Improved Power Control Load Balancing Multipath Routing Protocol For Wireless Ad-hoc Network

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Abstract-- Wireless ad-hoc network comprises of a set of wireless nodes and requires no fixed infrastructure. For efficient communication between nodes, an efficient routing is required. In our work, will take AOMDV routing protocol and consider the situation when each node has some load, and in our work modify the performance of AOMDV routing protocol with load balancing and congestion control parameter by reducing the no of available route in the network and will only select three best route from the network and subsequently ensure that data will be delivered successfully and if the queue is full and uses dynamic queue management System, with the purposed approach would be able to reduce the energy consumption of the routing protocol and prolong network lifetime. In this implement our system in ns2 and uses ns2.35 patch and added a new improved routing protocol in it, namely IPL_AOMDV, the performance of our system analyses with the help of graph and compared with other routing protocol as well.

Keywords: Multipath routing Protocol, Ad-hoc Network, Load Balancing, Congestion Control.

1. INTRODUCTION

Wireless ad hoc network is a collection of nodes. A node in an ad hoc network act like a host as well as a router. Nodes move randomly and organize themselves arbitrarily. As a result the network topology Changes rapidly and unpredictably. Communication among nodes can be point-to-point or multi-hop. Point-to-point communication is possible when they are within the radio range of each other. However, in the multi-hop communication a packet reaches the destination through multiple numbers of intermediate nodes, in this case they act as relay nodes.[4] Ad-hoc networks no central management. Each mobile node is associated With routing mechanism. [2]

1.1 Types of Ad-hoc Network

- MANET
- Wireless mesh network
- Wireless Sensor network
- VANET
- IMANET

1.2 Characteristics of Ad-hoc Network

- Autonomous behaviors.
- Dynamic topologies.
- Multi-hop routing.
- Distributed operation.
- Lightweight terminal.
- Energy constrained and limited bandwidth.

1.3 Application of Ad-hoc Network

- Personal area networking.
- Military Environment.
- Civilian Environment.
- Emergency Operations.

1.4 Advantages of Ad-hoc Network

- MANET can be succeeded where there is less telecommunication infrastructure.
- Minimum cost estimation.
- Enhanced Flexibility.
- MANET gives access to information and facilities regardless to geographic location.
- These networks can be arranged at any time in and place.
- Powerful due to decentralized management.

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1.5 Disadvantages of Ad-hoc Network

- Lack of physical security.
- Inherent Resources are limited.
- Mutual trust unsafe to attack. In sufficiency of authorization services.
- Dynamic network topology makes it difficult to identify malicious attacks.

1.6 Design issues/Challenges

- Power Consumption, Battery Life and Spatial Reusability.
- Symmetric (bi-directional) and Asymmetric (unidirectional) links.
- Mobility Pattern of nodes.
- Scalability.
- Quality of Service (QOS).

2. Multipath routing Protocol IPL_AOMDV (Improved Power Load Ad-hoc on demand multi Path distance Vector): IPL_AOMDV is independent paths, in the multi-path routing, independent path can be divided into node disjoint paths and link disjoint paths. Node disjoint path means there is Not two same nodes in these paths.The paths not belong to these two are un-disjoint path. Generally, the number of node disjoint paths is less than that of link disjoint. However, independence of node disjoint is a better than that of link disjoint. When S is source node and D is a destination.

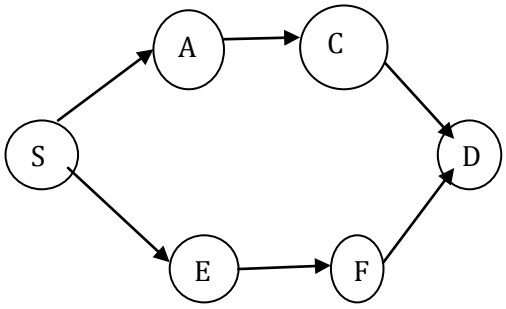

Figure2.node disjoint path

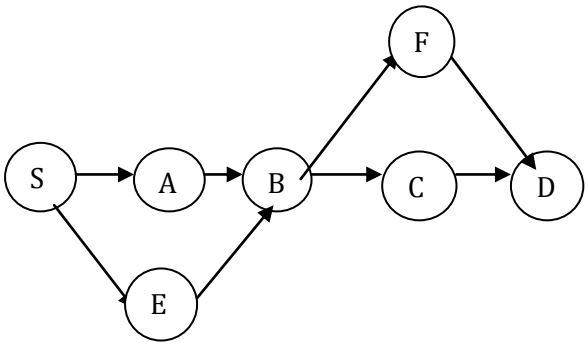

Figure 3.Link disjoint Path

The node-Disjoint Path those path source node has no other path to send data to a destination node, the source node starts broadcasting of theRoute-Request (RREQ) messages. Number of active neighbours for a node indicate that the number of neighbour nodes which have received and forwarded the Route Request (RREQ) message during the route discovery process. The path can be SACD and SEFG are node disjoint paths.

In Link disjoint path multipath intermediate nodes forward RREQ which are received via a different link and with the hop count not to be larger than the first received RREQ. The destination select the route on which it received the first RREQ packet (which will be a shortest delay path), and then it waits to receive more RREQ. The destination node then selects the path which is maximally disjoint from the shortest delay path. If it has more than one maximally disjoint path exists then the tie is broken by choosing the path with the shortest hop count. The path SABCD and SEBFD are link disjoint paths.

Route discovery: Route discovery Process in node s needs to communicate but there is not available routing, it initiates routing discovery process to broadcast routing request RREQ to all neighbors. The fields of BW and LE in RREQ packet initialed values of source node. After intermediate node I received RREQ packets, it determines whether received repeated packet with same source address, destination address and request ID in source neighbor address field SN in time of path traversal time. When the destination node are received RREQ, it will extract Sources address SA and neighbor address SN and determine whether SA(Source address) and SN from packet in list (SN Source neighbor)Send routing reply packet RREP to source node.

Route maintenance: IPL_AOMDV Protocol added periodic routing maintenance on paths to find network congestion or node energy Change in time, so as to achieve all bandwidth allocation of traffic adjustment. The processing on pathfailure of IPL_AOMDV is similar to that of AODV. After intermediate node find path failure to destination node it firstly send path failure message to source node and delete reverse paths to source node. If upper hopof some intermediate node to destination node, it send path failure message to source node and delete reversePath to destination node. IPL_AOMDV does

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not perform route recovery Operation till there is no available Path from source to destination node.

3. Problem Statement: Improve routing Protocols in terms of load balancing energy efficient and congestion Control.

4.Proposed Algorithm

Set M Mobile Node's

Set S sender and R receiver

Node Routing = IPL_AOMDV

Set Route

{

If (route from S to R found)

{

Check number of route;

If (route=>1)

{

Find (energy of each route && energy >20)

Select only 3 routes as a best route // shortest path.

Send route acknowledge through all Exist path

}

}

Else

{route unreachable}

}

{

Data _send (S, R, data) // sending case drop minimization

{

Senders send data through computed path;

Check (Q-limit of I node's)

//dynamic variation Q scheme at intermediate node

If (Q-limit == Full)

{

Increment-Q;

Store incoming data;

}

Receiver receives data from I

node;

Send ACK to sender S;

}

} }

5. Work Flow Chart of design

The flow chart of the proposed work is given below. First of judge the position of mobile nodes. Then calculate the distance of each mobile sinks or nodes. If node in the transmission range, then announce of each node and wait for joint request. If node in the not in transmission range, then wait for neighbour node announcements. Then node in transmission range, one node send join request to another neighbour nodes. Then create a TDMA Schedule. On the basis of the information of joining nodes, the cluster head creates a time division medium access (TDMA) schedule and forward this schedule to the joined nodes. Once the TDMA schedule is known to all nodes in the cluster, the set-up phase is considered to be complete and then the transmission phase of the wireless sensor network can begin. TDMA schedule communicate a one node to another neighbour node. Route discovery is done by using source routing. The routing process works in two phases: first, it discovers route from a source node (say S) to a destination node (say D). Whenever a node wants to know its neighbour, it Broadcasts a "HELLO" packet. From the transmission range and velocity can calculate the time required by the hello to reach at their neighbours. Upon receiving the hello packet the neighbour update their neighbour list and sends an acknowledgement to the sender. Since the transmission range and velocity are constant quantities, we can calculate the time required by the hello packet to reach at the neighbour. Also the acknowledgement from the neighbours must arrive at the sender side by 2t times, where t is equal to time taken for the hello packet to reach at their neighbour. All the nodes maintain a neighbour set. Each node updates its corresponding neighbour set by receiving the acknowledgement from the neighbours. This communication done with one

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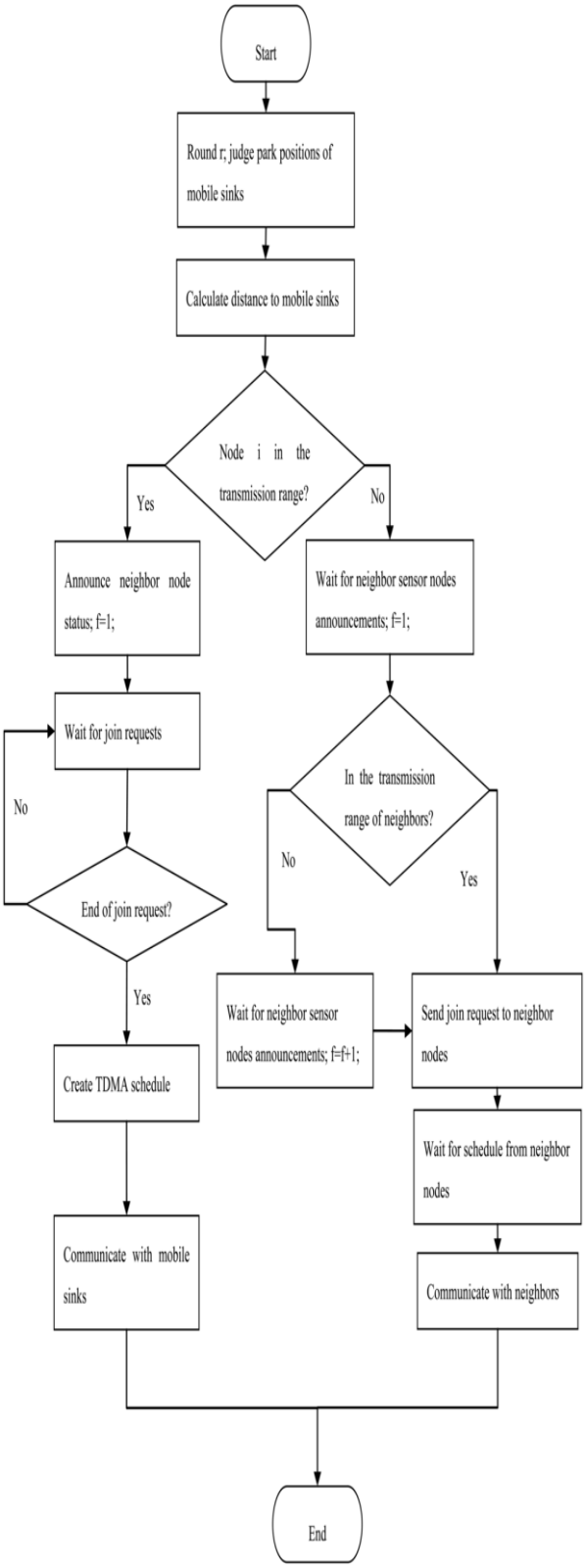

Figure5.Design of Work flow chart

mobile node to another neighbour node in the transmission range.

6. Proposed work

In our Proposed algorithm set no of mobile node sender to receiver. Then set the node routing protocol IPL_AOMDV. We select the route find route from sender to receiver. By selecting this route, every node will have energy greater than threshold level. In this scheme from the source to destination multipath on demand distance vector routing is performed. The energy of each node is initially set to 100 for each node. The average energy and the energy at each specific node Should not be below than threshold value 20 such routes are been selected and the shortest path route among them is Picked for routing to be conducted. Routing is dynamic queue based Considering the threshold 20.The IPL_AOMDV AOMDV protocol applied the technique of finding multiple routes between source and destination nodes, it is possible to have load balancing in the network or improve the fault tolerance of the network. Unlike the load balancing techniques that use multiple routes simultaneously, a typical fault tolerance technique uses one route as a primary route to send data packets, while the other alternate routes can be used When the primary route is cancelled.The proposed scheme established the multiple routes because of complete link is congested due to higher data rate then data is deliver to alternative route and the rate control and memory management scheme is applied to that route by that the easily reduce the possibility of congestion. Suchrouting through IPL_AOMDV Provides better packet delivery less routing load is energy-efficient. The various Performance parameters are been analyzed.

7. Load Balancing: Load balancing is a method to distribute work load across multiple paths, to maximize throughput, packet delivery ratio (PDR), minimize end-to-end delay, and reduce routing overhead. Most of the existing routing protocols that do not have multipath from source to destination balance their load by just transferring the packets from over loaded nodes to other unloaded nodes or idle nodes, which Results in routing delay. In order to determine the quality of path before conveying load, the existing Ad hoc protocols can't predict whether the nodes in that path are overloade or not during route discovery Phase.The Load Balancing algorithms that consider traffic load as parameter to choose a route to destination result in more traffic or congestion. Multipath routing can be a very good solution to reduce congestion in network.In multipath routing, even if one

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path drops, packet can still be routed through another alternative route without rediscovery new paths.

8. Simulation tool and parameters

Network Simulator (NS-2) is used to simulate proposed scheme. In our simulation, the number of nodes is 50. The mobile nodes move in a 800×800 m square region for 100 sec simulation time. We assume each node moves independently with the same average speed. All nodes have the same transmission range of 250 m. In our simulation, the speed is varied from 10 to 30 meters/seconds. Random Way Point mobility model is used. The simulated traffic is Constant Bit Rate (CBR) is attached with UDP and File Transfer Protocol (FTP) is attached with TCP.

9. Performance Metrics

The simulation results are evaluated Through performance matrices. Our focus is on evaluating the protocols under load Balancing approach under IPL_ AOMDV with energy aware and measure the network performance with various criteria. To Compare the performance of PL_AOMDV Protocol of IPL_AOMDV and improve the protocol, the metrics are elapsed time (0m/s) elapsed time (2m/s),elapsed time(5m/s),routing overhead.

- **Elapsed time(0m/s)**

This is defined as relation between dead node number and elapsed time (0m/s reflects uniformity of the energy consumption of each node. [1]

- **Elapsed time(2m/s)**

This shows that elapsed time 2 m/s of Number of dead nodes of routing protocol in ad-hoc network. [1]

- **Elapsed time(5m/s)**

This presents that elapsed time means performance response time between 5 m/s in number of dead nodes of routing protocol in ad-hoc network [1]

- **Routing overhead**

The routing overhead load refers to the number of routing packets are deliver in network for established connection in between sender and receiver. [17]

10. Results Analysis

The relation between dead node number and elapsed time reflects uniformity of the energy consumption of each node. it indicates that lifecycle of each node in the network has greater difference and energy consumption more uneven. If each node survival small the difference between the consumption of energy is more uniform, network because the node energy isexhausted and the probability of splitting the smaller. At the same time since the node of the energy consumption and the node load substantially proportional, the node energyConsumption also reflects the degree Of load balancing in the network, thenode energy consumption is more uniform, and the network load is more balanced.

10. Relationship between dead node and elapsed time at 0m/s

It shows the elapsed time moving speed vs. Number of dead nodes of routing protocols Comparison of elapsed time vs. number of dead nodes AODV, AOMDV, and PL_AOMDV routing protocols. It presents that elapsed time moving speed 0 m/s numberdead nodes of IPL_AOMDV,PL_AOMDV, AOMDV, AODV protocols.

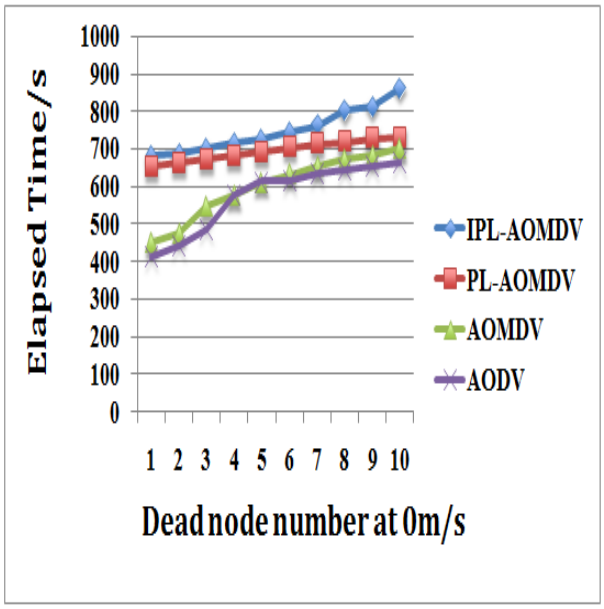

Figure10.Relationship between dead Node and elapsed time at 0m/s

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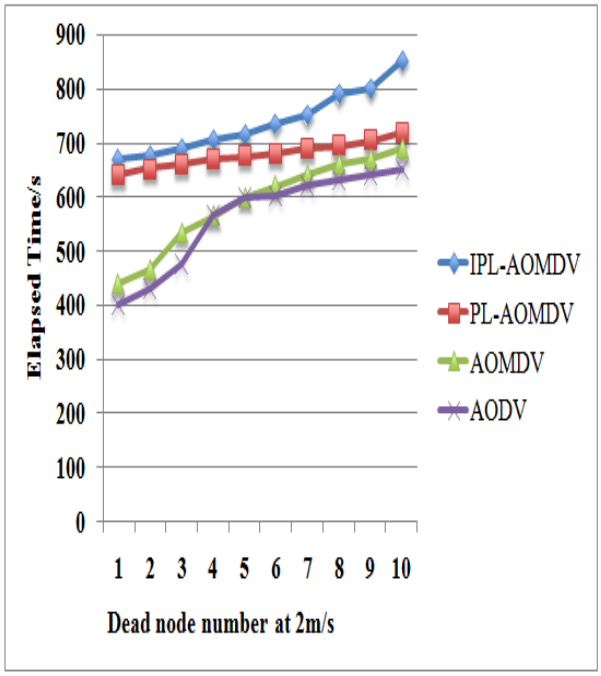

Figure10.1 Relationship between dead node and elapsed time at 2m/s

Figure10.1 It shows the elapsed time 2m/s vs. number of dead nodesof routing protocol. It presents that elapsed time moving speed 2m/s number of dead node of IPL_AOMDV, PL_AOMDV, AOMDV, and AODV Protocols has display different results. Each routing Protocol different elapsed time number of dead nodes is 10.

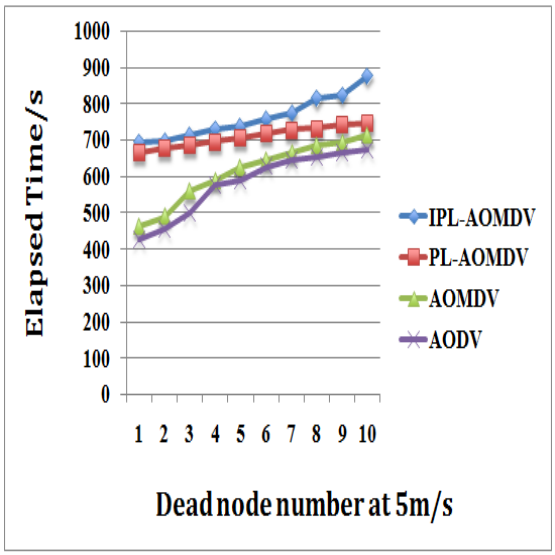

Figure10.2 Relationship between dead node and elapsed time at 5m/s

Figure10.2 it shows the elapsed time 5m/s vs. number of dead nodes of routing protocol. It presents that elapsed time moving speed 5 m/s number of dead node of IPL_AOMDV, PL_AOMDV, AOMDV, and AODV protocols. The curves of AODV, they are very steep. The curve of AODV and AOMDV has large difference. The Curve of IPL_AOMDV Protocol is also top of that of AOMDV and AODV. IPL_AOMDV relatively smooth which indicates node energy consumption of IPL_AOMDV is more uniform than PL_AOMDV, AOMDV and AODV. These three images that IPL_AOMDV protocol can reach energy and load evenly different moving speed.

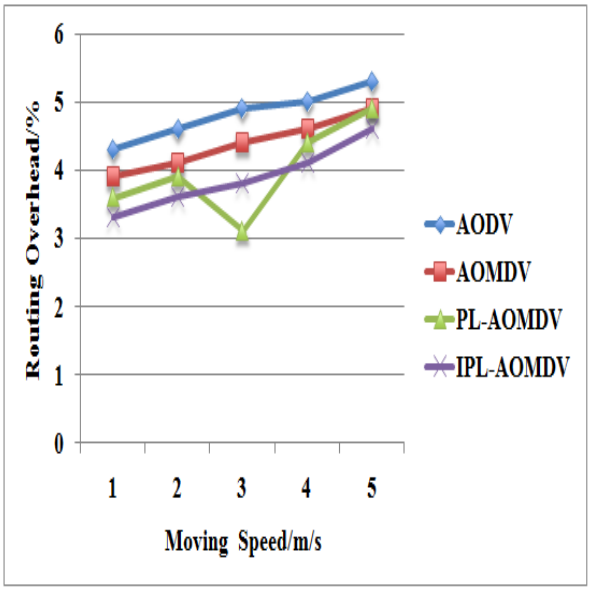

Figure 10.3 Network overhead

Figure 10.3 It shows that comparison of network overhead. As IPL_AOMDV adds bandwidth and energy parameters in routing packet as well as periodic network maintenance mechanism, the overhead of IPL_AOMDV is slightly increased than PL_AOMDV, but still less than of AOMDV. Seen from performance of energy and load balancing, the increased overhead is worthy.

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11. Results Performance of PL_AOMDV and IPL_AOMDV

Protocol Parameters	PL_AOMDV	IPL_AOMDV
Elapsed time (0m/s)	650	700
Elapsed time (2m/s)	650	680
Elapsed time (5m/s)	650	700
Network Over Head	330	360

12. CONCLUSION AND FUTURE WORK

In this paper evaluated the performance Of IPL-AOMDV, PL_AOMDV, AOMDV and AODV using ns-2.Comparisonwas based on the Routing overheadandrelationship between dead nodeand elapsed time at (0m/s, 2m/s, 5m/s).This work concluded that in the dynamic network, IPL-AOMDV gives better performance as compared to PL_AOMDV, AOMDV and AODV interms of load balancing and average node lifespan.In the simulation process get the results in the forms of graphs. Wireless ad-hoc network are made up of nodes which communicate with each other by sending and receiving messages. The infrastructure network where the number of nodes mayvary with time. The major challenge in the wireless ad-hoc network, improvedrouting protocol load balancing, power Control and congestion control. In thiswork four parameters are used for control Network overhead, load balancing. The IPL_AOMDV multipath routing protocol improved the load balancing, power Control, Congestion control. Future work securities is concerned; and also add security in the above protocol and further make load balanced secure routing protocol.

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