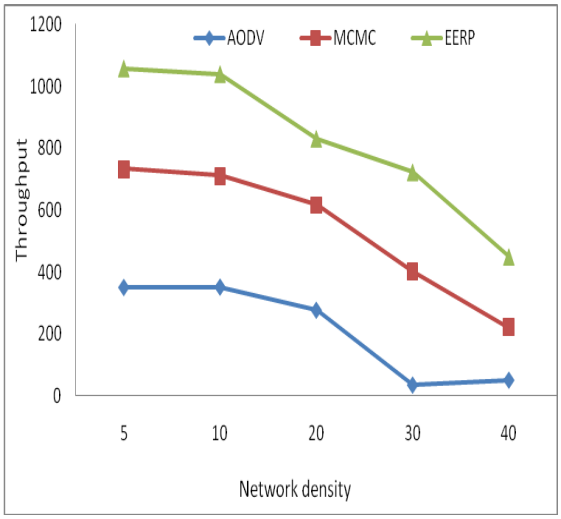

Fig.7.Throughput

Fig.7 shows that the throughput of AODV is less compared to that of MCMC and EERP.
From the above analysis, it is found that

- MCMC and EERP protocol delivers more packets then AODV protocol
- End to End delay of MCMC ana EERP is less than AODV protocol
- MCMC and EERP provides improved throughput and Jitter when compared to AODV

Hence it is proved the better energy efficiency is achieved using MCMC and network lifetime is increased in EERP.

When comparing with AODV protocol, multiple target tracking for MCMC algorithm provides more efficiency and EERP increse the network lifetime.

IV. CONCLUSION

Multipath routing is an energy efficient method to route data in WSN. Energy efficient routing protocol main goal is to consume energy optimally. EERP each node has the number of neighbors through it can route packets to the base station. EERP improves the energy efficiency and network lifetime. From the performance analysis, it is been found that MCMC improves energy efficiency.

REFERENCES

[1] B.Sengul, M.J. Miller, and I. Gupta, "Adaptive Probability-Based Broadcast Forwarding in Energy-Saving Sensor Networks" ACM Trans. Sensor Networks, vol. 4, pp. 6:1-6:32, Apr. 2008.
[2] Ming Tao, Dingzhu Lu, Junlong Yang," An Adaptive Energy-aware Multi-path Routing Protocol with Load Balance for Wireless Sensor Networks" Wireless Pers Commun , 63:823–846,2012.
[3] S. Saqaeeyan, M. Roshanzadeh, "IEATH: Improved Energy Aware and Two Hop Multipath Routing Protocol in Wireless Sensor Networks" I. J. Computer Network and Information Security, 5, 22-28,2012.
[4] Saira Banu, R.Dhanasekaran, "A New Multipath Routing Approach for Energy Efficiency in Wireless Sensor Networks"
[5] International Journal of Computer Applications (0975 – 8887)Volume 55– No.11, October 2012.
[6] Y. Zhuang, J. Pan, and L. Cai, "Minimizing Energy Consumption with Probabilistic Distance Models in Wireless Sensor Networks," Proc. IEEE INFOCOM, pp. 1-9, Mar. 2010.
[7] Y.M. Lu and V.W.S. Wong, "An Energy-Efficient Multipath Routing Protocol for Wireless Sensor Networks: Research Articles," Int. J. Comm. Systems, vol. 20, no. 7, pp. 747-766, 2007.

