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New Enhanced Hybrid Data Dissemination System Based On Genetic Algorithm And Fuzzy Inference In Vehicular Adhoc Networks (VANETS)

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ABSTRACT

Vehicular ad hoc network (VANETs) is a special class of MANET's which uses vehicles as a mobile node for the data dissemination. It uses Intelligent Transportation System (ITS) in which vehicles can communicate with each other to avoid large number of increasing accidents on roads. Such a system enables vehicle to vehicle and vehicle-to-infrastructure communication and provides vehicles with up to date route and traffic information. The communication the vehicles is at greater risk because the messages are broadcasted by wireless channel and vehicles move with high mobility. With dissemination of messages, vehicles can change their position and direction which causes communication gap between the vehicles. Efficient data dissemination to a desired number of receivers in a vehicular ad hoc network (VANET) is a new issue and a challenging one considering the dynamic nature of VANETs. To overcome such situation and achieve efficient communication among these vehicles, hybrid of genetic algorithm and fuzzy interference is used. This paper represents a simple and robust dissemination technique that efficiently deals with data dissemination where the density of roadside base stations and vehicles distribution are both high. This technique divides the users in two categories premium user as well as free users.

Keywords

Data Dissemination, HFGA, Techniques

1. INTRODUCTION

A vehicular adhoc network (VANET) is a form of adhoc networks. During the last couple of years, an advancement in embedded systems and wireless technologies has extended into new domains. Intelligent transportation systems (ITS) are taking information and communications technology capabilities and advantages to stimulate vehicle networks into new types of vehicular ad hoc networks (VANETs) [1]. The main goal of a vehicular ad hoc network system is to enable efficient data dissemination for drivers and passengers safety and comfort and to protect them from danger [2].

Vehicular adhoc network is a kind of wireless adhoc networks in which vehicles can communicate with base stations and other vehicles which mean every vehicle can move freely in the network and stay connected. All vehicles can communicate with each other through single hop or multiple hops. Fig1. Shows the architecture of vanet.

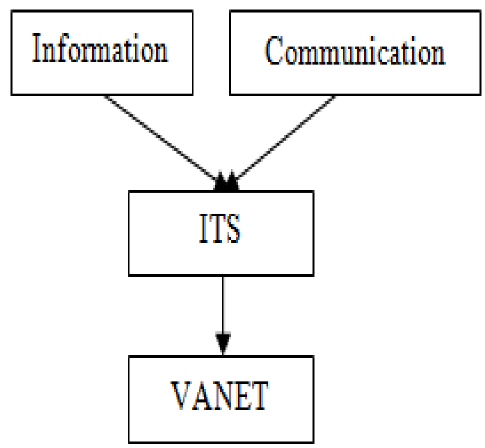

Fig1: Vanet

Vanet is an intelligent transport system which provides vehicles to vehicle and vehicle to infrastructure communication. Fig2. Shows the V2V and V2R communication.

- Vehicle to vehicle(V2V): In this, vehicles act as mobile node that aim to provide communication among nearby vehicles known as inter vehicular communication(V2V or IVC)
- Vehicle to infrastructure (V2I): Vehicle to infrastructure communication in which vehicles communicate with nearby base stations or BSs (V2I or I2V).

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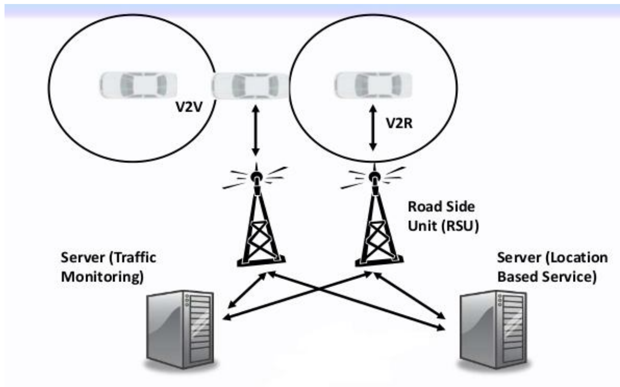

Fig2: V2V and V2R Communication [3]

Genetic Algorithm

Genetic algorithms are typically used when there is very less knowledge on the solution space or when there are far too many solutions to use standard search / optimization methods. There are various methods used in genetic algorithm, search mechanism inspired by Darwin's theory of evolution and problems are solved by using techniques of natural evolution: crossover, inheritance, mutation and selection. They can be used to solve every optimization problem which can be described with the chromosome encoding, and it is very easy to understand and it can get multiple solutions that can be evaluated later with other methods[4].It is a heuristic search and optimization technique that mimics the process of natural evolution. The mechanism is simulated through three operators: selection, crossover and mutation [5-9]. Genetic algorithm derives its inspiration from nature where in even the smallest creatures are able to adapt to changing environments through the process of evolution. Applying the nature's process of evolution to the computer systems has been a topic much researched upon. Genetic algorithms are self learning algorithms and these can be applied only to problems whose solution can have a chromosomal encoding. To apply the genetic operators of selection, crossover and mutation, an initial population is randomly generated. Genetic algorithm is an iterated process and the population in each iteration is called a generation. The fitness of each individual in a generation is evaluated and the algorithm stochastically opts for the best fit in each generation. Crossover and mutation are applied on the selected individuals to form a new generation. This new generation is then used for the next iteration. The algorithm terminates when the preset maximum number of generations is reached or when the threshold of fitness level is attained [10]. Fig3 shows the operations of genetic algorithm. The genetic operators are described below.

- Selection: The selection process is used to stochastically select the best fit from the population in each generation. The fitness of a solution is problem dependent and is a measure of how good each solution is. In the playlist generation problem, the fitness of a playlist is the number of constraints satisfied by it.
- Crossover: The crossover operator is applied after the selection operator and is used to create new solutions from the existing solutions available in the mating pool. This operator exchanges the gene information between two solutions in the mating pool, to generate a new solution. This new solution will have features (gene characteristics) of both its parents. The process is continued until a new population of appropriate size is obtained.
- Mutation: Mutation is the process of introducing new features in to the solution strings of the population pool after crossover, to maintain diversity in the population. Mutation randomly selects a gene from the chromosome of the individual and switches its bits.

The average fitness of the population generally increases after applying the genetic operators. This is because only the best individuals from the population are allowed to breed. A small number of less fit solutions are also included to bring about diversity. Theses operators are applied repeatedly on the generation till the termination condition is reached. The termination condition can be a limit on the number of generations or a set threshold of fitness value for the solution.

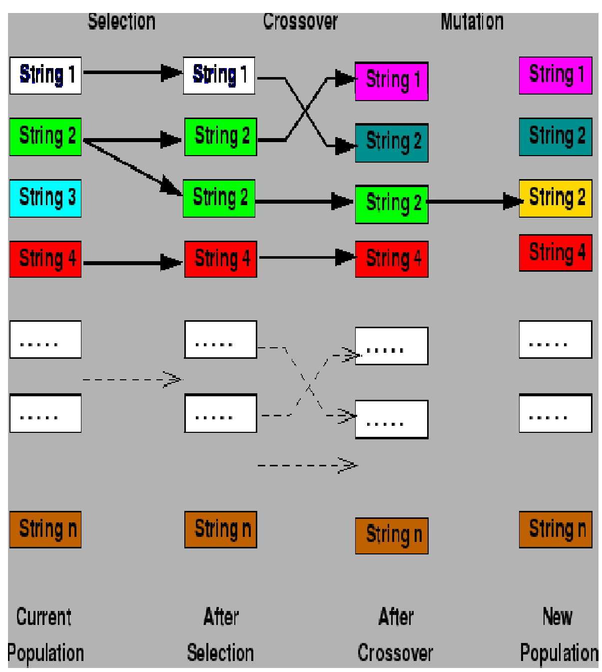

Fig. 3: Genetic Algorithm [18].

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Fuzzy Logic Inference System

Fuzzy Logic was initiated in 1965 [12-14], by Lotfi A. Zadeh , professor for computer science at the University of California in Berkeley. Basically, Fuzzy Logic (FL) is a multivalued logic, that allows intermediate values to be defined between conventional evaluations like true/false, yes/no, high/low, etc. Fig4. Shows an architecture of fuzzy inference system.

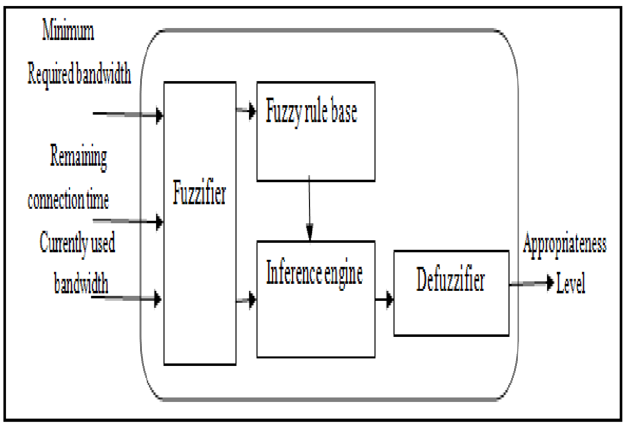

Fig. 4: Architecture of fuzzy logic inference system algorithm [11].

The basic functionality of each component in the fuzzy logic interference system is described as follows:-

i) **Fuzzifier**: The fuzzifier performs the fuzzification function that converts three inputs into suitable linguistic values which are needed for the calculations by the inference engine.
ii) **Fuzzy rule base**: The fuzzy rule base is composed of a set of linguistic control rules and the attendant control goals.
iii) **Inference Engine**: The inference engine simulates human decision-making, based on the fuzzy control rules and the related input linguistic parameters.
iv) **Defuzzifier**: The defuzzifier acquires the aggregated linguistic values from the inferred fuzzy control action, and generates a non-fuzzy control output, which represents the predicted priority.

Fuzzy logic inference system is used to determine if a BS or a vehicle can be chosen to transfer stream data for users or not. Fuzzy logic technique is adopted in this scheme because it has been efficiently used to solve various problems regarding VANETs, as well as some problems related to resource assignment [15][16], and is thus a powerful tool for controlling processes that are difficult to model and linearize.

Hybrid of fuzzy inference and genetic algorithm(Proposed Scheme)

VANETs (vehicular ad hoc networks) are emerging as a new network environment for intelligent transportation systems. Many of the applications built for VANETs will depend on the data push communication model, where information is disseminated to a group of vehicles. The previous work which took under consideration proposed an adaptive multimedia streaming dissemination system for vehicular networks [11]. ASSD scheme for different users for different environment for streaming the data. Playing live stream videos in vehicles thus becomes possible via VANET and roadside BSs. However, there are some difficulties to be overcome, such as the uneven distribution of roadside BSs, the high mobility of vehicles, and the volatility of network environments. Three cases has been taken under some considerations to deal with different kinds of network environments according to the number of vehicles and roadside BSs. When there are few roadside BSs, the user can still receive the stream data through other vehicles which act as forwarding nodes. When the number of vehicles and roadside BSs is insufficient to maintain the live streaming service, a preloading mechanism will be used to provide the premium users so they can enjoy satisfying viewing quality, meeting the requirement for a seamless live stream service. This system computes prefetched stream data for each user based on current situation of the users. A bandwidth reservation mechanism for premium user was proposed to ensure the QoS of stream data premium user received. A fuzzy logic inference system is utilized to determine if a BS or a vehicle can be chosen to transfer stream data. A series of simulations were conducted, with the experimental results verifying the effectiveness and feasibility of the previous work. In this a fuzzy logic inference system generates 27 different rules. These rules were sometimes failed where the input is in between low & medium or medium & high. Only one decision is being selected i.e. low, medium or high. With the increased requirement of stream service on mobile devices, there are some difficulties of playing live stream videos in vehicles. The difficulties are uneven distribution of roadside BSs, high mobility of vehicles and volatile networks. So, to enhance this, Genetic algorithm is further used to optimize the rules selection on the basis of their intelligence. The main focus is to analyze the performance of data dissemination system by using algorithm that are hybrid GA & fuzzy based system.

Following Objectives are considered:

1. To provide the optimized solution for improving data dissemination by using the
   - Hybrid Of Genetic Algorithm And Fuzzy Logic
2. To reduce the 27 rules which has been used in the ASSD scheme by replacing the fuzzy logic with genetic algorithm?

3. Evaluate the achieved optimized algorithm in comparison to the traditional algorithm considering the factors like throughput, packet delivery ratio and end to end delay.

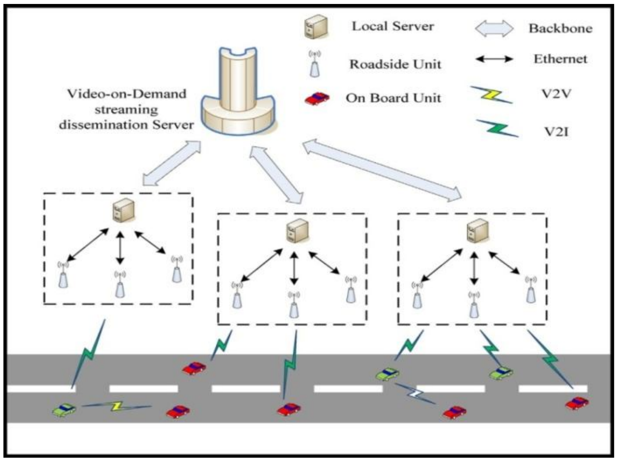

Fig. 5: Scenario of the proposed multimedia streaming dissemination system [11]

Fig5. Shows the scenario of the proposed multimedia streaming dissemination system. In the proposed work, we will work on the optimization algorithm with fuzzy inference system used to enhance the performance of data dissemination system. New proposed work will use a Genetic algorithm along with fuzzy inference system to optimize the rules selection on the basis of their intelligence. Fuzzy inference output will become Genetic algorithms input. In the field of artificial intelligence, a genetic algorithm (GA) is a search heuristic that mimics the process of natural selection. This heuristic (also sometimes called a metaheuristic) is routinely used to generate useful solutions to optimization and search problems. Genetic algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover.

Genetic algorithms evaluate the target function to be optimized at some randomly selected points of the definition domain. Taking this information into account, a new set of points (a new population) is generated. Gradually the points in the population approach local maxima and minima of the function. Genetic algorithms can be used when no information is available about the gradient of the function at the evaluated points. The function itself does not need to be continuous or differentiable. Genetic algorithms can still achieve good results even in cases in which the function has several local minima or maxima. These properties of genetic algorithms have their price: unlike traditional random search, the function is not examined at a single place, constructing a possible path to the local maximum or minimum, but many different places are considered simultaneously. The function must be calculated for all elements of the population. The creation of new populations also requires additional calculations. In this way the optimum of the function is sought in several directions simultaneously and many paths to the optimum are processed in parallel. The calculations required for this feat are obviously much more extensive than for a simple random search.

However, compared to other stochastic methods genetic algorithms have the advantage that they can be parallelized with little effort. Since the calculations of the function on all points of a population are independent from each other, they can be carried out in several processors. Genetic algorithms are thus inherently parallel. A clear improvement in performance can be achieved with them in comparison to other non-parallelizable optimization methods.

Compared to purely local methods (e.g., gradient descent) genetic algorithms have the advantage that they do not necessarily remain trapped in a suboptimal local maximum or minimum of the target function. Since information from many different regions is used, a genetic algorithm can move away from a local maximum or minimum if the population finds better function values in other areas of the definition domain.

The main focus of this work is to analyze the performance of data dissemination system by using different algorithms that are hybrid GA & fuzzy based system. In proposed work, there are two categories of users, first are premium users and second are free users.

- Premium Users: Premium users are those users which are always accessing internet. There is bandwidth reservation mechanism for premium users to ensure the QoS of stream data which premium users received.

- Free Users: Free users are those users which help premium users to keep accessing Internet resources without interruption and degradation of the service. There is free streaming service for free users but with limited bandwidth. The free users cannot only obtain free seamless streaming service, but they also help premium users to keep accessing Internet resources without any problem. If there is the shortage of bandwidth, then the

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quality of the streaming data will be less and compression ratio, frames per second for the free users will be degraded in order to provide more bandwidth to meet the minimum bandwidth requirements for the premium users who have higher priority [11].

Fig.4 shows the input–output elements to determine the appropriateness level of a candidate relay vehicle. There are three input parameters used in the fuzzy logic inference system,

i. **Minimum Bandwidth Required:-** To satisfy the streaming service for the requesting vehicle

ii. **Estimated Remaining Connection Time**:-It is the estimation of time between the candidate relay vehicle and its neighbor vehicles. This can be easily calculated by a simple computation based on the distance between the two vehicles and their relative speed. Moreover, the selected relay vehicles may have similar characteristics, with the same driving direction and the same driving speed as the requesting vehicle, which can provide stability while transferring streaming data.

iii. **Currently Used Bandwidth:-**This is the third input which determines the bandwidth currently being used by the candidate relay vehicle.

Moreover, insufficient bandwidth or number of free users and premium users in connection will affect the Quality of service of playing stream data, and service disruptions can occur.

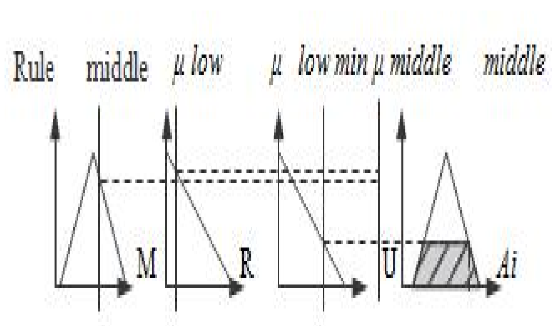

Fig. 6: The reasoning procedure for the Tsukamoto defuzzification method [11].

Input M denotes minimum bandwidth required for satisfying the real time traffic R denotes an expected remaining connection time between the vehicle indexed by i and its neighbor vehicles U denotes the band- width currently used at the vehicle indexed by i. μ denotes the degree of membership.
Fig. 6 shows the defuzzification stage of the fuzzy logic inference system. The fuzzy linguistic variables "Small", "Middle" and "High" give different required minimum bandwidth measures in the membership function for the input M. Similarly, three linguistic term sets, "Short", "Medium" and "Long" are used for R, and "Small", "Middle" and "High" are used for U. The output parameter of the inference engine, Ai, the appropriateness of the vehicle as an intermediate relay node on the transferred path, is defined as the estimated link quality when the vehicle is chosen as the intermediate node. The range of the output falls between 0 and 1. There are 27 inference rules generated in the Mamdani fuzzy inference system. The non-fuzzy output of the defuzzifier can then be expressed as the weighted average of each rule's output after the Tsukamoto defuzzification method is applied:

$$AL = \frac{\sum_{j=1}^{27} Aj.wj}{\sum_{j=1}^{27} wj} \qquad (1)[11]$$

Where Aj denotes the output of the j^{th} rule induced by the firing strength .

Table 1 ASSD 27 Rules

Input Parameters / Rules	Minimum Required Bandwidth	Estimated Remaining Connection Time	Currently Used Bandwidth
Rule 1	S	S	S
Rule 2	M	M	M
Rule 3	H	H	H
Rule 4	S	S	H
Rule 5	S	H	H
Rule 6	H	S	H
Rule 7	H	H	S
Rule 8	S	H	S
Rule 9	H	S	S
Rule 10	S	S	M
Rule 11	S	M	M
Rule 12	M	S	M
Rule 13	M	M	S
Rule 14	S	M	S
Rule 15	M	S	S
Rule 16	H	H	M
Rule 17	H	M	M
Rule 18	M	H	M
Rule 19	H	H	M
Rule 20	H	M	H
Rule 21	M	H	H

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Rule 22	S	M	H
Rule 23	H	S	M
Rule 24	M	S	H
Rule 25	H	M	S
Rule 26	M	H	S
Rule 27	S	H	M

Proposed algorithm

This algorithm depicts the working of hybrid of fuzzy inference and genetic algorithm in data dissemination among the vehicles and Base station. The detailed algorithm illustrated in Algorithm 1. In this algorithm, firstly fuzzy inference will be used and then genetic algorithm will take output of the fuzzy inference as the input. This will improve our results.

Algorithm1 HFGA (Hybrid Fuzzy GA based VANET)

Start:
{
R: The transmission range;
CW_{max} : The max contention window
CW_{min} : The min contention window
neighbour_list: The value set in the transmission range;
n_v: the vehicle no. In neighbour_list;
F= the forwarder vehicle;
d_f: The distance from f to current vehicle;
}
Initialization:
{
n_v =0;
F=null;
d_f =0;
neighbour_list = null;
initialize 'n' no. Of nodes in the network randomly;
set source_node 's';
set dest_node 'd';
}
Data Transmission:
{
Data_packet= data to be transmit from source to dest node;
Start transmission with HFGA;
}
HFGA:
Start with Fuzzy Inference System
{
Fuzzy Inference(s, Unknown Profiles)
// s→ inputs, UnknownProfiles → to calculate free or premium users)
Generate input membership function, output membership function, & rule base acc to inputs (s);
Apply fuzzy inference system generated above to unknown Profiles;

$$ValuePos = 0.3 * \int_0^{x_1} A(x)dx + 0.7 * \int_{x_1}^{x_2} A(x)dx + 1 * \int_{x_2}^{0} A(x)dx \qquad (2)$$

$$ValueNeg = 0.3 * \int_0^{x_1} A(x)dx + 0.7 * \int_{x_1}^{x_2} A(x)dx + 1 * \int_{x_2}^{0} A(x)dx \qquad (3)$$

{
x_1 & x_2 are the intersection points of low-medium, & medium-high membership function of each of the output membership function.
}
If ValuePos > ValueNeg
Then
Return user_n=Premium_user;
Else
Return user_n=Free user;
End if
Return rules for transmission parameters;
}
Start GA
{
Inputs=return from fuzzy inference
Size α of population, rate β of elitism, rate γ of mutation, number δ of iterations
Initialization:
Generate α feasible solutions randomly;
Save them in the population P;
for i to δ do
Number of elitism $ne = \alpha \cdot \beta$;
Select the best ne solutions in P and save them in $P1$;
// Crossover:
Number of crossover $nc = (\alpha - ne)/2$;
for j = 1 to nc do
Randomly select two solutions X_A and X_B from Pop ;
generate X_C and X_D by one-point crossover to X_A and X_B;
save X_C and X_D to Pop_2 ;
end for
//Mutation
for j = 1 to nc do
select a solution Xj from Pop2;
mutate each bit of Xj under the rate γ and generate a new solution Xj' ;
if Xj' is unfeasible
update Xj' with a feasible solution by repairing Xj' ;
end if
update Xj with Xj' in Pop2;
end for
//Updating
update $Pop = P$op1 + Pop2 ;
end for
// Returning the best solution
return the best solution X in Pop ;

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Proposed Flowchart

Fig 7 shows illustrates the flowachartof the working of the HFGA scheme. In this, firstly there is n number of nodes initialized. After that transmission starts among the vehicles and base stations. In our scheme. There are 100 nodes. After transmission, fuzzy inference will take the Minimum Required Bandwidth, Estimated Remaining Connection Time, Currently used bandwidth as the input and give output elements to determine the appropriateness level of a candidate relay vehicle. After that fuzzy will generate some according to its logics. If rules matched then genetic algorithm will run else it will iterate. Genetic algorithm will take the output of fuzzy as the input and do initialization, crossover and mutation and updation as we can see in above algorithm. After that best solution i.e. best vehicle is found and data transmission begins.

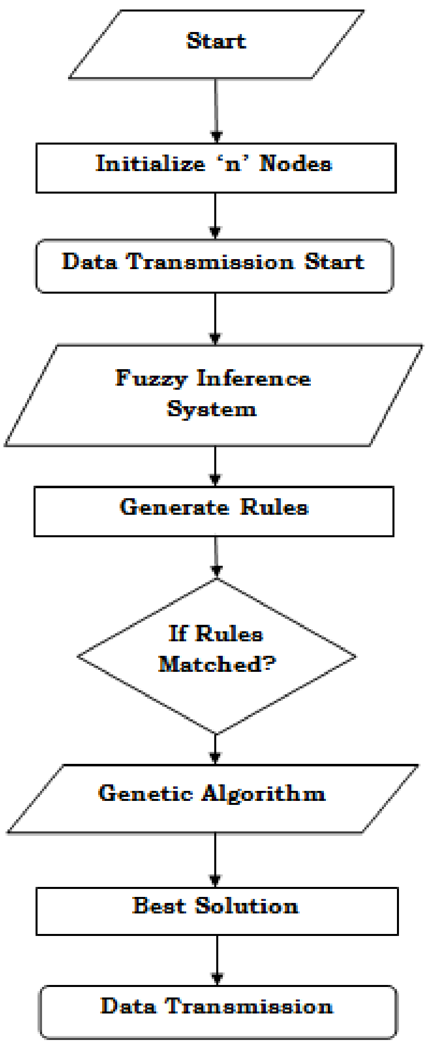

Fig 7 Flowchart of proposed work

2 Simulation Analysis

Network Simulator (Version 2), widely known as NS2, is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding behaviors. Due to its flexibility and modular nature, NS2 has gained constant popularity in the networking research community since its birth in 1989. Ever since, several revolutions and revisions have marked the growing maturity of the tool, thanks to substantial contributions from the players in the field. Among these are the University of California and Cornell University who developed the REAL network simulator, the foundation which NS is based on. Since 1995 the Defense Advanced Research Projects Agency (DARPA) supported development of NS through the Virtual Internetwork Testbed (VINT) project [19].Currently the National Science Foundation (NSF) has joined the ride in development. Last but not the least, the group of researchers and developers in the community are constantly working to keep NS2 strong and versatile. Notably, NS-2 tools are used to generate the network scenario and traffic model addressed in this scheme. Setting up a network to do some real experiments is the best way for studying about communication in internet. However, setting a network is not easy and costly. For this reason, a virtual network provided by network simulator is used for experiment in only one computer. Specially, NS2 which is free and easy to use is the popular all over the world. NS2 use Tcl language for creating simulation scenario file (for example, sample.tcl). Network topology, transmission time, using protocol etc... are defined in scenario file. If we execute this scenario file, the simulation result will be output to out.tr and out.nam file. Out.tr all the information about communication is written in this file. We can find out the way a packet was forwarded. This file is called as trace file. Out.nam contains the data for animation of the experiment result. This file can be executed by Nam, animation software. Fig 8 shows the basic structure of NS-2. These are the following steps to create the network scenario.

1. Create Simulator object
2. [Turn on tracing]
3. Create topology
4. [Setup packet loss, link dynamics]
5. Create routing agents
6. Create application and/or traffic sources
7. Post-processing procedures (i.e. nam)
8. Start simulation

Features of NS2

1. It is a discrete event simulator for networking research.
2. It provides substantial support to simulate bunch of protocols like TCP, FTP, UDP, HTTP and DSR.
3. It simulates wired and wireless network.

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4. It is primarily Unix based.
5. Uses TCL as its scripting language.
6. Otcl: Object oriented support
7. Tclcl: C++ and otcl linkage
8. Discrete event scheduler.

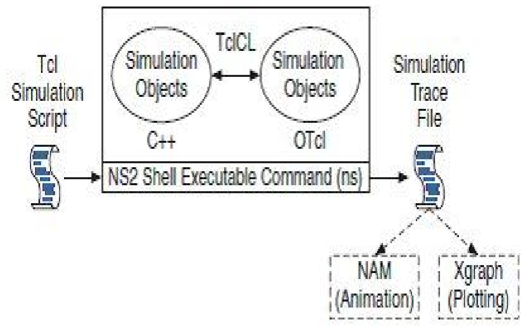

Fig8 Basic architecture of NS [18]

3 Performance Evaluation

We ran a series of simulation experiments to investigate the feasibility and effectiveness of our hybrid of fuzzy inference and genetic algorithm scheme. The simulation metrics are packet delivery ratio, end to end delay and throughput among the premium users as well as free users. The experimental results show that our scheme is reliable.

Experimental Setup. The experiments are performed by using the wireless channel on 2000*2000m area. In the experiments, the initial position of all vehicles are randomly placed, and vehicles make turns at the intersections with a certain probability(turning left and turning right and going straight). The vehicle density is one of the most important factors affecting the connectivity of a VANET.

Table 1: **Simulation parameters**

Parameter	Value
Channel Type	Channel/Wireless Channel
Radio-propagation model	Propagation/TwoRayGround
Network interface type	Phy/WirelessPhy
MAC type	Mac/802_11
Interface queue type	CMUPriQueue
Link layer type	LL
Antenna model	Antenna/OmniAntenna
Max packet in ifq	500
Number of nodes	100
Protocol	DSR
Fuzzy protocol	fuzzy
X axis distance	2000
Y axis distance	2000
Initial Energy	EnergyModel
Initial energy in Joules	100
Hybrid protocol	FGA

Adopted performance metrics for this work are:-.

i. **Packet delivery ratio**: - It is the ratio of the number of delivered data packet to the destination. This illustrates the level of delivered data to the destination. ∑ Number of packet receive / ∑ Number of packet send.The greater value of packet delivery ratio means the better performance of the protocol. It is the ratio of all the received data packets at the destination to the number of data packets sent by all the sources. It is calculated by dividing the number of packet received by destination through the no. of packet originated from the source.

$$PDR = (P_r / P_s) * 100$$

Where, P_r is total packet received and P_s is total packet sent.

ii. **End to End Delay**: - **End-to-end delay** or **One-way delay** refers to the time taken for a packet to be transmitted across a network from source to destination. This includes all possible delays caused by buffering during route discovery, latency, and retransmission by intermediate nodes, processing delay and propagation delay. It is calculated as

$$D = (T_r - T_s)$$

Where, T_r is receive time and T_s is sent time of the packet.

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iii. **Throughput**: - Throughput represents overall multimedia data transmission capacity, which includes the data received from the adaptive streaming server and the data shared between users through the BSs bandwidth sharing mechanism. It is the average at which data packet is delivered successfully from one node to another over a communication network. It is usually measured in bits per second.

Throughput = (no of delivered packets * packet size) / total duration of simulation

Result analysis of present work under different performance metrics are given in figures

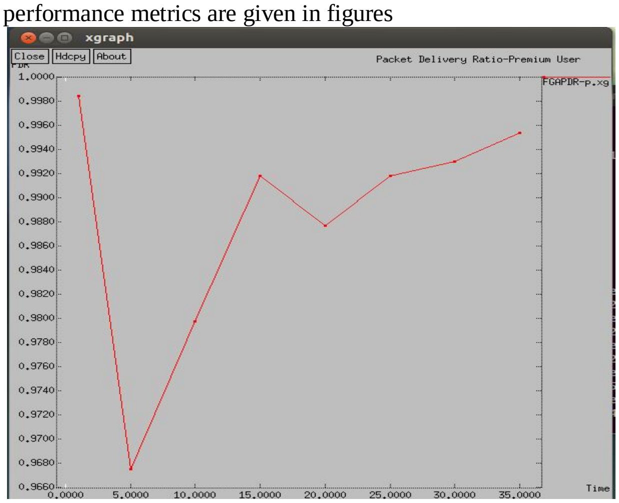

Fig. 9: Packet Delivery Ratio-Premium Users Using HFGA (FGA).

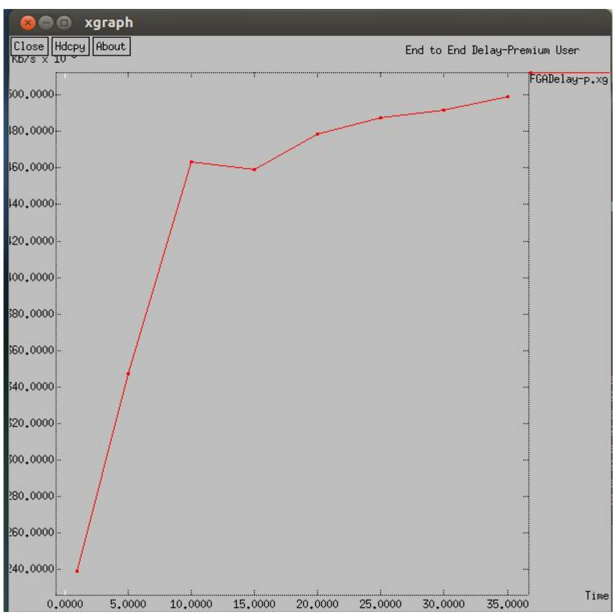

Fig. 10: End to End Delay-Premium Users Using HFGA (FGA).

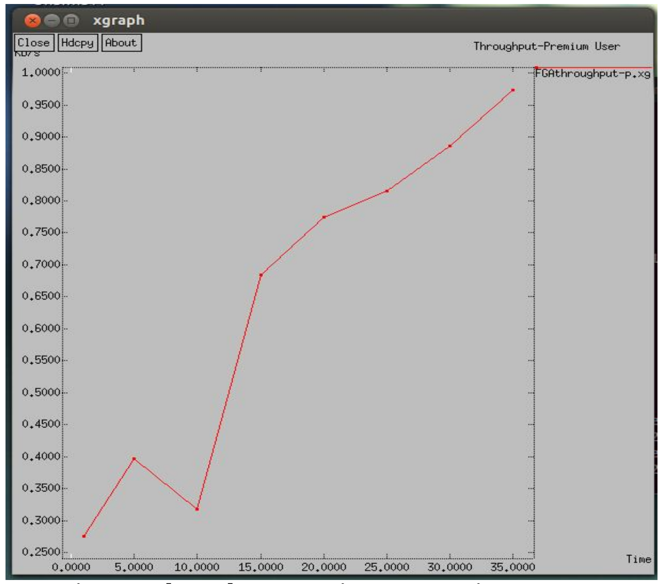

Fig. 11: Throughput-Premium Users Using HFGA(FGA).

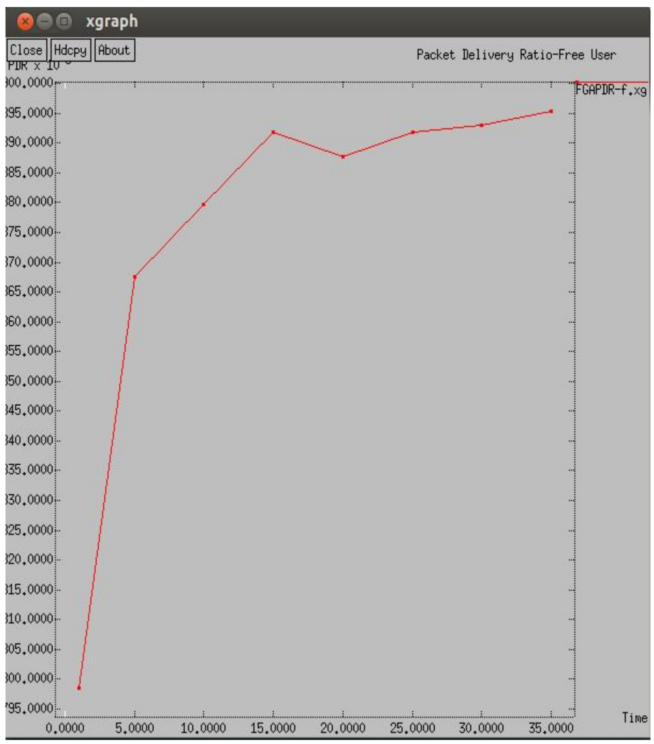

Fig. 12: Packet Delivery Ratio-Free Users Using HFGA (FGA).

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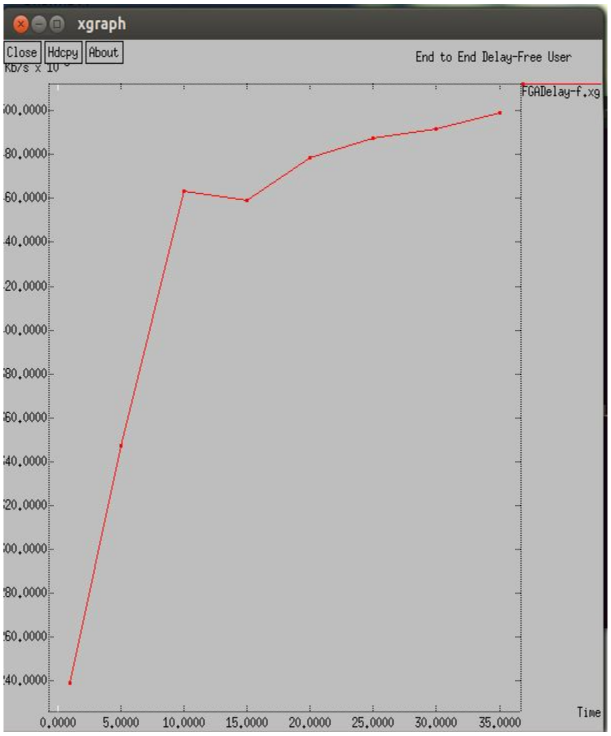

Fig. 13: End to End Delay-Free Users Using HFGA (FGA).

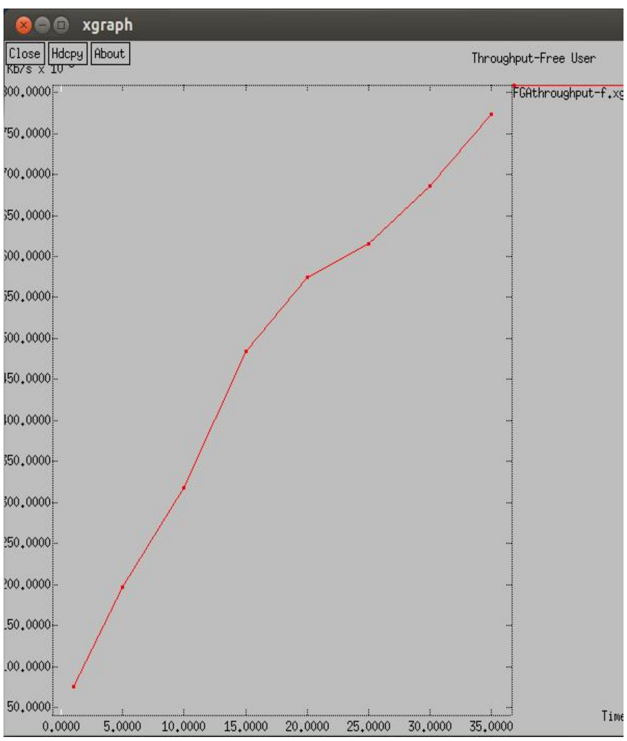

Fig. 14: Throughput-Free Users Using HFGA (FGA).

4 CONCLUSION

Vehicle communication technology has become crucial in designing vehicles for the future. VANET deals with communication services among vehicles or with roadside infrastructure. In this study, we discussed the HFGA scheme for different users for different environment for streaming the data. We classified these users into two categories: (1) premium users and (2) free users. We have presented a data dissemination technique suitable for dense vehicular networks. The use of HFGA technique or scheme has been motivated and employed in dense networks while the store-carry-forward communication model. The designed scheme is simple and robust. Playing live stream videos in vehicles thus becomes possible via VANET and roadside BSs. However, there are some difficulties to be overcome, such as the uneven distribution of roadside BSs, the high mobility of vehicles, and the volatility of network environments. In this paper, New Enhanced Hybrid Data Dissemination System Based on Genetic Algorithm and Fuzzy Inference dissemination system for vehicular networks is explained to solve the above mentioned problems. Two users are taken under some considerations to deal with different kinds of network environments according to the number of vehicles and roadside BSs. We believe that our work will be useful to the research community and will serve as suitable introductory material for individuals who want to pursue the study and data dissemination of VANETs.

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