Multi-Criteria Multi Path Routing Protocol using Fuzzy Cardinality Priority Ranking

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Abstract

This paper addresses an energy issue which is a deadly weakness in wireless sensor networks. Their restricted battery power limits the network utility. However, a purpose can be solved if current limited energy is used optimally. In this paper by using the present resources efficiently, a novel multi path routing technique is proposed in which multiple criterions: delay, hop count, and energy are considered for decision making. This algorithm uses greedy approach for calculating possible multi-routes and fuzzy cardinal priority ranking for best path selection amongst routes found. Delay hop count and transmission energy counts for link based metrics whereas path recons on end to end delay, path energy and data delivery ratio. Thus, link based, and path based general framework is presented for this method. Simulation results show it as an efficient routing algorithm, which is 2.5 times better than single path routing algorithm (TBEEP or SPRA). Thus, multipath routing is a viable alternative to single path, even though it is computationally expensive.

Keywords — *MPRA, Base station, delay, hop count, and network lifetime.*

I. INTRODUCTION

Sensors are so extensively used these days that they have become an unseen part of our life. Each and every gadget contains them in innumerable amount. These sensors are capable of monitoring various environmental conditions, organizing data, and transmitting it. In WSN's, multiple sensors are connected to form a communication system where they send data to a destination co-operatively. It can use any topology like star, and mesh, etc. Multiple applications of sensors have made WSN's applicable in almost all fields. At the same time, they are restricted to their limited energy which confines WSN's use. A protocol has been proposed for this issue and its results prove its worth. In 2007, Rajiullah and Shimamoto [1] proposed an energy-aware deterministic clustering periodical gathering protocol which showed more energy efficiency when clusters were formed from nodes with each cluster head having energy below a threshold energy. Protocol started with cluster formation phase. In this protocol, no new cluster head was elected at beginning; rather it was selected when energy reached to specific threshold energy. It considered a major factor that a node can become cluster head multiple times. In 2008, Paulo, Marco and Angelo [2] proposed a blind flooding energy efficient protocol. In wireless sensor network most of the protocols broadcast their messages like control message to control the topology of the network. This protocol improved the broadcasting in wireless sensor network up to some extent only. Dynamic power management and schedule switching modes (DPM-SSM) technique were used in blind flooding protocol for improving the battery capacity recovery effects. In 2008, Huang and Fang[3] proposed a multi constraint quality of service routing protocol for wireless sensor network. The idea was to raise the network reliability and to find the best route path among all the paths that could send the data from source sensor nodes towards the base station Muhammad Mahbub Alam, Md. Abdur Razzaque, Md. Mamun-Or-Rashid and Choong Seon Hong [4] proposed an energy aware QoS provision for WSN's. An algorithm was proposed for increasing the lifetime of network and to achieve a desire quality of service, an energy retransmission mechanism was proposed. This increased the reliability of the network and kept the delay with in delay boundaries. A multi path routing in a single base station had some problems. In this, cluster heads forward data using single path or multipath routing. Any path did not interfere with any other routing paths and data was sent towards the destination by proper load balancing. Hao and Cia [5] proposed an energy efficient routing protocol for large scale WSN's which was basically an AODV base protocol with routing identification and RREF packet capturing (AODV-RIRC). The source did not find a new route due to presence of route identification and after capturing the RREF packet nodes made the best route towards the destination silently. In AODV when RREQ packet arrived at the destination some packets are sent back towards to the previous nodes. The whole idea is to use same sink id but different addresses for differentiating the base station. In 2009, Xia and Su Wu [6] proposed multi path energy efficient protocol using ant colonial algorithm. Each node contained an ant and was deployed randomly in a specific area and every ant contained a list of paths and tabs for documentation of nodes where the ant visited. Greedy approach was used for building a tour. If same path is used, the value of pheromone is modified by each ant. In initialization phase ants were placed on different source nodes. In path selection phase each ant worked for finding the best path. Hong and Yang [7] proposed a rumor routing energy aware protocol for wireless sensor network EMBBR. It was a probabilistic technique that used to find the best suitable path by using two major parameters- the residual energy and energy usage by the neighbours. This protocol used two type of agents one was forward agent and other was backward agent. An agent was a query message that was sent over the network to find the path from source to sink. Forward agent found the information of the path and search for the multi path route from source to the sink. Backward agent moved in reverse direction and stored all the information regarding path in the routing table and give information to source node. Razzaque and Hong [8] proposed energy tax analysis method for multi path routing in WSN. This investigation was done by using analytical model. Net energy used in unit time was computed by checking two main factors route establishment and data forwarding to destination. Maximum energy consumption was during sensing, processing raw data, transmission and receiving of packets. Each node has four states transmitted, received, sleep and listen. The node remained in sleep mode when transmission and receiving operations go on. If the event was detected, then node changed its state from sleep to active state. An ARQ ACK mechanism was used for retransmission and maximum ARQ value was fixed. The routing table stores the next best hop that can be used for discovery routing paths. Marjan, Dezfouli, Razak and Bakar [9] proposed a low interface energy efficient protocol which aimed at improvement of packet delivery ratio, lifetime and latency of the network by using minimal interference and node disjoint path from source to destination. Load was balanced by distributing the traffic of the network over multiple paths. The lifetime of the network is 1.5 more efficient in comparison to single path forwarding scheme. It was a multi path based algorithm for solving the problem of event driven application. The algorithm was divided into two phases- one was initialization and second was route discovery. In initialization phase each sensor node obtained the information of routing from its closest node, for controlling the network each node sent the control packets and record was maintained for successfully received packets from its closest node and made a routing table which was useful for selecting a path. In route discovery and establishment phase when an event was triggered sensor node collected the data and sent it towards the base station. A route request packet was sent by a node to select a route and find the best next hop. Each node had a track of id for which packet was sent. Request packet is responded with route reply packet and a part of the route was established. In this way whole path was discovered and then source node communicated the packets to the base station. Xiao, Wei and Wang [10] proposed multi path routing scheme for WSN, EBMER. The residual energy and link quality were used to obtain the next best hop and routing paths. The routing tables stored all the path form source node to the destination node, when one of the paths failed to transmit the data another path was used to fulfil the task. EBMER protocol decreased latency time by 51 percent and 21 percent as compared with AOMOV and REAL protocols respectively. Each node had a link quality where high link quality means a node have low error rate and low probability of retransmission. Acknowledgment mechanism was used to ensure that packet was received or not. Retransmission reduced the efficiency of the network so choosing a low link quality hop increased the lifetime of network by consuming minimum energy. Dubal and Achala [11] proposed a new approach called balanced scheme in which transmission of packet was done by the use of multiple path. Each source node selected one of the paths by using weight factor for data forwarding. If the current path had remaining energy less than threshold energy than one of the best path was chosen from the backup paths and data was transmitted to the destination. Sayyed and Naderi[12] presented an energy efficiency real time routing protocol for WSN, (EERT). It used modular approach to send the packet towards the destination and focused on both energy transmissions cost and remaining energy of router by using a shortest path which increases the network lifetime. EERT protocol used a re-routing policy which allowed the packets of to be routed within real time through neighbouring nodes. Real time protocol was totally dependent on the application and used the packet velocity parameter that had an advantage of not requiring any synchronization between nodes. In order to achieve uniform distribution of traffic same path was used to forward the packets and increasing the latency of network. In 2012, Dehnavi, Mazaheri, Behzad and Sayyed [13] presented energy efficient and Qos based multiple Hierarchical routing protocol (EQMN). The protocol satisfied the quality of service requirements with minimal energy requirements and hierarchical methods. Multiple constraints such as energy, remaining buffer size, SNR and distance to the base station are considered for election of cluster heads and discovered route. Best path was obtained by using multipath approach. Load balancing was used so that there is uniform energy consumption throughout the network. The operation was divided into rounds. Cluster heads are elected after cluster formation in each round. In route discovery phase multiple paths were detected between cluster heads which relayed the data. Ali and Yifeng[14] proposed a simulation based evaluation of MANET routing protocol. The performance was analyzed in static network at NS2. It was done by studying the simulation results of AODV, DSR and DSDV routing protocols. The results focused on network density, size of network, end to end delay, delivery fraction and routing overheads, end to end delay, delivery fraction and routing overheads. Nirmala and Nallusamy [15] presented a MAC protocol considering both factors; energy efficiency and QoS in WSN. IEEE 802.11 protocol worked on DCF (Distributed coordinate function) mode. In DCF mode the coordinator only sent the active nodes to the sensor to minimize the energy consumption. The idea behind it was division of sensor field into different number of grids. One of the nodes in each grid was master node that collected the data from the other nodes in a grid. It also handled data transmission to the member nodes. Master grid nodes were connected to the multi path and these paths were stored in routing tables.

II. NETWORK MODEL

In multi path routing algorithm (MPRA) the greedy approach is used to find all the paths and fuzzy cardinality priority function is used to find the optimal path among all the paths stored in a routing table. During deployment phase the 100 nodes are deployed randomly in an area of 100*100 m^2 as shown in figure 1. The delay constraints used in MPRA are application specific. If the available path is not able to transmit the data next optimal path is used to transmit the data to the base station.

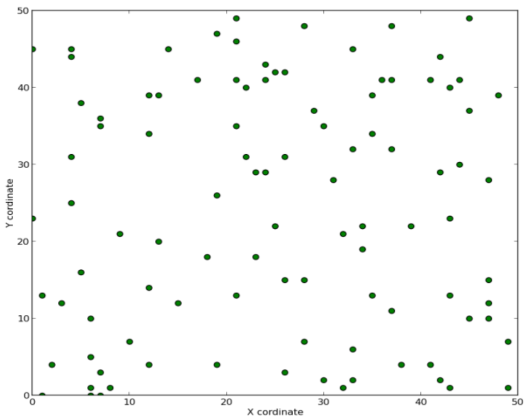

Fig 1. Deployment of 100 nodes

The network design for multi path routing algorithm consists of weighted connected graph *G= (V, E)* where *V* denotes the number of nodes in a network i.e., *V*: {s_1, s_2, …., s_n} and *E* represents the number of link i.e *E: {*u_i, u_j|(u_i, u_j)Є *V}*. The link (u_i, u_j) represents that there is a connection from node u_i to node u_j and works in full duplex mode. The *d* (u_i, u_j) represents the distance or Range between from node *i* to node *j*.

A. Radio Model

The radio frequency model used for proposed techniques is same as in LEACH. In this model the radio dissipates energy E_{elect} which is used to run the circuitry of transmitter and receiver and E_{amp} is used for the amplification of the signal. Both are 50nJ/bit and 100pJ/bit/m^2 respectively. The size of the data packet is 2000 bit. The energy used for sensing, data fusion and reconfiguration of minimum spanning tree is ignored. Charges for transmission and receiving for *k*-bit packet in d distance are calculated by judgment given below.

*1) **Transmitted Energy***

$$E_{Tx}(k,d) = E_{elec} * (k) + E_{amp}(k,d)$$
(2)

The transmission energy is used to send the data in a network.

$$E_{Tx}(k,d) = E_{elec} * (k) + k * E_{amp} * d$$
(3)

The transmission energy is used to send the data to the base station.

$$E_{Tx}(k,d) = E_{elec} * (k) + k * E_{amp} * d$$
(4)

*2) **Receiving Energy**:*

$$E_{rx}(k) = E_{(rx-elect)} * (k)$$
(5)

$$E_{rx}(k) = E_{elect} * k$$
(6)

Where *k* represents the number of bits sent during transmission and *d* represents distance between two sensor nodes. Radio model follows the symmetric nature of radio channels i.e. energy requirement to send a packet from node *A* to node *B* is same as energy required to send the packet back in reverse direction, for a given signal to noise ratio. Each node works at fixed rate and always has data to send to the end users. Receiving the data from network is a very costly operation; therefore, there is a need of optimizing the amount of energy required in communication. If the nodes are deployed densely, the quality of the network is hardly affected if some of the sensor nodes die because there are many neighbour nodes that can relay the data of dead nodes. This increases the robustness of a system. Relay nodes shape the traffic and transport the packet to its destination. Network quality is compromised when half or a more than half nodes get dead. The network functions till the last node is alive. Threshold energy used is a key point behind all logic, below which sensor nodes in network are not capable to relay the traffic. The dead energy is minimum energy level with which node becomes useless as it cannot perform in any transmission and is thrown out of the network.

B. Radio Model

The radio frequency model used for proposed techniques is shown in fig 2. The node information contains location of nodes, tier-id and energy required to transmit the data to base station.

NODE ID	(XY)	ENERGY THRESHOLD	REMAINING ENERGY	INITIAL ENERGY	DISTANCE FROM BS	TRANSMISSION ENERGY

Fig 2. Node Structure

where NODE ID identifies sensor node uniquely. It can be mac or ip address of any network device, (X Y) are the co-ordinates of the node that define the position of the sensor node, ENERGY THRESHOLD is the minimum amount of energy below which data transmission is infeasible. INITIAL ENERGY represents the initial energy of node either homogeneous or heterogeneous. The filed DISTANCE FROM BS is remoteness between node and base station. TRANSMISSION ENERGY denotes the charge for conveying the data to the base station. The value of hop count is considering during path selection process. The best paths are selected on the basis of fuzzy cardinal priority ranking function applied which generated a cost value according to parameters such as transmission energy, delay and hop count used. All the paths are stored in routing table and every time an optimal path is chosen to forward the data.

III.PERFORMANCE METRICS

MPRA uses multi objective QoS parameter to increase the lifetime of network. They are described as follows:

A. Energy Consumption

The energy consumed for relaying data by using a single path can be expressed as

$$Er_{paths} = \sum_{i=1}^{hop_s} Ec_i$$

(7)

Where Er_{paths} is the average energy consumed by a single path and Ec is the energy consumption of single hop. hop_s represent the number of hops in a single path. Ec can be expressed as

$$Ec = E_{tx} + E_{rx}$$

(8)

Where E_{tx} is the energy that is used to send the data to its neighbour node and E_{rx} denotes charges energy for receiving the data from its neighbouring nodes. The end to end energy consumed by all the paths used can be written as

$$E_{end} = \sum_{p=1}^{np} Er_{paths}$$

(9)

Where, np signifies total number of paths in a list and Er_{paths} tells about energy consumption by single path.

B. Delay

Delay is referred as time required for sending and receiving the data packet from source sensor node to sink. The delay between two neighbouring nodes is donated by D_{link}. The delay for a given path Dr_{paths} and is the sum of all the delay of link in a path.

$$Dr_{paths} = \sum_{i=1}^{hop_p} D_{link}$$

(10)

So, following expression helps for end to end delay calculation.

$$D_{end} = \max_{(1 \le p \le np)} Dr_{paths}$$

(11)

Where np signifies total number of paths in a path list and Dr_{paths} represents the delay of single path.

C. Data Delivery ratio

The probability of transmission of packet successfully or unsuccessfully can be expressed in terms of Data delivery ratio. As characterized by equation 12, it is defined as the ratio of number of packets generated by source to the number of packets received by the destination. If the total packet PK_{totals} stands for packets sent by the source node and the number of packets received by sink are PK_{recvs} then the data delivery ratio can be written as

$$DDR = \frac{PK_{totals}}{PK_{recvs}}$$

(12)

IV.PROPOSED WORK

The Random node deployment method is followed for it in a fixed size sensing field. When the event is triggered the nodes sense the analog data and converted into digital data b using ADC converter. In MPRA protocol initial energy, delay and hop number are distributed randomly over the network. Multiple minimum spanning trees are generated from source sensor node to the BS and stored in a routing table. By using Fuzzy Cardinal Priority ranking algorithm an optimal path is chosen, and data is conveyed to base station. In case, current path is unable to relay the data the next optimal path is chosen from the routing table by using Fuzzy Cardinal Priority ranking algorithm and tries again. This process is repeated again and again either the data is sent to the destination or all the paths are exhausted. The packets are dropped if the entire paths are exhausted. The source node finds all the possible paths through which it can communicate to sink. The sink is represented by the wireless tower which acts as a base station with unlimited power. The base station is connected to the external network or end user for transmitted the packets to the end users. The figure 3 show the architecture of MPRA.

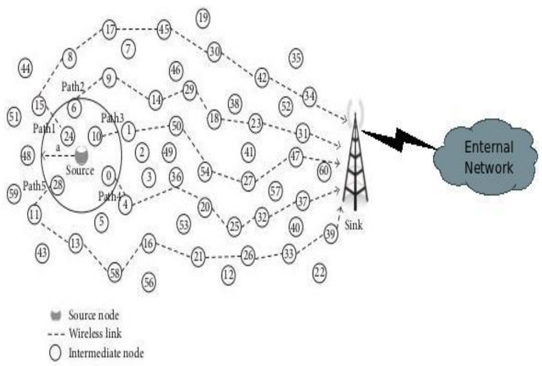

Fig 3. Multipath Routing Algorithm

After getting the table of these paths, we have to find out the optimal path suitable for data transmission. The proposed algorithm calculates the total energy, maximum delay and the hop count of each path. To uncover the total energy consumption of a path, energies of all the nodes involved in a path are summed up. Total delay of a path is made out by adding the delay introduced by each link while the hop counts signify, number of nodes involved in a path. The mathematical representations of the described notations are characterized by following equations.

$$Er_{paths} = \sum_{i=1}^{hop_p} EC_i$$

(13)

$$Dr_{paths} = \sum_{i=1}^{hop_p} D_{link}$$

(14)

$$HC_{paths} = \sum_{i=1}^{hop_p} hop_n$$

(15)

Where Er_{paths} is the amount of energy consumed during transmission of data, Dr_{paths} is the total delay during communication and HC_{paths} represents the number of hops in communication. After getting this data, maximum and minimum values of energy, delay and hop count are obtained. This is done by performing comparison between all the paths. By using these parameters, membership sets whose range is between 0 and 1 are acquired. These membership sets are used to calculate β_k factor. For this purpose, the formulae used are shown below.

$$\mu_1 = \frac{E_{max} - E_{p_k}}{E_{max} - E_{min}}$$

(16)

$$\mu_2 = \frac{D_{max} - D_{p_k}}{D_{max} - D_{min}}$$

(17)

$$\mu_3 = \frac{H_{max} - H_{p_k}}{H_{max} - H_{min}}$$

(18)

Where

p_k: Path number
E: Energy of p_k path
D: Delay of p_k path
H: Hop count of p_k path

The problem is to find out the best path among the paths, with low transmission energy, minimum delay and less number of hops. Therefore, multi objective parameters are used by the fuzzy cardinal priority ranking algorithm to find optimal path.

A. Optical Path

The problem is to find out the best path among the paths, with low transmission. After calculating the cost function value for each path, a set of optimal values are obtained. For the communication purpose one optional path is selected from the set and is called as best optimal path. This done by using the membership function β_k, which provides the cardinal priority ranking of each path. The path for which the value of β_k factor is maximum considered as the optimal path. The β_k can be calculated by using the expression below.

$$\beta_k = \frac{\sum_{j=1}^{M_{obj}} \rho_j}{\sum_{j=1}^{M_{obj}} \sum_{l=1}^{p_k} \rho_j^l}$$

(19)

Where M_{obj} is the number of multiple objectives used in communication and k represent the number of paths in each list. The following algorithms show step by step procedure for communication.

B. Algorithm: Multipath Routing Algorithm

1: Deploy nodes in a specified or decided sensing field in a random manner and initialize each node with some amount of initialize energy.

2: Delay of link is distributed randomly in a network.
3: Assign a unique identification number to each node in a network.
4: By the use of greedy approach find the multiple optimal or best paths from source node towards base station (BS) and stored in a routing table.
5: Follow fuzzy cardinal priority ranking algorithm to find the best optimal path by using the parameters transmission energy, remaining energy, hop count and delay.
6: If the optimal path is obtained in a result go to step 8. If the resultant is not an optimal path, then go to step 7.
7: If no path exists between node and base station in routing table then packet is dropped and go to step 10.
8: Now the transmission of data take place through this path and this process will consume the energy (as specified in radio model) and increase the packet received variable by 1 go to step 10. If the remaining energy of any node is less than the required transmission and receiving energy, then the node is considered as dead and the current path is discarded. Go to step 9.
9: Now choose a next optimal path from the routing table and apply step 6.
10: The process repeat until the energy of node is not equal to dead energy which will take the whole network down.

C. Algorithm: Fuzzy Cardinal Priority Ranking

/* Paths_ List is actually list of lists in the form [(a, b, 2, 4, 1) (b, c, 3, 6, 1)] */
1: Initialization
2: *Total Fuzzy Energy Cost*← 0
3: *Total Fuzzy Delay Cost*← 0
4: *Total Fuzzy Hop count Cost*← 0
5: For *i* ← 0 to length (Paths_List) **do**
6: *Total Energy(i)*←Sum of energy of each sub path of path
7: *Total Delay(i)*←Sum of delay of each sub path of path
8: *Total Hop count(i)*←Sum of hop counts of each sub path of path
9: End **For**
/*Total Energy, Total Delay, Total Hop count lists will be obtained*/
10: E_{max} ← maximum of Total Energy
11: E_{min} ← minimum of Total Energy
12: D_{max} ← maximum of Total Delay
13: D_{min} ← minimum of Total Delay
14: H_{max} ← maximum of Total Hop count
15: H_{min} ← minimum of Total Hop count
16: For *i* ← 0 to length(Paths_List) **do**
17: *Fuzzy Energy Cost(i)*← $(E_{max} - i) / (E_{max} - E_{min})$
18: *Fuzzy Delay Cost(i)*← $(D_{max} - i) / (D_{max} - D_{min})$
19: *Fuzzy Hop count Cost(i)*← $(H_{max} - i) / (H_{max} - H_{min})$
20: *Total Fuzzy Energy Cost=Total Fuzzy Energy Cost(i) + Fuzzy Energy Cost(i)*
21: *Total Fuzzy Delay Cost=Total Fuzzy Delay Cost(i) + Fuzzy Delay Cost(i)*
22: *Total Fuzzy Hop count Cost = Total Fuzzy Hop count Cost(i) + Fuzzy Hop count Cost(i)*
23: End **For**
/*This will give cost list according to all three parameters in range of 0 to 1*/
24: *Sum*← *Total Fuzzy Energy Cost + Total Fuzzy Delay Cost + Total Fuzzy Hop count Cost*
25: For *j* ← 0 to length (*Fuzzy Energy Cost*) **do**
26: βfactorlist(j) ← (*Fuzzy Energy Cost(j) + Fuzzy Delay Cost(j) + Fuzzy Hopcount Cost(j)*) / *Sum*
27: End **For**
28: β_{max}← maximum in β factor list
29: Return path with value β_{max}
/* maximum value of beta max gives first optimal path */

V. RESULTS

Simulation is carried out on 100 sensor nodes that are scattered randomly in an area of 50*50m^2. The MPRA is compared with SPRA (single path routing algorithm) and MPRA shows better results. Each sensor node works in range of 20 meter and the base station is kept at (50, 100). During initialization phase, energy of each node is 0.5 joule and random delay distribution in a range of [1, 10]ms. The delay is application specific parameter. The table 1 shows the inputs parameters for transmission of 2000 bits message over the network.

TABLE I. Input Requirements

1	Initial Energy	0.5 Joule
2	Packet size	2000 bits
3	E_{elect}	5*nj/bit*
4	E_{amp}	100$pj/bit/m^2$
5	Number of Nodes	100
6	Area	50*50m^2
7	Dead Energy	0.002 Joule
8	Threshold Energy	0.256 Joule
9	Position of BS	(50,100)
10	Range	20 meters
11	Delay	20ms

The following figure 4 shows the life cycle of MPRA protocol. The x-axis symbolizes the number of nodes and the y-axis, the lifetime of network.

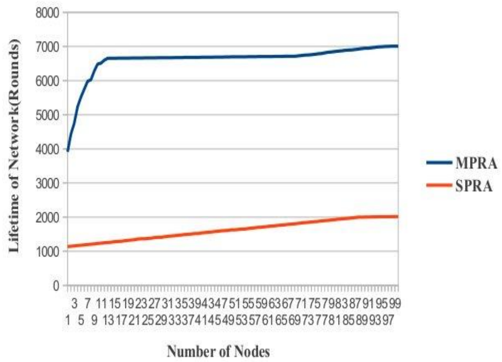

Fig 4. Lifetime of Network using SPRA and MPRA

The figure shows the percentage of dead nodes in a network when SPRA and MPRA routing algorithm are used. The x axis confirms the percentage of nodes dead and y axis, the life time of network.

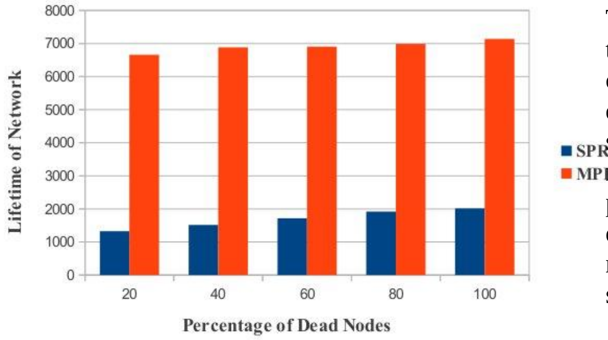

Fig 5. Comparison of transmission cost of packet vs percentage of node dead.

The energy used for transmitting the packet is a combination of energy used to start the circuitry i.e., E_{elect} and the energy used for amplification denoted by E_{amp}. The energy used by Eelect is 5*nj/node* and for amplification is 100pj/m^2. The transmission energy and delay are distributed randomly all over the network links. The energy consumed for transmitting a data from source to the based is calculated by using the formula as shown in section II. The graph shows the comparison of single path routing protocol and Multi path routing algorithm average energy consumption. The x-axis shows the number of packet send by both the protocols and y-axis shows the average energy consumption. The value of delay constraint is 20ms. The initial energy of each sensor node is 0.5 joule. The range of the network is 20 m. The position of sink node is (50,100).

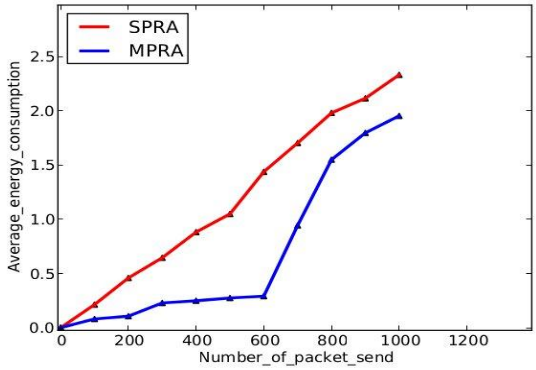

Fig6. Average energy Consumption

Figure 6 proves that on increasing the numbers of packet sent by nodes, the average energy consumption also increases linearly in case of single path routing algorithm. But in case of Multi path routing algorithm the results are better than the SPRA. The reliability of network depends on the successful transmission of data. If the nodes send certain amount of data and the sink receives all the packets, then the data delivery ratio probability is 1. Data delivery ratio signifies total data accepted by the receiver. Figure 7 represents the amount of data delivery ratio probability while considering the delay constraint. The delay parameter is application specific. The x-axis represents the application specific delay and y axis shows the data delivery ratio.

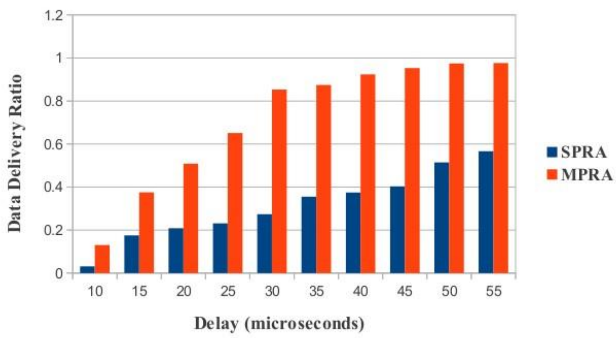

Figure7. Data Delivery Ratio

The above figure represents the data delivery ratio probability and results near to optimal in case of MPRA. The graph shows the range of delay constraint in range of 10 to 50 ms . The delay is application specific parameter which is used by the user according to their application requirement. The data delivery ratio in case of SPRA is not more than 0.6 but in MPRA it reaches up to 0.9. If the value of delay constraint is limited by application, then the DDR ratio dropped but if the delay constraint value is increased the data delivery ratio probability is also increased.

VI. CONCLUSION

In this paper, MPRA is proposed and compared with an existing SPRA protocol. The simulation results explain that the proposed algorithm is 2.5 times better than SPRA. In Multipath routing algorithm, a backup path is used when current selected path is unable to forward the packet to the base station. The proposed algorithm amplifies the network lifetime by raising the number of rounds nodes survive. In future, the network can be made more reliable by data storage capability, because in these algorithms if receiver node died before accepting data from sender all data will be lost.

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