Efficient Prior Path Failure Recovery Algorithm Using Channel Aware Routing In Manet

Ramadass Sundar, Ayyaswamy Kathirvel

***Abstract:** In a MANET each nodes are deployed in a self configurable, organisable and controlled manner. Rapid node mobility will lead to signal fluctuation and reduces packet delivery. It also leads to path loss in near future. In our proposed failure path recovery algorithm, we analyze medium to measure loss and gain of signal strength. Whenever a signal fluctuation occurs, a path alteration is done by selecting a stable one hop neighbor node with better processing capacity. This is done prior to path failure and ensures the reliable data transmission. This projected concepts is evaluated by NS-2 Simulator, it involves minimizing the computation overhead, packet loss and increase delivery of data transmission reasonably than the AOMDV and CA-AOMDV. The maximum lifetime of the node on the AOMDV and CAAOMDV is less than 3.615% when compared to PPFR-AOMDV and also the path stability of PPFR-AOMDV is 1.925 greater than that of CA-AOMDV AND AOMDV.*

***Index Terms:** Medium analysis: signal fluctuations; link quality; processing capacity.*

I. INTRODUCTION

A mobile ad hoc network does not require any infrastructure and allows each user to communicate directly with each other. It is a self-organizing network of mobile devices which are connected via wireless links without any access point [1].

MANET is self-healing through continuous reconfiguration without any other central network administration. It is easy to deploy and also accommodates the addition of more nodes are configured in the network. It also supports anywhere and anytime computing process in mobile devices [2].

The import constraints are in the mobile device path failure due to node unavailability. A node becomes unavailable as it moves out of coverage area with the signal strength, node stability, link stability and behavior of nodes.

$$\text{Signal Strength (SS)}\ \alpha\ \frac{1}{\sqrt{DISTANCE}} \qquad (1)$$

Nodes are communicated directly within the transmission range and indirectly through multi hop communication in MANET.A network topology changes unpredictably based on movement speed and vary with time of the mobile devices. According to the formula (1) factors that affect bandwidth are fading, noise and interface. Channel aware multi hop neighboring nodes are selecting the best pathway to send information from source to the destination.

The proposed framework a prior path failure recovery algorithm is used for analyzing channel behavior of the data transmitted using the signal stability based on medium analysis and link quality based on link stability. It reduces the communication overhead, packet loss and increases the delivery of data transmission.

The take it easy of the article is prepared as given: we discussed the background and related works are in Section II. The proposed methodology of prior path failure recovery algorithm is in Section III. Simulation results and analysis of the result performance are given in section IV. Conclusion and future enhancement be presented within part V.

II. BACKGROUND AND RELATED WORKS

In a MANET, mobile nodes communicate over wireless channels without any base station. In this network, mobility nodes arbitrarily leave or join the network. They use many routing algorithms. In the existing system, the reactive routing algorithm is used, where it broadcasts the control packets through the Route Request and Route Reply message. When the node declares that the active route is broken or congested based on unavailability of node, received the power of signal strength is low, next neighbor node unreach. The periodic HELLO timer expires and there is no HELLO packet received, in this case it sends Route Error message to the source node to perform the local route repair strategy. The AOMDV and other reactive routing algorithm repair the route by broadcasting the RREQ packet to find an alternate route to destination [3]. This scenario creates the following problems, in an existing system to overcome the above problems they use the algorithm called prior path failure recovery AOMDV (PPFR-CAODV). This algorithm of for analyzing channel behavior the data transmitted using the signal stability based on medium analysis and link quality based on link stability, it reduces the communication overhead, packet loss and increase delivery of data transmission [4].

In [5] proposed channel aware routing in Mantes with route handoff. A user discussed with path information maintained to selection of the best path, channel average non -fading metric route discovery using a pre-emptive handoff based to improve the system performance. But here Node availability and unavailability of information based on node stability in a path is not considered.

In [6] proposed to enhanced trust based delegation for load balancing in MANETS. In this paper the user has proposed load imbalance and perform the delegation to make the load balanced. But here signal strength use availability and unavailability of the node based on distance, the coverage area of the two neighbor node to predict link stability is not discussed

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Ramadass Sundar, Research Scholar, Department of Computer Science and Engineering, Sathyabama University, Chennai.India.

Dr.Ayyaswamy Kathirvel, Professor, Department of Computer Science and Engineering MNMJAIN Engineering College, Chennai, India.

In [7]proposed LSMRP: Link stability based multicast routing protocol in MANETS. This paper has proposed to receive power signal stability analysis to find the loss and gain of signal stability based on communication with the neighbor node to provide the stability of the link. But every node to various from the node stability based on distance and coverage are provided the availability of the link which is not discussed.

In [8] proposed to enhance ODMRP with Motion adaptive refresh. These techniques are discussed to select min hop count based on the route is established without considering the link quality of reliable transmission. Which may lead to path loss in the route discovery and also reduces delivery of data transmission

In [8] proposed an improved AOMDV routing protocol based on prediction of link stability. A user discussed the availability of the link estimation has been used for route selection as it provides high throughput. But the user does not discuss to monitor instantaneous link conduction. It estimates the availability of the link to provide better throughput at end to end system.

In [9] proposed predicting the link stability based on link connectivity changes in mobile ad hoc network. Here predict the link connectivity changes affected by the network layer, amount of channel bandwidth measure for data transfer in the stability of the link is proposed. But user has not discussed any prior information about the monitor instantaneous link conduction.

In [10] proposed optimized local route repair and congestion control in MANET. These techniques are discussed to select the path battery status, queue length and forwarding region on effective data transmission. The set of intermediate may be selected during route discovery which have limited resources are energy level, allocation bandwidth and node stability and link stability are not considered.

In [11]proposed enhanced routing algorithm to reduce number of transmission in MANET. These techniques are discussed few multiple paths instead of all the paths with based on signal strength, Signal to Noise ratio and trusted node in order to find out the minimum path between source and destination. If the node moves out of the coverage area, there occurs the node unavailability and the alternate route failure not considered.

In [12] proposed introducing efficient AODV routing protocol for MANET. A user discusses with frequently route breakage to find out the best path in a neighbor node way reach from source to destination. Hence it requires an assessment of node processing capacity, which depends on high energy level for those nodes involved in transmission not discussed.

In [13]proposed performance evaluation and comparison of AODV and AOMDV. When all routes fail, a new route discovery is broadcasting. The advantages are a fast and efficient recovery from failures. It may increase the delay in packet transmission and reduce the energy level of nodes in the particular path. The user does not discuss every packet which has to be transmitted sequentially from source to destination. There occurs more traffic due tothe large number of control packets.

A. Research Motivation:

In rapid node mobility the signal fluctuations occurred in the mobile ad hoc network. It affects the link quality which may lead to path loss in the route discovery and also reduces delivery of data transmission**.** A prior path failure recovery algorithm for analyzing channel behavior of the data transmission based on medium analysis and link quality based on link stability, it reduces the communication overhead, packet loss and increase delivery of data transmission.

B. Research Questions:

1. How will you find the node mobility in MANET using medium analysis?
2. How will you find the signal stability and bit error rate of rapid node mobility in MANET using medium analysis?
3. How can you find the stable and unstable neighbor node in MANET using the link stability?
4. How can you find consumes energy for establishes a link in MANET without affecting the link stability?
5. How will you find loads of the data for reliable data transmission in MANET without affecting the delivery of data transmission?
6. How can you construct the prior path failure recovery algorithm of for analyzing channel behavior the data transmission?

C. PROBLEM IDENTIFICATION*:*

- If the node moves out of the coverage area, there occurs the node unavailability and the alternate route failure.
- In the network, all packets are transferred from source to destination; hence it requires an assessment of node processing capacity, which depends on high energy level for those nodes involved in transmission.
- A link availability estimated was used for route discovery, monitor instantaneous link conduction to provide better throughput at end to end system.
- Since every packet has to be spread on consecutively from source to destination, there occurs more traffic due to the large number of control packets.
- The set of nodes may get selected during route discoveries which have fewer resources such as energy and buffer to store the packets, which leads to further breakage of links. The above problem causes congestion in the network.

D. Motivating Examples:

1. How can emergency situations be observed to quickly set up for dynamic network in MANET.
2. How can an environmental monitoring observe the stable or unstable nodes communicate?
3. How can a medical health care application and remote area military purpose share the information even though earthquake or fire.

III. PROPOSED WORK

In this proposed system prior path failure recovery algorithm for analyzing channel behavior of the data transmission with proper channel aware failure node detection and recovery is done.

The neighbor nodes with the following components are analyses like node stability, link stability and it provides the path stability, etc. The stable neighbor node is selected for the reliable data transmission.

A prior path failure recovery algorithm for analyzing channel behavior of the data transmitted using the signal stability based on medium analysis and link quality based on link stability. It reduces the communication overhead, packet loss and increases delivery of data transmission.

A. **Medium Analysis***:*

In MANET communicate and cooperative with each other to achieve in the goal. The mobility nodes are randomly moved from away or links together join the network. It uses many routing algorithms. In the network, the AOMDV routing algorithm is used, where it broadcast the control packets through the Route Request (RREQ) and a Route Reply (RREP) message for multiple paths routing.

A formula (2) Medium analysis is done to detect signal fluctuations as well as node stability. It's not affected by link quality to provide a reliable data.

$$Medium\ analysis\ (MS) = Node\ Stability\ (NS) + Signal\ stability\ (SS) \quad (2)$$

$$Where\ Node\ Stability = distance\ (D) * coverage\ area\ (CA) \quad (3)$$

Node stability means node distance and coverage area to monitor instantaneous on the entire neighbor node. In this path information should be found based on distance and coverage area of availability with unavailability of nodes using the formula (3), (4), (5).

Availability of Node (AN) =Node moves from same direction with nearest neighbor node (4)

Unavailability of Node (UAN) =Node moves from away direction within outside coverage area (5)

Rapid node movements and less energy level are an important factor in mobile ad hoc network. The reduction of energy loss as a possibility will cause in the early hour's unavailability of node and consequently the links are failure in Fig 1.Stablenode generally depends on the availability of the link and a monitor instantaneous link conduction to provide reliable data transmission at the end to end system.

According to the formula (6) using components are received power signal stability (RPSS) is done to detect signal fluctuations Transmitted power signal stability(TPSS) ,it involves the measure of loss and gain of the signal strength which may lead to path loss in near future.

$$RPSS = TPSS + GSS - LSS \quad (6)$$

$$Pr = \frac{Pt * C2GtGr}{4\pi rf} \quad (7)$$

In this formula (7) Pr has received power signal strength, Pt is transmitted power signal strength, C is Speed of light, Gt is transmit antenna gain, Gr is received antenna gain ,cyclic frequency is f ,range of communication is r.

Gain and loss of power level calculated in DB

$$G_{DB} = 10 \log_{10}\left(\frac{POUT}{PIN}\right) \quad (8)$$

$$L_{DB} = 10 \log_{10}\left(\frac{PIN}{POUT}\right) \quad (9)$$

If RPSS is more than the Average Signal Strength (ASS) then we can accept path otherwise reject. The neighbor nodes are analyses the gain and loss of signal strength from the source through the channel to the recipient in the system using formula (8), (9).

B. **Availability of Link based Delegation on Neighbor Node***:*

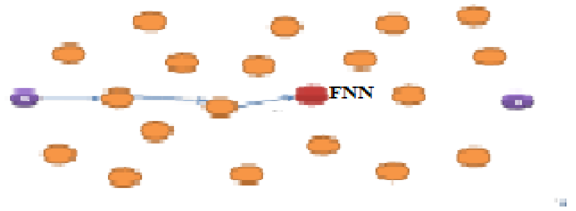

Figure1: Failure of node detection

In the proposed system, instead of sending information to the source node, the neighbor node itself finds the alternative path in fig 2. We use a PPFD-CAOMDV algorithm is a node failure or low energy level, the PPFD-CAOMDV algorithm is invoked to select the next suitable neighbor node. For selecting the next neighbor node(ANN), this algorithm in its place of set of nodes to selects a single Challenge node(CA) based on the following components, such as Received power signal (RPSS) is greater than Average signal strength (ASS) with Distance (D) of the same Coverage Area (CA) in that channel of the path to improve life time of link a formula (10).Otherwise a RPSS is low and also next neighbor node unreachable, then the link termination and path also terminated whenever the minimum LTT in formula (11),(12).Thus, by the above scenario the AN with MLT nodes are selected a route discovery process, when the minimum(LTT) means the delegation of neighbor node is selected for alternate path in fig 3.

$$Max\ life\ time\ of\ link\ (MLT) = (RPSS > ASS) * D\ (CA) \quad (10)$$

Link termination time (LTT) = (RPSS<ASS) + (next neighbor node unreac)(11)

Route termination time (RTT) = minimum (LTT) (12)

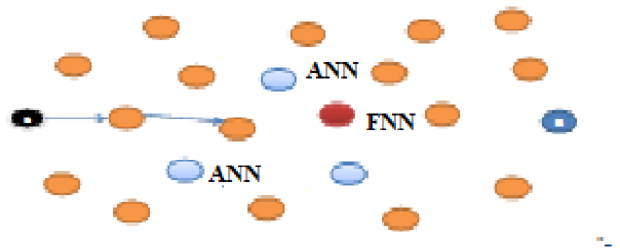

Figure 2: Finds the Availability of neighbor node (ANN)

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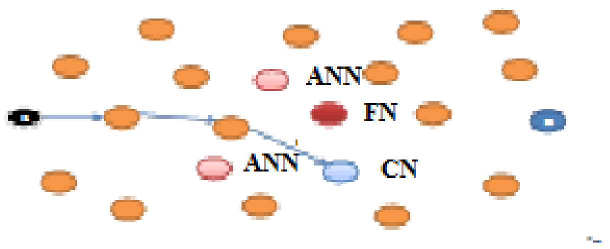

Figure 3: Selected the Chance (CN) able the availability of a neighbor node

When the node becomes unavailability means it can move away from the direction within an outside coverage area.

When the received power signal strength (RPSS) is more than the ASS, it assigns the availability node in monitor instantaneous link condition add the array list a[j] using algorithm1

Algorithm1 Availability of Node Monitor_ instantaneous_ link condition :(ANMII)

1. Instead of the entire Node (M1, M2, M3…Mn) are Route Request (RR),the Availability of neighbor nodes aredetected thenaddsanarray list of the neighbor nodes n1, n2….nn nodes a[j] for thepath.

2. For i in range(1,m) {

3.if $((a[i].RPSS > ASS)\&\&(a[i].AN == D * (CA)))$

4. {Return neighbor node a[j]=Node[i] ;}}

Path Stability is the sum of all the Max life time of link to a neighbor node divided by the length of the path.

5. Path Stability (PS)= $Sum\ +\ a[j].\frac{MAXLIFETIME}{PATHOFLENGTH}$

C. **Node processing capacity***:*

The processing capacity of each node depends on node energy level is current workload and a moment of time taken. Incoming and Processing the number of

Algorithm2 Processing_Capacity_ Node_ Selection (PCNS):

Path Stability (PS) ofarray list PS1, PS2, PS3…PSn in multipath travelfrom initialize to the receiver side.

For i=1 to n do {

1.PS[i].Nodeenergy[NE] = $PS[i].workload\ [WL]\ *\ PS[i].moment\ [M]$

2. An Incoming packet of the node energy [IPNEr] = $PS[i].Number\ of\ packet\ *\ PS\ [i].moment$

3 .Processing packet of the node energy [PPNEr]

$= PS\ [i].Processing\ the\ number\ packet * PS[i].moment$

4. Time taken for incoming packet of the node energy [IPNEt] = $\frac{PS[i].amount\ of\ packet}{PS\ [i].bandwidth}$

5. Time taken for processing packet of the node energy [PPNEt] = $\frac{PS[i].processing\ the\ number\ of\ packets}{PS[i].bandwidth}$

6. Energy utilization of each node [En] = $PS\ [i].[IPNEr * PPNEr] + PS\ [i].[IPNEt * PPNEt]$

Return Path PS[i];}

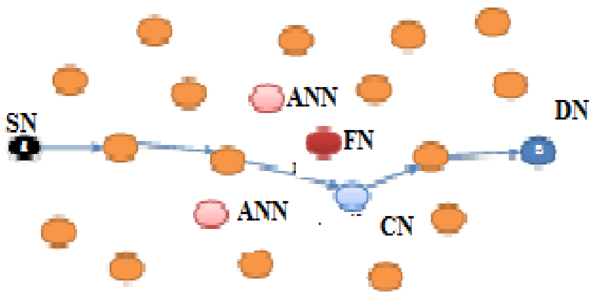

Figure 4: prior path failure recovery neighbor node

Packets a node consumes energy to establish a link using and amount of channel bandwidth utilized for time taken Incoming and processing the number of packets to transferring the data between the neighbor nodes.

The each node of the processing capacity will manage to have an energy utilization based on consumes energy to establish (incoming and processing the number of packets in a link established) and (time taken for incoming and processing the number of packets) amount of channel bandwidth utilized for data transfer between the neighbor nodes an algorithm 2.

D. Prior Path Failure Recovery -CAOMDV ALGORITHM:

Mobile nodes are dynamically moves unfortunately not reachable, while transmitting the data at the movement of the time to recover the path will identify the Availability Neighbor Node and also the selection in this all neighbor nodes choosing node at the maximum lifetime of the node in which constraints based chosen in that path Fig 4. To call function again and again each node travels the entire path ANMII () and PCNS () maintain the node and the best path is selected in algorithm3.

Algorithm3 Prior Path Failure Recovery (PPFR):
1. If (Received Power Signal Stability>ASS) or next node reachable))
2. Begin
3. Call function Availability (
nodeMonitor_instantaneous_link ();
4. Return neighbor nodes
5. End
6.if((node_energy_level<low)&&(node_highworkload>threshold))
7. Begin
8.Call function processing_capacity_node_selecion ();
9. End

IV. Simulation Results

A. Simulation model and parameters:

Ns-2[14] Network Simulator is used to simulate the prior path failure recovery algorithm using channel aware routing in MANET. In this simulation 50 nodes are set up in the area 1200*1000 using the routing protocol in AOMDV.A Simulation Time is 250s, the node set up Antenna height to be 2.0m.A power of transmitting system is 0.258938W and coverage area of nodes are 250m. The rapidly node movements on random way point of data transmission in a 2m/Sec.

In the proposed scheme compare routing protocol AOMDV (Adhoc On demand Multipath Distance Vector CA-AOMDV (Channel Aware-Aomdv) and PPFR-CAAOMDV (Prior Path Failure Recovery-CAAOMDV) using simulation parameters on evolved the performance metrics are communication overhead, packet delivery ratio, number packet loss and average end to end delay and stability of neighbor nodes are analyses using Path Stability, Max Life Time Stability, Link Stability.

a) Case 1 :(stability of neighbor nodes)

In AOMDV algorithm select the best path in the minimum hop count, but link stability and path stability isnot fully considered. When the link failure a path between sources to the destination, alternative path is utilized. Inthe active path becomes unserviceable the result will be frequent link failure that affect by the data loss show in table1.

Link Stability Estimation:

In Fig5 link failure on AOMDV Routing Protocol is 18.404% less than that of the CAOMDV Routing Protocol. Similarly, the CAOMDV is 1.38% less than when compare to PPFR-AOMDV.

High average end to end delay in AOMDV compare to the AODV, because alternative path is chosen when every link failed. No prior checking a node processing capacity based on every node consumes energy for establishing link amount of channel bandwidth utilized for data, transfer it affected by the high communication overhead show in table1.

In fig 6 max life time of node on AOMDV Routing Protocol is 2.34% less than when compare to CA-AOMDV. Similarly, the CA-AOMDV IS 4.89% Less Then When Compare To PPFA-AOMDV.

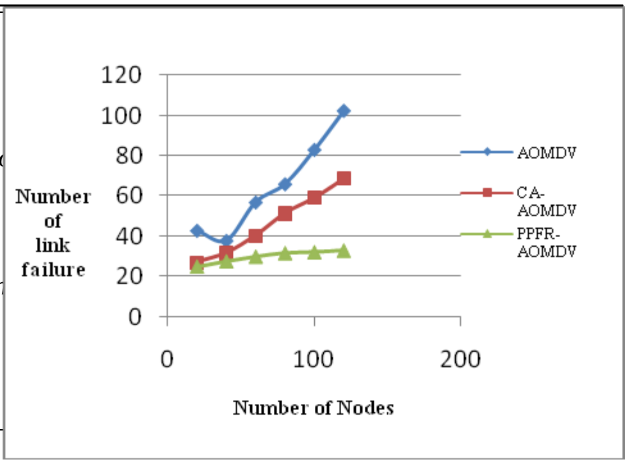

Figure 5: Link failure vs. Number of Node

Max Life Time of Node:

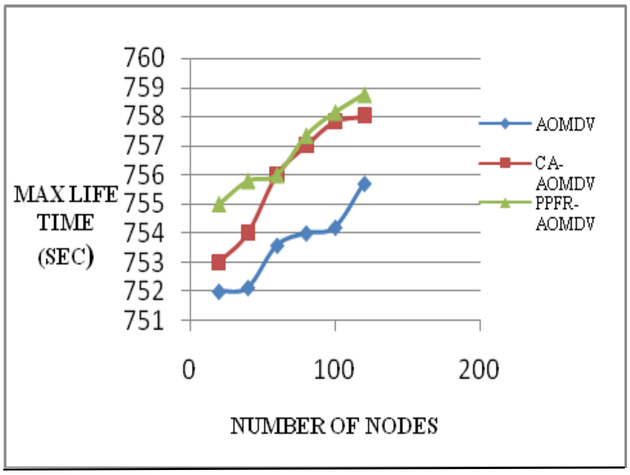

Figure 6: Max life time vs Number of Nodes

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Max Life Time of Node Estimation:

When the node becomes unreachable, no prior check processing capacity of the link as well as the data transfer and it doesn't monitor instantaneous link condition on availability of the node to provide the reduces the packet delivery ratioshow in table1.

In PPFR-CAOMDV algorithm a node becomes unreachable, a prior path failure recovery algorithm to select the neighbor node to delegating all the activities, prior check processing capacity of the link and availability of node to monitor instantaneous link condition without any packet loss and reduces the delay.

In path stability of the CA-AOMDV is 1.78% greater than that of AOMDV. The path stability on CA-AOMDV is 0.745% less than when compare to PPFR-AOMDV.

Path Stability:

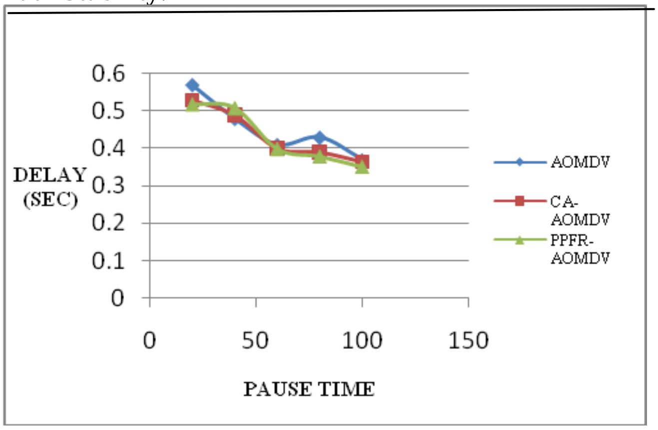

Figure 7: Delay Vs Pause Time

Table 1: PROTOCOL VS PERFORMANCE METRICS.

PROTOCOL PERFORMANCE METRICS	AOMDV	CA-AOMDV	PPFR-CA AOMDV
COMMUNICATION OVERHEAD	HIGH	HIGH	LESS
NO.OF PACKET LOSS	MORE	LESS	LESS COMPARE CA-AOMDV
PACKET DELIVERY OF DATA TRANSMISSION	LESS	MORE	MORE COMPARE CA-AOMDV
AVERAGE END TO END DELAY	HIGH	LESS	LESS

b) CASE 2: Performance Matrices:

Communication overhead:

$$Communication\ overhead = ST + \frac{LM}{B} \qquad (13)$$

In Fig 7 communication overhead draws the graph as a formula (13) SetupTime (ST), Length of Message (LM) divided by Bandwidth (B) this parameter involves derivingby delay vs. pause time. When the overhead of AOMDV is 1.78% more when compared to CA-AOMDV and 0.0608% more than comparable to PPFP-AOMDV.

Communication overhead estimation:

Packet delivery ratio:

$$Packet\ delivery\ ratio = \frac{SENDER\ SEND\ NUMBER\ OFPACKET}{RECEIVER\ RECEIVE\ NUMBER\ OFPACKET} \qquad (14)$$

Packet delivery ratio estimation:

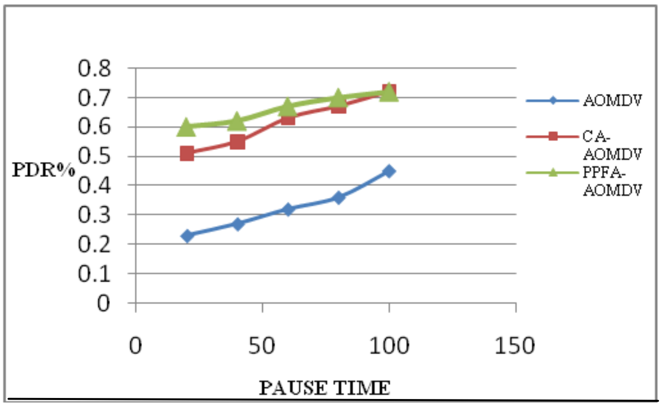

Figure8 Packet Delivery Ratiovs Pause Time

In Fig 8 the throughput of CA- AOMDV is 5.86 % more than when compare to AOMDV. Similarly the packet delivery ratio of derived as a formula (14) PPFR-AOMDV is 0.82% more than when compared to CA-AOMDV.

V. CONCLUSION AND FUTURE ENHANCEMENT

This article is projected in such a manner that intermediate itself finds the alternative path without intimating to the source node. Also, we extend with the PPFD-CAODV algorithm by selecting stable neighbor node with link stability and also monitor instantaneous link based on, energy level and node behavior to maintain path stability. Hence, it reduces the recovery time of path failure and burden of source node to select alternative path. The simulation parameter maximum life time of node is analysis based on selecting the stability of next hop neighbor node and monitor instantaneous link condition analysis depending on the path stability will be provided. This paper extends to helps the research, the available resource based on shared by the number of each mobile nodes to improve the delivery ratio in the various efficient path.

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AUTHORS PROFILE

R.Sundar working as Assistant Professor of Computer Science and Engineering, Adhiparasakthi College of Engineering, Kalavai, Vellore Dist. India. He has received 4 National conferences and 2 International conferences for his research contributions in International Journals of (Scopus & SCI). His area of Interest includes Wireless Networks, Mobile Ad hoc Networks and Web Security.

Dr. A. Kathirvel working as Professor of Computer Science and Engineering, M.N.M Jain Engineering College, Chennai.india. He has published more than 90 papers in national and international conferences and in international journals. He is working as scientific and editorial board member of many journals. He has reviewed dozens of papers in many journals. He has author of three books. He has also published a research monograph from the LAP Lambert Academic Publishing GmbH & Co., Germany, Europe based on his Ph.D thesis titled "Umpiring Security Model and Performance improvement on MANETS", costing 110.35 Euros. His other two books are Introduction to GloMoSim and Prevention of Attacks using Umpiring Security Model for MANETS,LAP Lambert Academic Publishing GmbH & Co., Germany.Europe. His research interests are protocol development for wireless ad hoc networks, security in ad hoc network, data communication and networks, mobile computing, wireless networks and Delay tolerant networks. He is a Life member of the ISTE (India), Senior Member IACSIT (Singapore), Life Member IAENG (Hong Kong), Member ICST (Europe), IAES, Member IEEE and ACM.

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