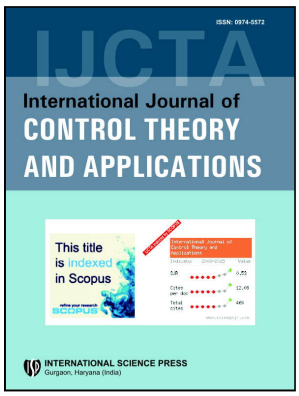

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Reduce Energy Consumption in Ad Hoc Network with Wireless Power Transfer Concept

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Abstract: A mobile Ad-hoc Network is a network in which various autonomous nodes are working in combined manner each node is an autonomous body and work in network environment. This network does not need any central node to manage the network. In this network each mobile node working as a packet forwarder. The Mobile Ad hoc network is infrastructure less network and can be preparing in any situation and any place. This network have one main issue to discus is power consumption of the nodes because wireless network is the battery operated network.

This paper used some different methodologies to give the solution for energy problem of the wireless network nodes. This paper introduces a technique Wireless transfer of power from source station to Ad hoc network nodes. This technique resolves the battery exhausted problem of Ad hoc networks and second technique is reduced energy consumption (RECAODV) protocol to reduce the consumption of battery used by the nodes. The result analyses with some parametric metrics like: Mobility, network lifetime, packet delivery ratio, network delay etc. This paper gives significant simulation results with both methodologies used.

Keywords: MANET, RECAODV, Wireless power, Energy Efficient protocol.

1. INTRODUCTION

A mobile Ad-hoc Network is a network in which various autonomous nodes are working in combined manner each node is an autonomous body and work in network environment. This network does not need any central node to manage the network. In this network each mobile node working as a packet forwarder. The Mobile Ad hoc network is infrastructure less network and can be preparing in any situation and any place. This network have one main issue to discus is power consumption of the nodes because wireless network is the battery operated network.

Wireless electricity transmission is the transmission of electricity from source to an electrical load. In wireless electricity transfer, a wireless transmitter connected to a source transfer the energy to many receivers

through intervening space, where it is again converted into electrical current and used. The advantages of wireless flow of electricity are convenience, less complex, low cost.

Wireless power techniques are of two types Nonradiative and radiative. This paper describes the nonradiative power supply. In nonradiative techniques, power is supply by magnetic field using magnetic resonance inductive coupling with the help of coils.

The organization of the rest of the paper is as follows. Section 2 discusses about previous work. Section 3 describe the generation concept of wireless power .section 4 introduce new reduced energy consumption AODV. In section 5, we define simulation Environment. Next, in section 6, this paper describes Performance Evaluation analysis. Finally in section 7, give conclusion.

2. PREVIOUS WORK

Wireless network nodes are working with limited amount of power so that network always needed the technique for low consumption of energy so that life time of network would increase. Various power aware and power saving routing reduce the transmitting power. This routing main aim to find out the power aware low cost route [1].

In [2] paper using an algorithm which is based on the chain concept. This paper uses the greedy algorithm to make the data chain. In this concept each lower node of the network aggregates the data and transfers that data to upstream node and by which that data reach to base station. In this communication a node can communicate with neighbor node only. This reduces the energy uses for each round.

In [3], the authors explain the concept of periodical selection of cluster head with some factors like node residual energy and node degree by using important clustering HEED algorithm. Node degree is used as second parameter.

Manish et al. [4] in this paper disadvantage of LEACH protocols was overcome with fuzzy logic concept used in cluster head election method. With the help of fuzzy logic concept authors introduce the new method of cluster head selection so that the network lifetime would increases.

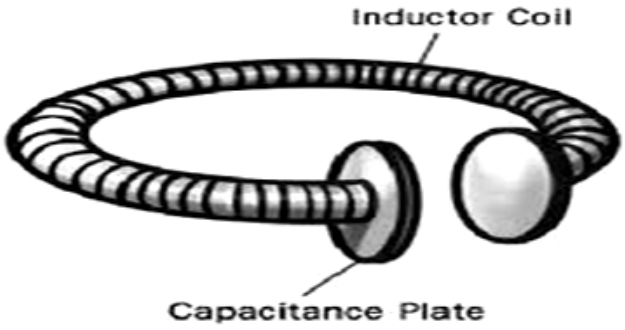
Manish et al. [5] in this paper explain the cooperative communication with this different nodes send the same data at single instant of time. This paper reduces the power consumption of the network by using the optimum relay nodes selection technique in CC network.

Manish et al. [6] this paper using a wireless electricity transfer and Backpressure Technique to resolve the energy problem of the wireless nodes. In this paper one energy conservation algorithm is used and with the help of this algorithm good simulation results were found. This Paper main aim to reduce the overheads and maintenance of route and increase the link utilization.

3. WIRELESS POWER TECHNIQUE

As property of the magnetic field it spread in all around, waste lot of power with that reason. To transfer power between the two coils in efficient way it is necessary to extend the separation by using resonance concept. The resonance concept is working in the circuit at particular frequency that is called “Resonant Frequency”. The two coils of the circuit tuned with single resonant frequency and with the help of this it transfer power between this two coils. This concept uses a round coil of inductor wire. This coil is end up with two plates called capacitance plates which hold the charge. Once the electricity flow with this coil the coil start to resonate. Resonant frequency is calculated with the help of formula as

The electromagnetic waves make the electricity, to tunnel from one coli to another upto both are working on the same resonant frequency. The electromagnetic wave with high angular waveguide produce the evanescent waves have nil power. With this evanescent waves power tunnel from one coil to another coil. According to this concept, a single coil can transfer power to various receiving coils up to they all are resonate at single frequency.



Resonant frequency= Inductance of the coil x Capacitance of the plates [9].

Figure 1: Charged Coil

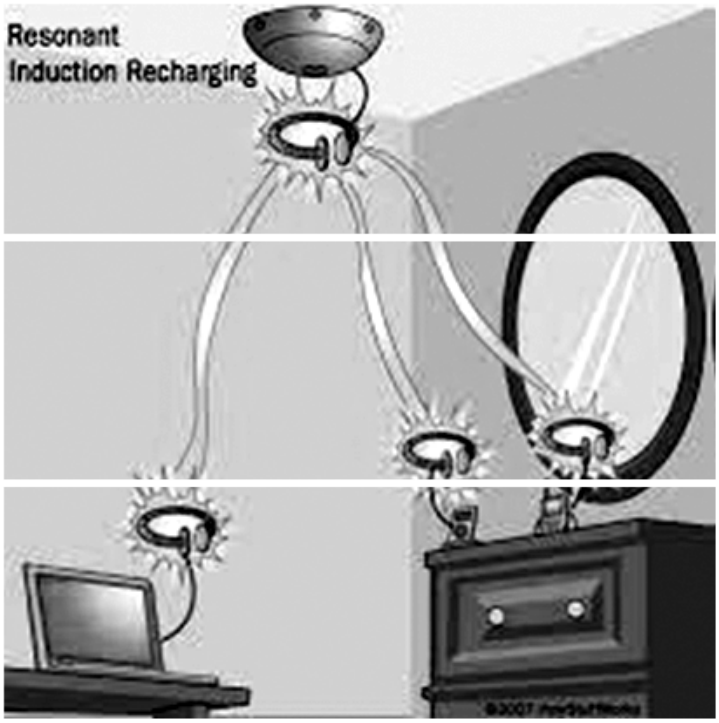


Figure 2: Flow of charge

This type of power named as non-radiative power transfer because it contains stationary fields around the coils rather than fields that spread in all directions [10].

According to the above described method, one coil can recharge any device that is in range, as long as the coils have the same resonant frequency. The receiving coils are single layer solenoids with fine spaced capacitor plates on each end, which in combination allow the coil to be tuned to the transmitter frequency thereby eliminating the wide power wasting "wave problem" and allowing the power used to focus in on a specific frequency increasing the range.

4. REDUCED ENERGY CONSUMPTION AODV

This paper propose a new routing algorithm Reduced Energy Consumption AODV. This new routing algorithm based on the concept of using alternate route which have maximum energy so that the lifetime and power utilization of the network get increased. The algorithm uses the path which having highest energy with minimum cost.

4.1. Proposed Routing Algorithm

1) When the source node want to communicate with any node in the network then route discovery process get started. This could happen only for those nodes for which no routing information available in the routing table.

2) Each node of the network must have two types of numbers like node sequence number and broadcast id. In this paper information of the intermediate node would be maintain so that mange the RREQ messages.

3) In wireless network various route request messages are generated so that every node has the property to accept more than one route request messages at the same time. When this process execute at the same time it maintain the current node energy information and add this with route request packet field. Upto RREQ message is not reach at the destination level the above process will continue. Once it complete the all intermediate nodes have the route information of source to destination.

4) Once the above process was complete the RREQ packet reached to destination node then it calculate the accumulate energy field and updated the same in destination route table. Destination node select the best energy route out of all route available and then update the route table once it get the best route destination node send the route reply message RREP.

5) When source node receives the RREP message from destination node source will communicate with destination node via best energy route. Every work in the wireless network system needs energy so that after every step nodes which are used in this step lose some energy. So energy level of each node will update after every step of work. This energy calculation is explained with the help of some equations mentioned below:

$$\text{Energy used in transmition } (E_{trans}) = {}_{trans}\text{Power} \times {}_{trans}\text{time} \quad (1)$$

$$\text{Energy Remaining } (E_{remain}) = \text{current energy} - E_{trans} \quad (2)$$

$$\text{Energy used in receiving } (E_{reicv}) = {}_{reicv}\text{Power} \times {}_{reicv}\text{time} \quad (3)$$

$$\text{Energy Remaining } (E_{remain}) = \text{current energy} - E_{reicv} \quad (4)$$

5. SIMULATION ENVIRONMENT

This paper uses the network simulator version 2.35 for simulation with the rigorous parameters metrics and obtained the significant results. Table contains the simulation parameters below:

Table 1
Simulation Parameter

S. No	*Parameter*	*Value*
1.	MAC Layer	IEEE802.11
2.	No. of Nodes	10 to 100
3.	Reception Queue Length	50
4.	Radio Propagation Model	Two Ray Ground
5.	Transmission Power	0.6 W
6.	Reception Power	0.3 W
7.	Initial Energy	4 joule
8.	Packet Size	512 byte
9.	Simulation Time	100to1000sec
10.	Simulation Area	1000*1000

6. PERFORMANCE EVALUATION ANALYSES

The paper performs the simulation with a significant simulation area 1000*1000. In this simulation 10 to 100 nodes are used that shows the performance of the networks and compared the performance of network protocol AODV and proposed network protocol RECAODV. This paper uses the technique to recharge the network nodes wirelessly without detached from its installed place. According to the figure 2 a centralized transmitting coil transfer the power to all receiving coil of the room. With the help of this technique power flow wirelessly between the two batteries operated devices with very less amount of power loss. After that evaluated the RECAODV protocol with energy conservation algorithm then compare the lifetime of nodes with in AODV protocol.

Figure 3 shows the result in line graph format with 10-70 nodes of the network. Node speed in this simulation is 1 m/s and every node has different initial energy or called randomized energy levels. Graph shows that network lifetime of the network nodes get increased with increasing the no. of nodes. This graph shows that in

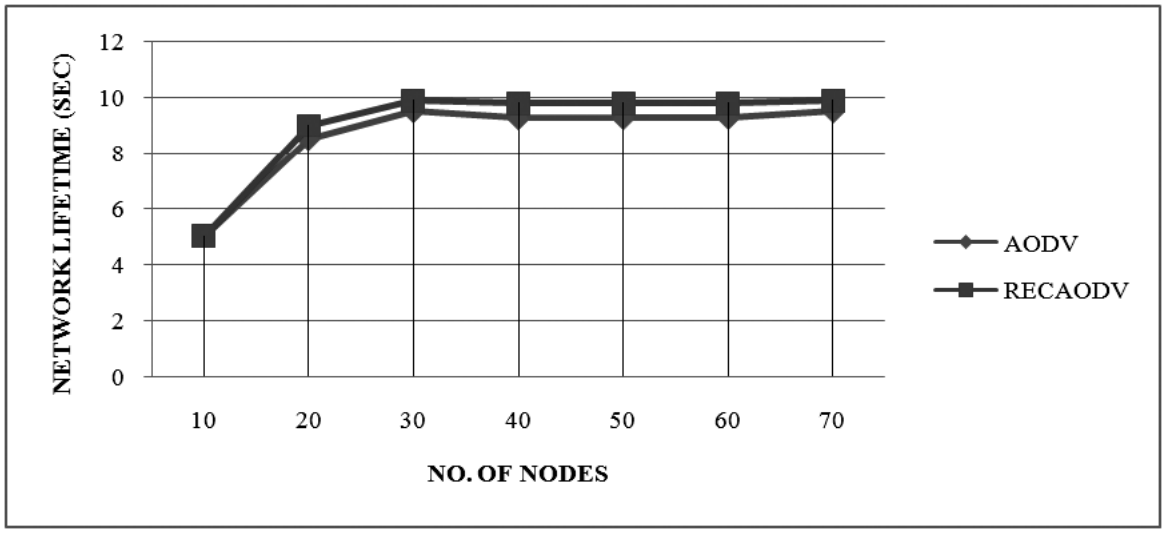


Figure 3: Network life time vs No. of nodes

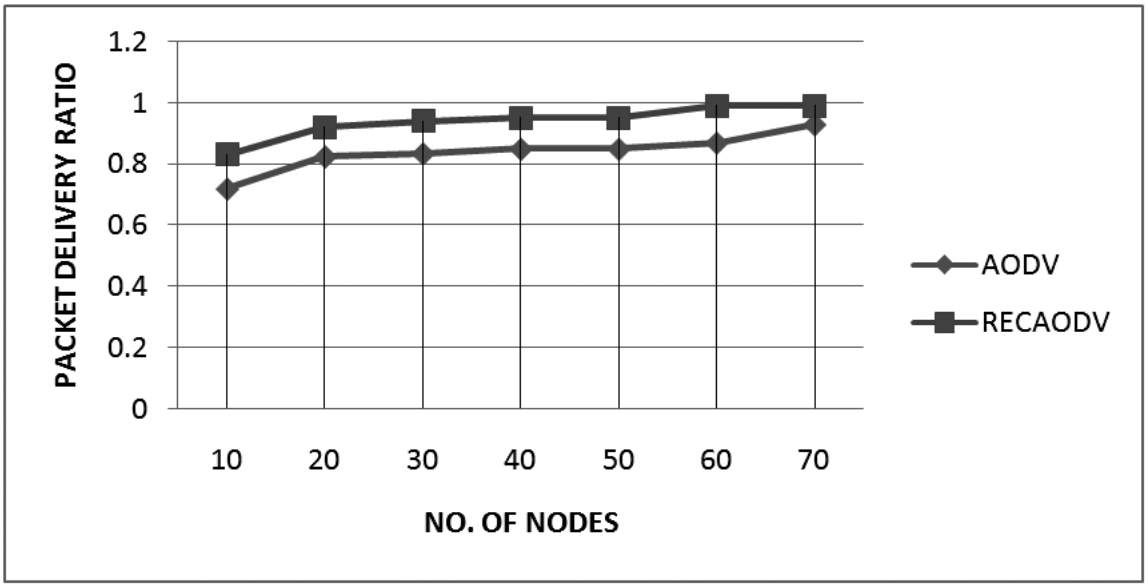


Figure 4: Packet Delivery Ratio vs No. of nodes

both protocols AODV and RECAODV network lifetime first increase linearly and then parallel Results shows that the proposed protocol (RECAODV) has better lifetime then AODV protocols at some points of node.

Figure 4 shows the line graph between packet delivery ratio and no. of nodes. In this simulation 10 to 70 nodes are used. This graph shows that as the no. of nodes increased packet delivery ratio is also increased and within both protocols packet delivery ratio of RECAODV protocol is better than AODV protocol. The RECAODV protocol increases the packet delivery ratio of network nodes effectively.

Figure 5 shows the graphical representation of delay result between RECAODV and AODV protocol. In this figure 10 to 60 nodes are used. Delay in this graph can be calculated in milliseconds Graph shows that as the no. of node increased the delay factor for both protocols is also increased but at every node step delay in RECAODV protocol is less than AODV protocol. The major difference between the delay times of both protocols is when the number of nodes in the simulation is 50-60.

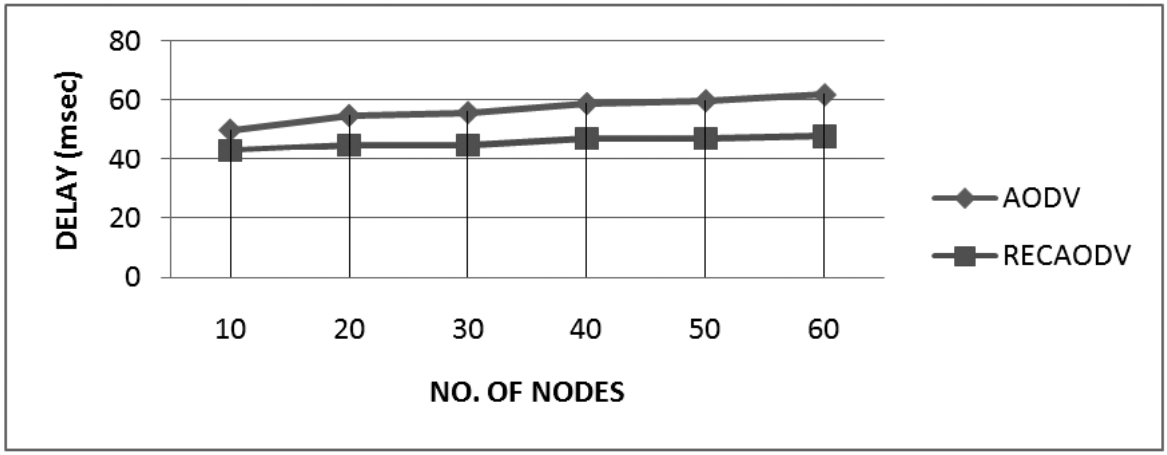


Figure 5: Delay vs No. of nodes

7. CONCLUSION

This paper perform simulation with the help of network simulator 2.35 with energy centric performance metrics like network lifetime, packet delivery ratio and delay that conclude the results for network nodes lifetime of the network and performance comparison of proposed protocol RECAODV and preexisting AODV protocol. According to the simulation results this paper shows that lifetime of the nodes in the network get increased in case of proposed reduced energy consumption AODV protocol. Packet delivery ratio of AODV protocol is less than the proposed reduced energy consumption AODV (RECAODV) protocol. Results also shows that delay performance metrics are also different in both protocols. Delay in proposed protocol is less than AODV protocol. This paper also provide the another solution for the energy exhausted problem of the nodes in the network. With the help of this methodology every portable device or node can be recharged wirelessly. This solution reduces the power problem of battery operated device. Power loss in this methodology is very less. This new technique wirelessly charged of nodes using magnetic resonance concept.

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