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Review Paper on AODV Performance in MANET using Genetic Algorithm

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ABSTRACT:
In this review paper, we are analyzing performance of AODV Protocol for cluster based routing scenario network in MANET using Genetic Algorithm. In cluster based routing scenario, network is divided into a number of small groups known as clusters, each cluster has one leader called as cluster head which is responsible for routing among the other clusters. Genetic Algorithm (GA) is a modest, effective and computationally effective optimization algorithm. It uses to address MANET issues such as node localization, optimal deployment, clustering and data-aggregation. This research work is focused toward the development of weighted cluster based routing algorithm optimized by Genetic algorithm. Simulation has been carried out on MATLAB-2010a and performance of our proposed algorithm is compared with conventional AODV routing algorithm based on network throughput, Network lifetime and End-to-End delay.

KEYWORDS: MANET, AODV, Throughput, Avg end to end delay, Network Lifetime, Genetic Algorithm.

INTRODUCTION

Wireless networks are gaining popularity to its peak today, as the users want wireless connectivity irrespective of their geographic position. Mobile Ad-Hoc Networks are autonomous and decentralized wireless systems. MANETs consist of mobile nodes that are free in moving in and out in the network. Nodes are the systems or devices i.e. mobile phone, laptop, personal digital assistance, MP3 player and personal computer that are participating in the network and are mobile. These nodes can act as host/router or both at the same time. They can form arbitrary topologies depending on their connectivity with each other in the network. These nodes have the ability to configure themselves and because of their self-configuration ability, they can be deployed urgently without the need of any infrastructure. Internet Engineering Task Force (IETF) has MANET working group (WG) that is devoted for developing IP routing protocols. Routing protocols is one of the challenging and interesting research areas. Many routing protocols have been developed for MANETS, i.e. MDVZRP, DSDV, AODV, OLSR, DSR etc.We have surveyed that, when we group the devices into number of clusters, assigning a cluster head to each cluster to route data to the destination. This increase the overall efficiency of the network as there's no repetitive data routing from number of hops for overall energy consumption. Also the main issue in such a cluster network is the selection criteria of cluster head because the routing mainly depends upon these cluster heads. This motivates us to introduce network grouping in traditional routing and adding a selection criteria of cluster head which is more efficient. The MANETs work without a centralized administration where the nodes communicate with each other on the basis of mutual trust. This characteristic makes MANETs more vulnerable to be exploited by an attacker inside the network. Wireless links also makes the MANETs more susceptible to attacks, which make it easier for the attacker

to go inside the network and get access to the ongoing communication Mobile nodes present within the range of wireless link can overhear and even participate in the network.

LITERATURE SURVEY

Author in **[3],** proposes routing protocols based on the {heading direction angle + Number of Hops, Number of Hops + heading direction angle, the best heading direction angle route}. The first one is designed to calculate the angle direction and when the angles are the same take the best hop count. The second one is designed to calculate the best hop count and when the hops counts are the same take the best angle direction. The last one is designed to calculate the average of all heading direction angles in the route and find the best route from the source to the destination. This protocol is compared with the well-known On-Demand (reactive) routing protocol (AODV).

Author in [4], describe a novel multipath hybrid routing protocol in name of Multipath Distance Vector Zone Routing Protocol and refer to it as MDVZRP. In this paper, the MDVZRP's performance is evaluated and compared with DSDV and AODV standard protocols delivering CBR traffic. Simulation results show that it gives better performance than DSDV in all situations, and better than AODV, when mobility is low.

Author in [5], present the implementation and analysis of MANET test-bed considering AODV and OLSR protocols for wireless multi-hop networking. In this work, authors consider four scenarios: Static, Source Moving, Destination Moving and Source-Destination Moving. They assess the performance of test-bed in terms of throughput, number of dropped packets and delay. From result, we found that OLSR protocol has a better performance than AODV when both source and destination nodes are moving. AODV as a reactive protocol is slower than OLSR when routes are changing quickly and continuously.

Author in [6], focused on increasing the prolonged existence of node in the network. In this paper, one set the minimum energy threshold limit of a mobile node, when a node reach the minimum threshold limit the node goes to sleep mode, save energy and participate in the event as long as possible. This paper also compares and analyzes the simulation results with a popular on-demand routing protocol AODV to show the usefulness of this algorithm.

Author in **[7],** proposes two energy-aware routing algorithms: an energy aware ad hoc on-demand distance vector (e-AODV) and an energy-aware dynamic source routing (e-DSR), and compares their performance with the well-known AODV and DSR routing algorithms. Glomosim is used to simulate and to compare the performance of the four routing algorithms (AODV, DSR, e- AODV and e-DSR) in terms of average energy consumption, average end-to-end delay and average drop packets.

Author in [8],evaluates the performance of various ad-hoc routing protocols such as DSDV, AODV, DSR, TORA and AOMDV in terms of energy efficiency and it also proposes a new routing algorithm that modifies AOMDV and it provides better performance compared to all the above protocols. Simulation is done using NS-2.

Author in [9], the performance analysis of AODV routing protocol is done on the basis of few performance metric parameters such as average end-to-end delay, throughput and packet delivery ratio. The simulation is done in MATLAB.

All reviews are done on AODV performance, but we are focusing AODV performance in weighted cluster based routing algorithm optimized by Genetic Algorithm.

MANET

A MANET can be defined as a collection of wireless mobile nodes that are capable of communicating with each other without the use of a network infrastructure or any centralized administration. The mobile hosts are not bound to any centralized control like base stations or mobile switching centers. The idea of MANET is also called infrastructure less networking, since the mobile nodes in the network dynamically establish routing among themselves to form their own network on the fly. It is formed instantaneously, and uses multi-hop routing to transmit information.

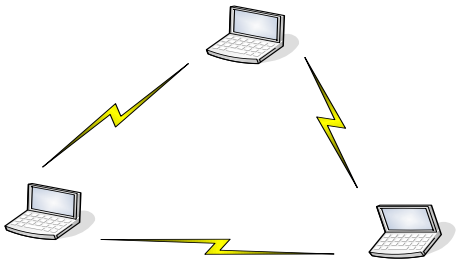

Fig. 1 An example of Ad-hoc Network

AD-HOC ON DEMAND DISTANCE VECTOR PROTOCOL (AODV)

As AODV protocol is used in this paper, AODV is described in RFC 3561 [10]. It's reactive protocol, when a node wishes to start transmission with another node in the network to which it has no rou6e; AODV will provide topology information for the node. AODV use control messages to find a route to the destination node in the network. There are three types of control messages in AODV which are discussed below.

A. Root Discovery Mechanism in AODV

When a node "A" wants to initiate transmission with another node "G" as shown in the Figure 2, it will generate a route request message (RREQ). This message is propagated through a limited flooding to other nodes. This control message is forwarded to the neighbours, and those node forward the control message to their neighbours' nodes. This process of finding destination node goes on until it finds a node that has a fresh enough route to the destination or destination node is located itself. Once the destination node is located or an intermediate node with enough fresh routes is located, they generate control message route reply message (RREP) to the source node. When RREP reaches the source node, a route is established between the source node "A" and destination node "G". Once the route is established between "A" and "G", node "A" and "G" can communicate with each other. Figure 2 depicts the exchange of control messages between source node and destination node.

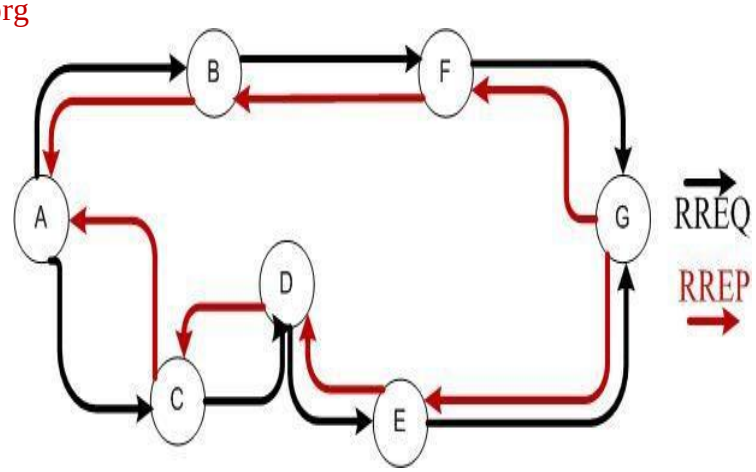

Fig. 2 AODV Route Discovery

When there is a link down or a link between destinations is broken that causes one or more than one links unreachable from the source node or neighbours nodes, the RERR message is sent to the source node. When RREQ message is broadcasted for locating the destination node i.e. from the node "A" to the neighbours nodes, at node "E" the link is broken between "E" and "G", so a route error RERR message is generated at node "E" and transmitted to the source node informing the source node a route error, where "A" is source node and "G" is the destination node. The scheme is shown in the Figure 3 below.

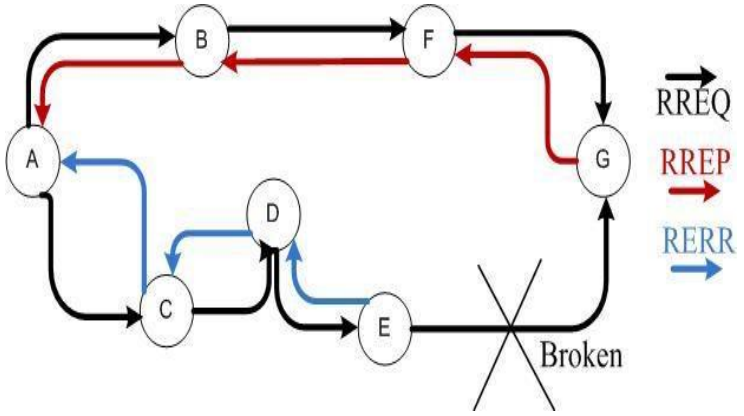

Fig. 3 Route Error Message in AODV

I. GENETIC ALGORITHM

A genetic algorithm is a probabilistic inquiry procedure that computationally simulates the methodology of biological advancement. It emulates development in nature by over and again modifying a populace of applicant results until an ideal result is found.

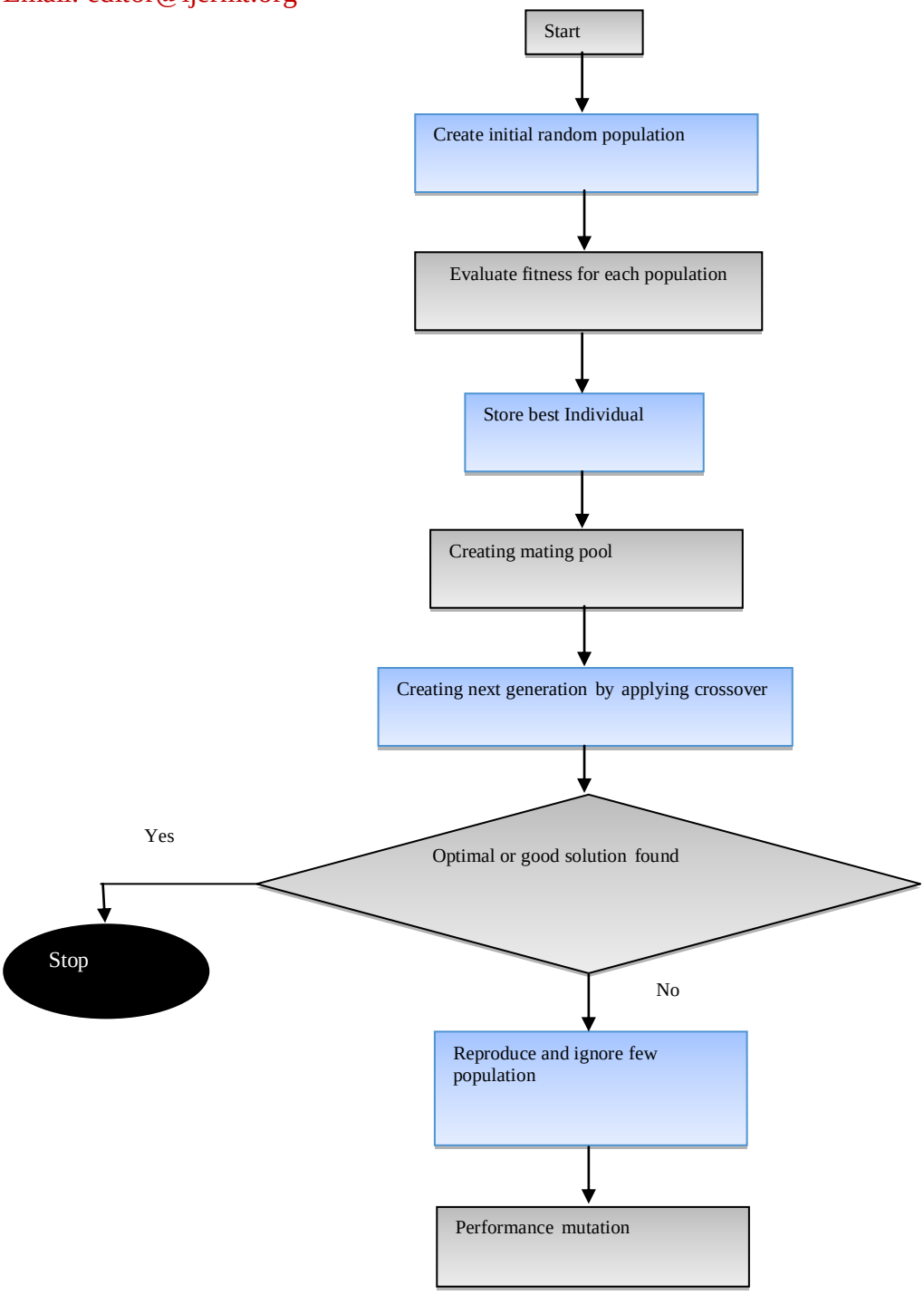

Fig. 4 Flow chart of GA

A. SELECTION

In biological development, just the fittest survive and their gene pool helps the production of the successive generation. Determination in GA is additionally focused around a comparative methodology. In a typical manifestation of choice, known as fitness proportional determination, each chromosome's probability of being chosen as a good one is relative to its fitness value.

B. MODIFICATION TO DEVELOP WORTHY SOLUTIONS

The alteration step in the genetic algorithm refines the good solution from the current generation to turn out a new species of candidates. It is carried out by performing crossover and mutation.

C. CROSSOVER

Crossover may be viewed as artificial mating in which chromosomes from two people are joined to make the chromosome for the next generation. This is carried out by joining two chromosomes from two separate results at a hybrid point and swapping the grafted parts. The thought is that a few genes with great attributes from one chromosome might therefore join together with some great genes in the other chromosome to make a superior result spoke to by the new chromosome.

D. MUTATION

Mutation is an arbitrary modification in the genetic composition. It is valuable for presenting new aspects in a population – something not attained through crossover individually. Crossover just adjusts existing attributes to give new mixtures. For instance, if the first bit in every chromosome of a generation happens to be a 1, any new chromosome made through crossover will additionally have 1 as the first bit.

SIMULATION ENVIRONMENT AND PERFORMANCE

In this paper, all the simulation work is done in MATLAB 2010a. Numbers of nodes in the field are taken as 100. All scenarios are designed in 100m x100m area. Optimal Election Probability is 0.1.Initial Energy of nodes is 0.5 J. Energy consumption of transmit and receive amplifiers are 500 Nano Joules Per Round and Maximum number of rounds are 6000.

Field area	100×100 meter squares
Number of nodes in the field	100
Optimal Election Probability	0.1
Initial Energy of nodes	0.5 J
Energy consumption of transmit and receive amplifier	500 Nano Joules Per Round
Maximum number of rounds	6000

Table 1. Network Parameters

PERFORMANCE METRICS USED FOR THIS WORK ARE AS FOLLOWS:

Throughput is the measure of the number of packets successfully transmitted to their final destination per unit time. It is the ratio between the numbers of sent packets vs. received packets [10] [11].

Average End to End Delay signifies the average time taken by packets to reach one end to another end (Source to Destination) [12].

The lifetime in a MANET is the time period throughout which the system ceaselessly fulfills the provision necessity.

SIMULATION RESULTS

(A) Network throughput for the AODV with respect to number of rounds

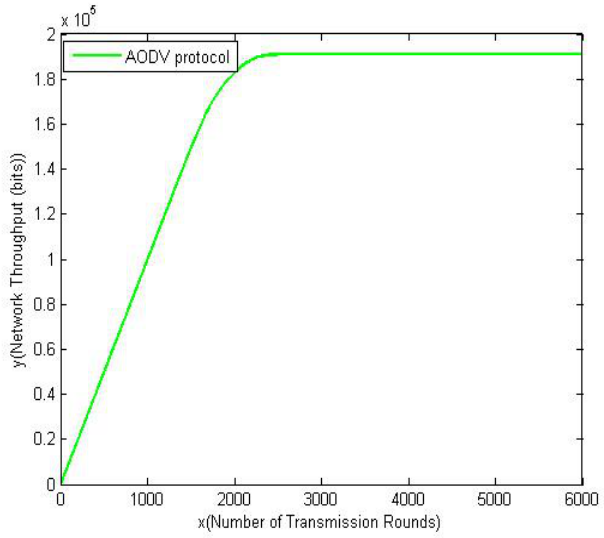

Fig 5. Network throughput for the AODV with respect to number of rounds

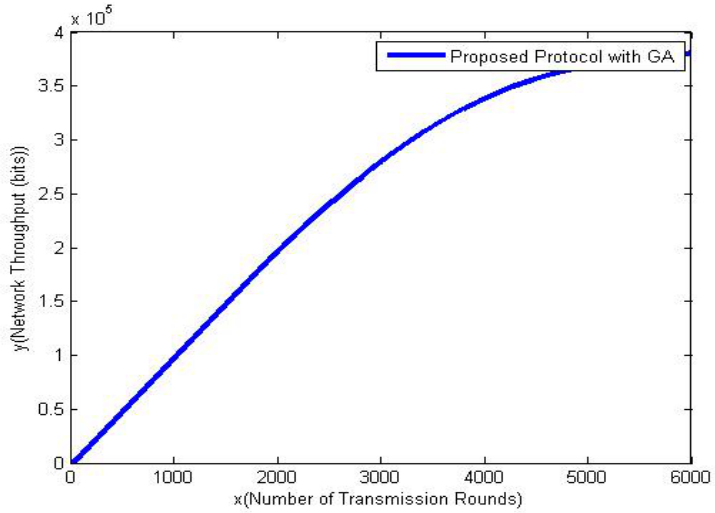

Fig 6. Network throughput with respect to number of rounds for the proposed protocol with GA

(B) End-to-End delay for the AODV with respect to number of rounds

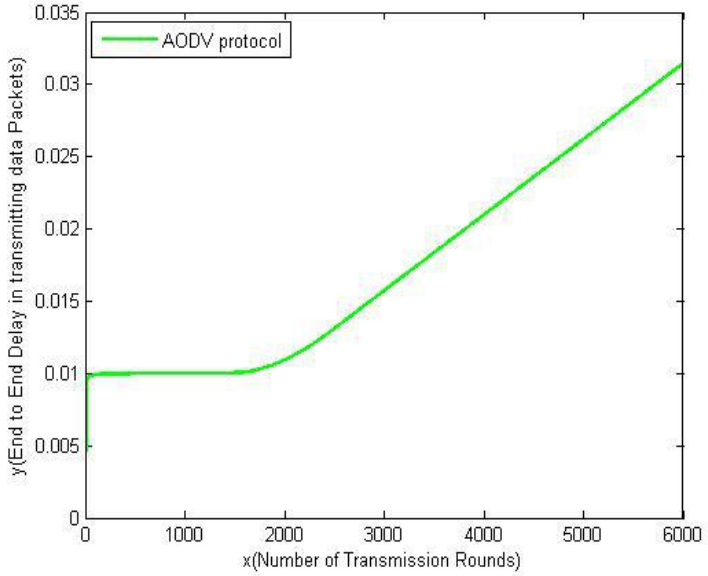

Fig.7 End-to-End delay for the AODV with respect to number of rounds

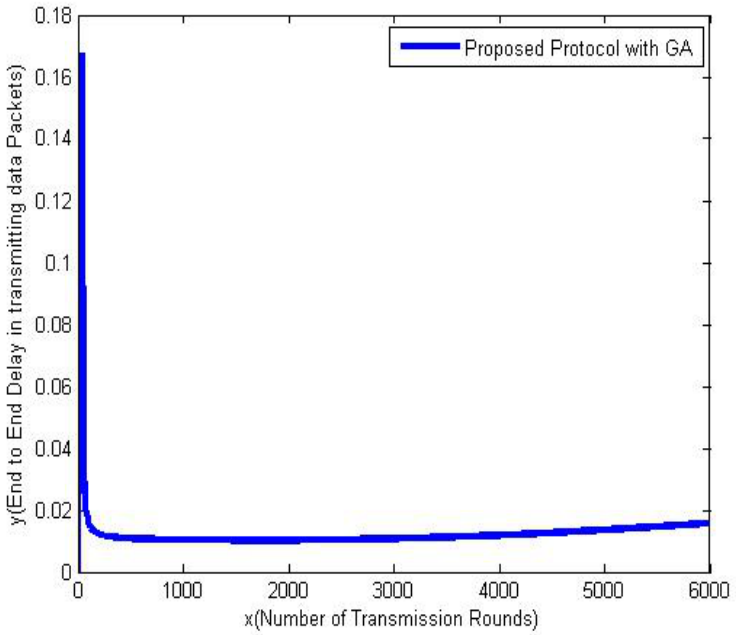

Fig 8. End-to-End delay with respect to number of rounds for the proposed protocol with GA

(C) Network life-time for the AODV with respect to number of rounds

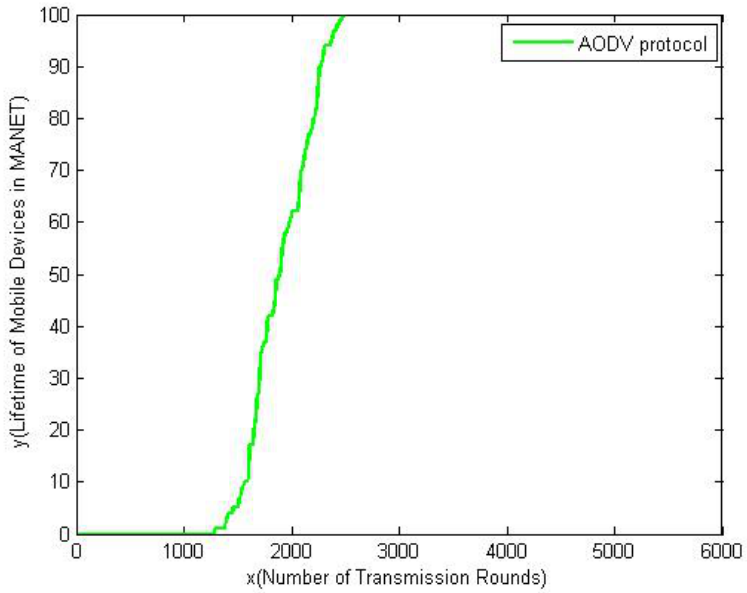

Fig. 9 Network life-time for the AODV with respect to number of rounds

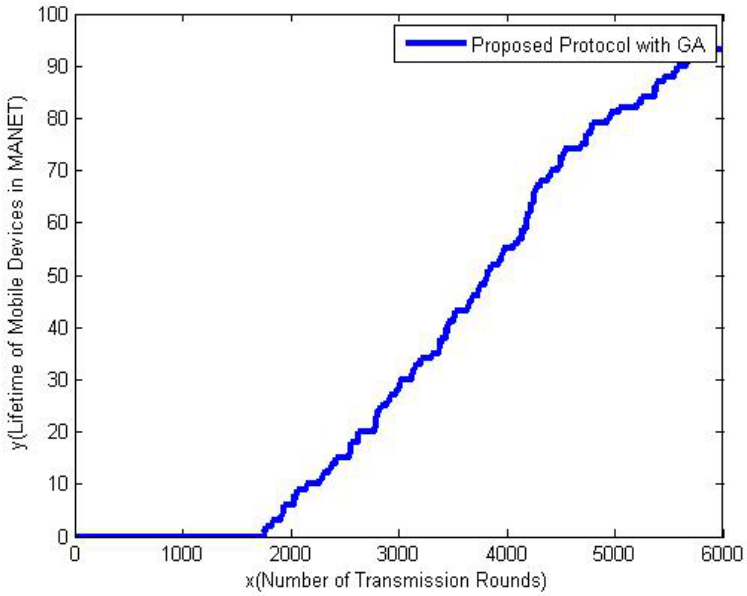

Fig 10 Network life-time with respect to number of rounds for the proposed protocol with GA

As we can see from figure 5 and figure 6, Network throughput with respect to number of rounds for the proposed protocol with GA is better than Network throughput for the AODV with respect to number of rounds. As numbers of rounds are increasing, network throughput is increasing. As we can see from figure 7 and figure 8, End-to-End delay with respect to number of rounds for the proposed protocol with

GA is less than End-to-End delay for the AODV with respect to number of rounds. As numbers of rounds are increasing, End-to-End delay is decreasing with GA algorithm. As we can see from figure 9 and figure 10, Network life-time with respect to number of rounds for the proposed protocol with GA is increasing compare to Network life-time for the AODV with respect to number of rounds.

II. CONCLUSION & FUTURE WORK

In this review paper we have presented an overview of the existing Genetic Algorithm, we analysed the current state of proposed clustering protocol, particularly regarding their power and reliability prerequisites. In MANET, the energy confinements of nodes expect a critical part in sketching out any protocol for execution. Genetic Algorithm has been a mainstream method used to solve optimization issues in MANET because of its effortlessness, high calibre of result, fast convergence and unimportant. Computational trouble Further work can be carried out to improve the ambiguity of this method for cluster based routing in MANET

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