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STABLE PATH SELECTION NODES BASED ON REINFORCEMENT LEARNING ALGORITHM TO ENHANCE THE NODE AND LINK STABILITY IN MANET

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ABSTRACT:

In MANET the route discovery in AODV (Ad hoc on demand distance vector routing protocol) is performed on demand and it involves flooding the route request packet. The existing path may be unavailable as the node moves out of coverage due to its rapid node mobility or node fail as it energy level is drained. The proposed system implemented by a Reinforcement Learning using machine learning in which establishing the stable path by selecting these nodes that have node and link stability. A node performs the activity as action and a state. Action is apply the external condition and when given condition is satisfying than it provides reward is a state. This process will eliminate re-route discovery process and there by reduces additional routing overhead caused by the re route discovery. It provides a high degree of stability, increases packet delivery ratio and reduces routing overhead and delay

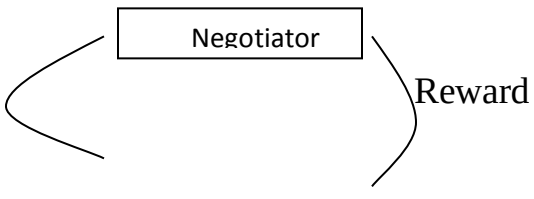
1. INTRODUCTION

A group of mobile nodes also wireless devices that cooperate and forward packets for each other. All Nodes are Self-creating; self-administering and self-organizing in which the wireless range communicate directly Nodes can join in or move out at any time. Every node can act as a router or as a host or both. An important issue in stable ad hoc networks and protecting their network layer operations from stability of nodes.

We tackle an important stability issue in ad hoc networks, namely the protection of their data layer operations from unstable nodes and link failures during the route discovery process. Unstable nodes and link failure are disrupt routing algorithms by transmitting a there may high drop packets, more delay and high routing overhead so on. Main objective of our research focus is to protect the route discovery and forwarding data packets in a combined framework.

In AI a node can act as intelligence behavior. Node have route discovery can identify nearest neighbor nodes, if any one of NN is failed due to low energy level or link fails. Prior to failure, a node that is going to fail in near future, will delegates all its activate to trust neighbor node and avoids existing path failure.

Reinforcement Learning using machine learning in which establishing the stable path by selecting these nodes that have node and link stability. This process will eliminate re-route discovery process and there by reduces addition routing overhead caused by the re route discovery. It provides a high degree of stability, increases packet delivery ratio and reduces routing overhead and delay.



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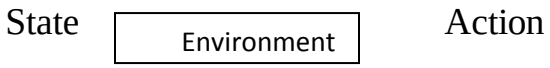

Fig 1 Reinforcement learning

The take it easy of the article is structured as follows: In this Section II we discuss the background and related work. The Section III details about the Problem identifications of existing systems. In our proposed methodology of reinforcement learning algorithm in Section IV. Analysis and results are performing is given in section IV. Conclusion and future enhancement presented in Section V

2. LITERATURE SURVEY

Mukesh Kumar ,Ghansyam Prasad Dubey [1] in MANET nodes are free to move in the network or outside the network. The mobile nodes are continuously moves in different mobility and forming dynamic connection in between senders and receivers. The main consumption source of energy is transmission then receiving in network. The proper energy of mobile nodes are should not exhaust until and unless without any problem in internal circuit. The energy efficient routing is the major issue in dynamic network and this problem is possible to resolve by modifying the routing strategy of communication. The proposed Energy efficient Multipath scheme is always select the higher energy level nodes for sending packets.

In this scheme does consider the remaining battery energy of nodes, and was used to study the energy efficiency of the proposed algorithm. Extensive simulations showed that EER not only saves more energy compared to existing energy efficient routing algorithms, but also increases the reliability of link establishment in between sender and receiver in MANET. Furthermore, we observed that proposed finds multiple routes that their energy efficiency and reliability is more as compare to route discovery of normal energy based routing. However, it is also extends the network lifetime by directing the traffic to nodes having more amount of battery energy. The routing overhead is reduces and packet dropping is almost half of the normal multipath routing, that is the sigh of better routing in MANET. The proposed scheme is utilizes the energy consumption of mobile nodes and reduces the possibility of retransmission. The power consumption is not utilized more for route request but for data delivery. The larger packets receiving is demonstrate the corroboration of strong link establishment. The location system is identified the proper location of mobile nodes and by that from current location of node the estimated location discover is also reduces routing packets flooding.

Kamlesh Chandravanshi , D.K. Mishran [2] From the number of statistics analysis from MANET environment, we conclude subsequent points under our AOMDV-Dream Protocol. It provides location information of each node and create location reference table. It produce information about nodes belongs to which route and also minimize routing overhead as compare to AOMDV. It gives movement log table of each mobile node. It gives analysis outcome type of packet, number of data send, number of data received is higher than the AODV routing and overhead is lower we will find the location of every mobile node and create location table of each mobile node, location table provide DREAM routing module and after that we transmit data packet through AODV module that provide Multipath way data transmission mechanism, after we analyze our result through various network parameter like routing load base tcp and udp analysis is to combine AODV-Dream protocol gives better result as compare to AODV routing.

P. Sreevatsan [3] mobile ad hoc network (MANET) is a continuously self-configuring, infrastructure-less network of mobile de vices connected without wires. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. This results in a highly dynamic, autonomous topology. This makes routing in MANET a tedious process. Clustering is a process that helps in efficient handling of MANETs. The WCA algorithm is considered to be the best algorithm that takes into account various parameters for clustering

In this work the WCA algorithm is extended to include a factor known as cluster stability factor to measure the stability of each cluster. The cluster stability factor may depend on several parameters such as distance between the farthest node and the cluster head, velocity of the cluster head, energy of the cluster head, and number of nodes in the cluster.etc. We observe the cluster stability factor of each cluster. Depending on the change in cluster stability factor we invoke the re-clustering algorithm. The work is also extended to include routing through the clusters. Routing can be made efficient using

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fuzzy logic. If there are more than one route between a source and destination, fuzzy logic can be applied to include the best route by considering the energy and velocity of nodes in the path. This work also detects malicious nodes and eliminates them from the clustering process.

Thus compared to the normal WCA algorithm the new method solves the problem of malicious nodes, over loading the clusters due to movement of nodes, and the problem of nodes dying out while routing.

Mr. Deshkar Rao Adkane , Mr. Umesh Lilhore**,**Mr. Ankur Tanejan [4] a mobile node may lose connectivity with the rest of the network simply because it has wandered off to far, or its power reserve has dropped and energy is reaches to below a critical level. If the link is break unexpectedly then the loss of data is again retransmitted through another path. The proposed energy scheme is always select the reliable energy nodes for sending packets. The proposed RRs routing does consider the remaining battery energy of nodes, and was used as a benchmark to study the energy efficiency of the proposed algorithm. Extensive simulations showed that proposed routing not only saves more energy compared to existing energy efficient routing algorithms, but also increases the reliability of link establishment in between sender and receiver in MANET. Finds routes that their energy efficiency and reliability is more as compare to route discovery of normal energy based routing. In this scheme also extends the network lifetime by directing the traffic to nodes having more amount of battery energy. The power consumption is not utilized more for route request but for data delivery.

3.1 EXISTING SYSTEM

In this modified form of AODV selects only few neighbor nodes having maximum energy level and RREQ is multicast to those neighbor. In AODV establish having maximum energy level. In this neighbor nodes are selected based on the transmission range and energy level but they had not addressed about the traffic load which will lead to congestion.

In this only consider about the energy level but we are not bather about the inter queue space for traffic analysis. A path having higher energy level may be congested and may not deliver the packet and hence decrease the packet delivery ratio.

3.2 PROPOSED SYSTEM

Learning is close the environment outside the control of the agent.RL agent learn from close interaction with environment. When close interaction means agent sense the state in which the environment is it takes the action which apply to the environment in this cause the state environment changes there by completed interaction cycle. Agent sense what is state of environment changes, it is cycle the state of the apply to the changes.

Every time it takes the action, it changes various output will be produced is called the stochastic network. The goal of agent is learn the policy which is kind of mapping sense the state and action to apply as to max measure of long term performance.

Agent - Neighbor Node

State - Route discovery and forwarding the data packets

Action- one node to another node a route request and reply as well as transmission of data packets.

Environment –local and global to reaches from source to the destination.

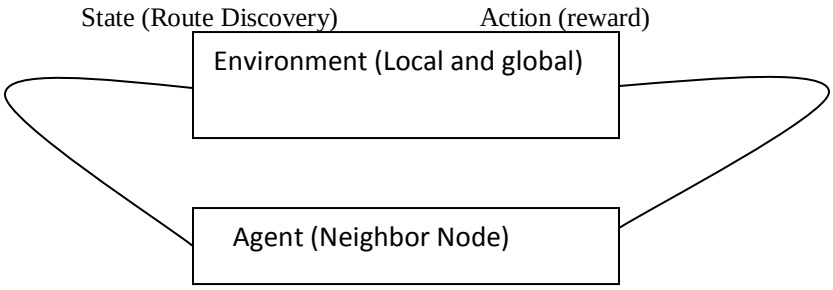

Fig 2. Basic diagram reinforcement structure

3.3 Reinforcement learning stable path:

The proposed system to handle network operations successfully in the presence of unstable nodes we need a Stable system with the following three functionalities: (i) sense (ii) separation the unstable nodes and (iii) reclaim. The third functionality that of

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reclaiming the route after any disruption. We will consider two distinct situations: disruptions during (i) route request (ii) route reply and (iii) data forwarding phases.

If the nodes behave during route request phase, it affected by the node becomes unavailable and signal strength. If the nodes behave during route reply phase, it affected by node becomes unavailable due to drain in its energy level and it is heavily load, such nodes will be sense the network by the prior to failure and reclaim packet commences immediately.

3.4 Route Request and Reply phase

During route request and reply phase reinforcement leaning is operational. In this the immediate predecessor and forwarding Successor monitors the performance. If node N_i becomes fail, and say announces a wrong sequence number. This is immediately observed by the node N_{i+1} which sets the sense of N_i to and starts RREQ reclaims operation. On the Other hand Ni simply loses communication link with $Ni_{+1,}$ N_i is not booked; only route reply prior to failure recovery .In this segment reinforcement learning will operational. On the other hand if node N_i goes out of communication link but the searching the agent (check external condition) to apply a node do not receive the hello messages from N_i and simply switch over to alternative path, thus booking of innocent node is avoided. In such a case N_{i-1} monitors N_i and N_i monitors N_i and N_i monitors N_{i+1} under RLSP [Reinforcement Learning Stable Path].

3.5 REINFORCEMENT LEARNING ALGORITHM:

Step1: Start

Step2: Let $N_1,N_2,\ldots\ldots\ldots, N_N$ be number of nodes in MANET

Step3: Each nodes moves with Velocity $VN_1,VN_2,\ldots\ldots\ldots, VN_N$

Step4: Each nodes has initial Energy level $EL_{N1},EL_{N2},\ldots\ldots\ldots EL_{Nn}$

Step5: for (int i=1;i<n;i++){

Step6: if ((Ni (VNi, ELNi)>Dth) Dynamic Threshold Value) { Step6.1: forward RREQ to select as a stable neighbor node.

Step 6.2 Reward –data may be sent to the available this node to another node.

}

Else

{

Step 7.1 reply RERR (Route Error) unstable neighbor nodes

Step 7.2 neglect (prior to failure recovery)

}

}

Step 8: As a result best path P1, P2, P3 RREP (Route Reply) message is forward Path is established in the reverse direction to reach source.

Step 9: Data may be sent to the available best path, which is kindly mapping sense the stable and action.

Step 10: Stop

3.6. REINFORCEMENT LEARNING-MARKOV DECISION PROCESS:

A markov decision process is state less process. It doesn't consider about the pervious transaction process. Every action is to make the decision for in the present situation. It is a widely used terms in reinforcement between agent and environment.

It consists of state, action, transition probability, reward and discount factor. State can be defined as current position of an agent. Action is responsible for moves from one state to another. Probability distribution is over next possible state given the current state. Reward means it takes the decision is positive solution.

Event:

Forward data packets=+1

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Node $_{\text{Nout of battery power}}$ $_{=}$<Dth (Dynamic Threshold Value)

Node $_{\text{delegation}}$ =reward

State:

Transaction from one node to another (Stable, Unstable)

Action:

Forward data packets are probability transaction (successful, failure)

Fig 3.State --Action diagram

Phase	SNo	Situation	Event	Action
RRQP AND RREP phase	**1a.**	**N_i out of communication range**	**Ni loss Communication range**	**N_{i+1} marks N_i w Identify node f Initiates Ro reply Recla operation as nod**
	1b.	**Ni due to the energy level**	**N_i gives a wrong hop count or sequence number**	**N_{i+1} initiates Ro reply recl operations**
Data forwarding phase	**2a.**	**N_i due to the signal strength or heavy load**	**Ni drops packets**	**N_i is marked w red flag by N_{i-1}, Alternative path established via A_i and N_{i+1}.**
	2b.	**N_i out of communication range**	**N_i loses power or goes out of communication zone.**	**Alternative path established via A_i, and N_{i+1}.**
	2c.	**Agent A_i out of communication range**	**loses power of goes out of communication link**	**N_{i-1}, N_i find out.**

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Response of RLSP for various situations

TableState-Action

ACTION\STATE	STABLE	UNSTABLE
SUCESSFUL	0.9	0.1
FAILURE	0.3	0.7

1. A node becomes stable state then the action is successfully data transfer
2. A node becomes unstable state then the action is very low percentage of successfully data transfer
3. A node becomes stable state then the action is failure due to signal strength reduces
4. A node becomes unstable state then the action is moves to delegate another node.

Even though a node becomes unstable then delegation process is implemented to provide the reward**.** A main goal of Markov Decision Process is continuously produces the stable and also successfully data transfer to reward.

4. Simulation and parameters

Ns-2[14] Network Simulator is used to simulate the reinforcement algorithm using Markov decision process in MANET. In this simulation 100 nodes are set up in the area 1000*1000 using the routing protocol in AODV.A Simulation Time is 250s.A MAC Protocol is 802.11 and variable bit rate is traffic pattern. When the packet size is 512 bits and data rate is 100kb, 200kb, 300kb in table3.

Number of nodes	100
Area size	1000*1000
MAC protocol	802.11
Coverage area	250s
Traffic pattern	Variable bit rate
Routing protocol	AODV, AODV-RL
Rate	100kb, 200kb, and 300kb
Packet size	512 bits

4.1. Performance Metrics:

A Performance Analysis between the Ad hoc on demand Distance Vector (AODV) and AODV

AODV and Modified AODV-RL PRTOCOL using simulation parameters on evolved the performance metrics are routing overhead, packet delivery ratio, average end to end delay and stability of neighbor nodes are analyses using Path Stability, node Stability, Link Stability.

Table 3 simulation parameters:

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Reinforcement Learning (RL).throughput, packet delivery ratio, end to end delay, routing overhead.

Throughput: How much of bandwidth need for transmit the data packets between sender and receiver.

Packet delivery ratio: it is ratio of packets successfully received to the total sent.

End to end delay: how much time taken for a packet to be transmitted across a network from source to destination.

Routing overhead: Node route request again and again, it affected by the unwanted situation.

Fig 4 shows the Throughput vs. Number of Nodes. The effect of variation in Number of node as (20, 40, 60, 80,100).A number of nodes increases then throughput also increases.AODV is average throughput 24.12% but AODV-RL is 23.01%, it increases 0.89% compared to AODV.

Fig 5 shows the Packet delivery ratio vs. Number of Nodes. The effect of variation in Number of node as (20, 40, 60, 80,100).A number of nodes increases then packet delivery ratio also increases.AODV is packet delivery ratio 89.12% but AODV-RL is 91.01%, it increases 1.89% compared to AODV.Fig 6 shows the End to end delay vs. Number of Nodes. The effect of variation in Number of node as (20, 40, 60, 80,100).A number of nodes increases then packet delivery ratio also decreases.AODV is end to end delay 498.88 sec but AODV-RL is 498.1 sec, it decreases 0.88 sec compared to AODV.Fig 7 shows the Routing Overhead vs. Number of Nodes. The effect of variation in Number of node as (20, 40, 60, 80,100).A number of nodes increases then packet delivery ratio also decreases.AODV is Routing packet 11.22% but AODV-RL is 10.01%, it decreases a number of nodes route request again and again 1.21% compared to AODV.

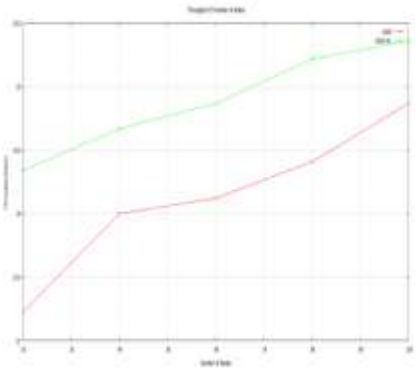

Fig 4.Throughput vs Number of node

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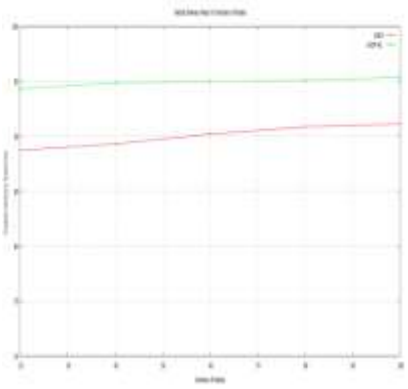

Fig 5. Packet delivery ratio vs Number of Nodes

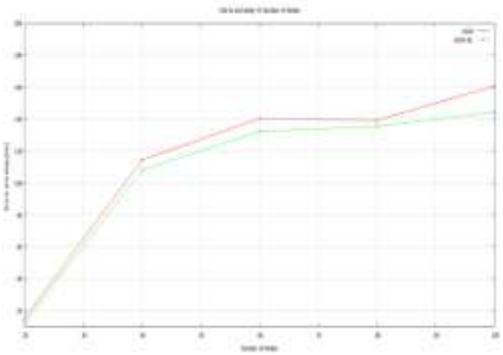

Fig 6.End to End delay vs Number of nodes

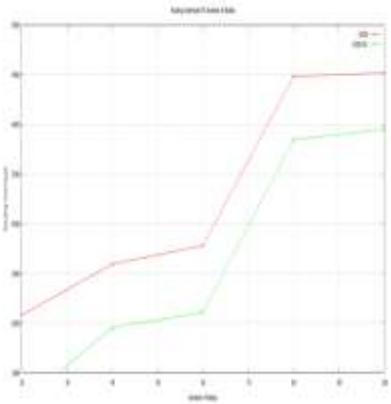

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Fig7.Routing Overhead vs Number of nodes

5. CONCLUSION AND FEATURE ENHANCEMENT:

In this planned system have been designed like the implementation of a modified AODV Reinforcement Learning (RL). This paper is sense a neighbor node to route discovery and forwarding data packets. Every time it takes the action, it changes various output will be produced is called the stochastic network. RL technique also attached the Markov Decision Process(MDP) is sufficient numbers of NN are selected to reach from the source to the destination if a node becomes unavailable, it involves delegation process to maintain node stability and link stability providing a stable path. According to the simulation results, our recommended RL-MDP can be implemented in mobile ad hoc network consequently stable paths have been established to improve the throughput ratio, which in turn reduces the route discovering overhead and disruption.

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