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Delay Optimization For Multimedia Traffic Over The MANET Using Genetic Algorithm

Munmun Asati[1], Dr.Amit Shrivastava[2]

[1]Research Scholar, CTA, MTECH, SIRT,Bhopal, India , [2]HOD,CSE, SIRTS, Bhopal, India

ABSTRACT

MANET has several challenges in transmitting large size packets, mainly large delay, Loss tolerant and buffer size estimation for effective multimedia transmission. Packet out of order delivery at destination is major cause of delay. A in- order delivery of packets with the help of router buffer management can minimize the delay, improving the capability of receiving packets in correct order. In this paper proposed delay optimization method in which router buffer is treated as knapsack, apply 0/1 Knapsack algorithm to obtain the in-order delivery. Genetic algorithm is used To solve this 0/1 knapsack problem in optimal time. Performance analysis of proposed method is done on the bases of network end to end delay, packet delivery ratio, routing road and network throughput.

Keywords: MANETs, Multimedia Traffic, network delay, 0/1 Knapsack problem, Genetic Algorithm.

1. Introduction

Mobile ad hoc network (MANET) [1] is most popular network and it is useful in application as military, disaster relief, search and rescue Operation but MANETs has high delay for multimedia traffic. In this paper describe a new approach for delay optimization. Main objective of our proposed work is to make packet in order within intermediate router or node buffer. In earlier work to optimize the delay, author used Knapsack algorithm. Knapsack algorithm is used to fill the packets in the memory by optimizing the buffer utilization. However, the packets are coming in, getting stored and going out through an intermediate node that acts as a router. Buffer is leaky bucket where some packets are remain stored in the buffer because of sequence out-of-order and in order packets are sent to directly reach to destination through intermediate nodes or make packets in-order in buffer within a specified time of transmission. In previous work author uses dynamic approach for solving Knapsack but this dynamic approach required $o(n^3)$ time delay to overcome this time delay problem in our proposed work we used genetic algorithm for solving 0/1 knapsack ,our main goal is to maximize the in-order capability of packets and at the same time minimize the random packet transmission in the buffer. This approach is very useful to reduce and optimize the delay and increase the throughput by avoiding out-of-order packets delivery. This is more suitable to the multimedia data communication with good QoS for multimedia transmission in MANETs.

0/1 knapsack Problem [2]

The knapsack problem can be define as have some set items with certain cost or weight and profit associated with items and some constraint to carry the weight in knapsack. Now select item from the item set in such way that it maximize the profit with satisfy the constant. Knapsack is optimization problem so always try to find out the optimal solution.

This theory is applied in network as network buffer is treated as knapsack and packets as items, packet size taken as weight and more imported number of in order packet is as profit. Available buffer capacity is knapsack constraints.

Introduction Genetic Algorithm (GA)

Genetic Algorithm [3] is a natural evolution method of finding a optimal solution of a given problem from the population. Population is a set of possible solutions of the problem. Genetic algorithm concepts are taken from nature evolution are:

1. Inheritance
2. Selection
3. Crossover
4. Mutation

Genetic algorithm starts with a population of chromosomes, which gives solutions called individuals, creatures, or phenotypes to an optimization problem. New population can be created by using old population with solution which have greater fitness value it means new population evolves toward better solutions. Chromosomes are generally represented by a string of 0s and 1s (in binary form). In GA population is generated randomly.

GA basic step to solve the problem is as follows:

1. Start: Generate random population of Chromosomes.

2. Fitness: Calculate the fitness of all chromosomes.

3. Create a new population:
   a. Selection
   b. Crossover
   c. Mutation

4. Replace: Replace the current population with the new population.

5. Test: Test whether the end condition is satisfied. If so, stop. If not, return the best solution in current population and go to Step2

4. Related Work

Sarraf, Siew & goodman, et al. [9] in the field of communication and networking, researchersstudied the optimum pre-defined size of the packet beneath bound channel conditions and network style. additionally existing works have addressed the network condition byconsidering the variations within the network style.

Yin, Wang, and Agrawal [10] Analysis and calculations for adaptative packet size are planned, However, these approaches concentrate on the planning relating medium access control (MAC) or link layer. per the network designers' read, it's necessary to work within the waterproof layer just in case of problems associated with the physical transport channel. Performance knowledge|of knowledge|of information} packet transmission are often improved if an approach of fragmenting data units is being optimized for specific applications. However, the fragmentation method will increase the information measure usage and also the delay, and therefore not appropriate for transmission applications.

Liao Associate in Nursingd bird genus [12] delineated an approach for video quality watching and designed a model to enhance video performance. However, this approach has abundant error resilience that degrades video quality. not like existing works, our work focuses on rising the in-order packet transmission to enhance th QoS for transmission traffic.

Syed Jalal Ahmad, V.S.K. Reddy, A. Damodaram, P. Radha Krishna, [13] auther approach exploits the buffer internals and dynamically adjusts the buffer usage in order that a node transmits the packets within the desired order to its consecutive nodes. Careful estimation of packet size and buffer size helps in minimizing the delay, rising the potential of receiving packets within the correct order and reducing out-of-order packets within the buffer at intermediate nodes. conjointly controls the loss of transmission knowledge packets throughout transmission.

In above literature review several techniques has been proposed and at some stain it gives good result but mobile ad hoc network is still having problem for multimedia traffic such as it needs more bandwidth, mostly packet is delivery out order so it required extra delay for making packet in order, Existing technique for making packet in order used 0/1 knapsack but is solve knapsack by dynamic algorithm. Dynamic algorithm required $O(n^3)$ time to solve.

5. Proposed methodology

Number packets received is categorized in three category (1) Out-of-order, represented by 'P_o', (2) in-order, represented by 'P_I' and (3) lost packet, is represented by 'P_L'. Now let the average number of packets that will become in-order in the router buffer is represented by $P_{B1}, P_{B2}, P_{B3} \ldots P_{Bn}$ at different instants of time with corresponding to the buffer sizes are $b_1, b_2, b_3, \ldots, b_n$.

Now to find the subset of packets that to be store in the buffer such that,

(a) The size of all packets combined in the buffer should not exceed buffer size (B).

(b) make in-order packets (P_I) (packet which received out of order) as large as possible within buffer.

We assume that packet are stored completely and consider two tuples of size n: one represent the in-order packets ($P_{B1}, P_{B2}, P_{B3} \ldots P_{Bn}$) and the second represent the new value of buffer size ($b_1, b_2, b_3, \ldots, b_n$). We want to find out the in order packet subset S ε {P1,P2, . . . ,Pn} to fill the buffer such that

$$\text{Maximize} \sum P_{IB} \quad , \text{ where } P_I \varepsilon S \quad \ldots\ldots\ldots\ldots(1)$$

$$\text{Subject to constraint} \sum b_i < B \quad \ldots\ldots\ldots\ldots(2)$$

Let construct a two-dimensional array P_iB [0. . .n,0. . .B]. The entry P_iB $[i,b_i]$ is the maximum (combined) in-order packets of any subset as packets (1, 2, 3, . . , i) of (combined) size at most b_i which is the available buffer at that particular instant of time. After getting all the entries of this array, then entry P_iB [i,B], gives maximum in-order packets that can increase order transition.

Modified Genetic Algorithm

1. Chromosomes

A array $P_I[0:n]$ is used to represent chromosome and size of array is equal to number packet. Element in this array denotes whether a packet is stored in buffer ('1') or not ('0') .

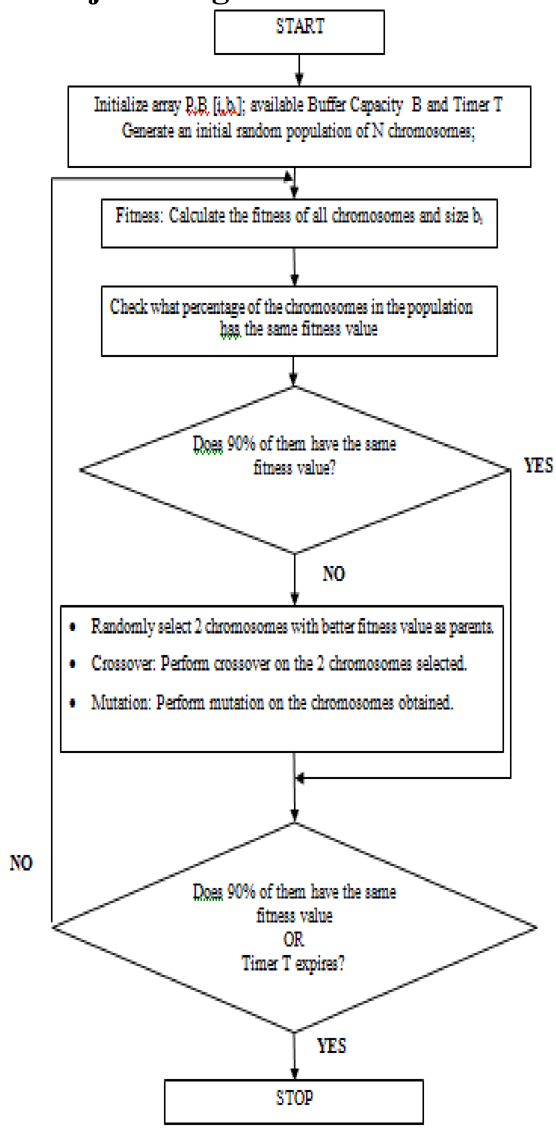

Figure 1: Flow Chart of Modified Genetic Algorithm

2. Fitness perform

Fitness of every chromosome is calculate by the entire number of in-order packet (PI) that are filled in the router buffer, whereas checking the total size of in order packet(b1, b2, b3,, . . . , bn) not exceed to the buffer size B . Fitness function step are as follows

1.Do the subsequent for every chromosome within the population:

2. For every packet, if it's enclosed within the chromosome (bit=1) in buffer, add its size to total size of in order packet and additionally increase the total number in-order packet by one.

3. If ($\sum$ bi>B) then

a. choose a packet from the chromosome till to get a packet that is to be included within the buffer (i.e. bit = 1)

b.Remove this packet from the buffer (i.e. change bit = 0)

Goto step 1.

Else

Add this packet's size to total size of packet (bi) and increase the total number in-order packet (PIB) by one.

Exit

6. Results

Simulation is perform at ns-2 and performance is compare with existing Dynamic approach of knapsack and proposed scheme. Performance analysis of proposed method is measures on the following parameters:

For implementation of past model utilize 40 nodes and in proposed model reenactment 40 node is utilized. simulation time was taken 100 seconds. All the situations have been outlined in 800m x 800m zone. Versatility model utilized is Random for portable node and directional for mobile node.

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1 Packet Delivery Ratio (PDR) Analysis

In figure 2 shows the PDR of proposed has better performance compare to existing work. The PDR in case of normal AODV protocol is very squat because of only having a mechanism to provide in – oder packet delivery required more time due this some packet are dropped in buffer.

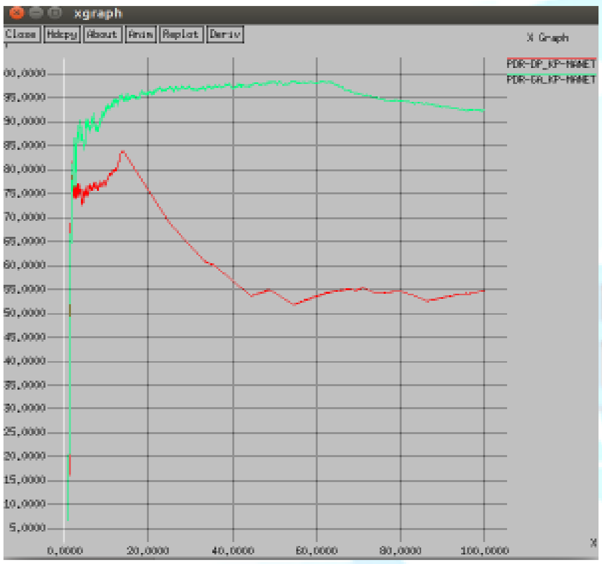

Figure 2: PDR Analysis

2. End – To End Delay analyses

End to end delay is a time overhead during data transmission. Figure 3 shows the end- to end delay analyses of existing methodology based on dynamic programming and proposed method based on Genetic algorithm. As we seen in figure Genetic minimize because it optimize the process of finding in-order sequence packets.

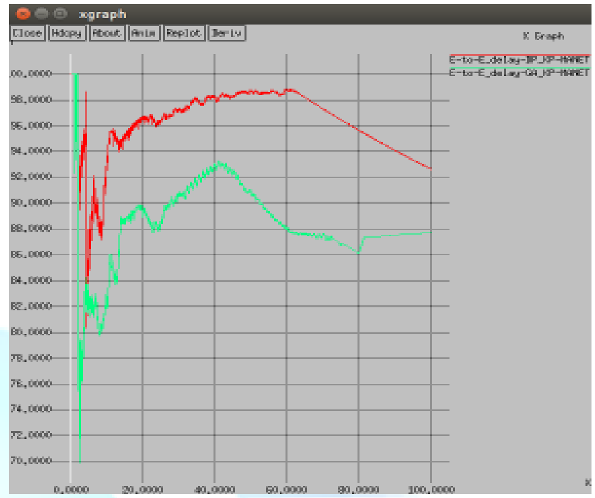

Figure 3: End-To-End Delay

3.Throughput Analysis

successful packets received by receiver in per unit time is called network throughput. The throughput analysis in this research is measured in no of packets transmitted per second in the network. The throughput is shown in figure 6.5 and graph shows the better results in case of proposed genetic algorithm based method with compare to dynamic programming based method.

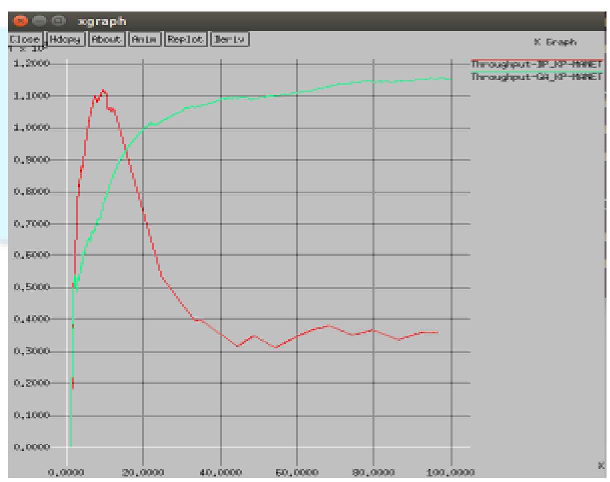

Figure 4: Throughput Analysis

7.Conclusion and Future Work

This proposed genetic algorithm based in-order packet delivery method make un-order packet in-order within the network buffer, due this in-sequence packet reach at the destination which improve the overall performance of the network. Our main concern is to minimize the delay of packet by maximizing in-order packets. For in sequencing of packet in buffer we used Genetic algorithm which make packet in -order within buffer itself. wherever we tend to analyzed the efficiency of transmitted packets (i.e., throughput, packet loss, in-order packets and out-of-order packets).

Future work some area such as developing new rules for mutation that locally optimize the results and buffer management predict buffer size for priori support.

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