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A PRIORITIZED VANET TO REDUCE THE TRAFFIC CONGESTION USING ARTIFICIAL BEE COLONY

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Abstract: *VANET works on the basis of real time system where the vehicles are affecting nodes and travel with a very high speed on the roads in the metropolitan areas. There are many protection issues like confirmation, tunnel attacks, intellectual system approach, impact detection, congestion avoidance, communication system approach etc.*
This paper proposed a method to design a specific fitness function of artificial bee colony algorithm to predict that at what distance the vehicles should slow down or can change the path so that they don't face any traffic congestion because of the prioritized traffic at the light point. It must have to be assumed that all the vehicles have a GPS system with them and priority is given to one side traffic only. The implementation has been taken place in MATLAB and efficiency of planned work depends on various parameters like Throughput, Vehicle density, End-to- End Delay and Error rate.

Keywords: *: VANET (Vehicular ad-hoc network), GPS, MATLAB, ABC, Traffic management.*

1. INTRODUCTION

Vehicular Networks (otherwise called VANETs) are a foundation of the imagined Intelligent Transportation Systems (ITS). By empowering vehicles to speak with one another through Inter-Vehicle Communication (IVC) and with roadside base stations by means of Roadside to Vehicle Communication (RVC), vehicular systems will add to more secure and more productive streets by giving opportune data to drivers and concerned powers Shurman et.al [1].
VANET is an original form of Mobile Ad-hoc Network which consists of number of vehicle with the capability of communicates with each other without a fixed transportation. So VANET has extremely dynamic topology as compare to MANET Nathan et.al [2]. The main challenge in maintain a good connectivity are high vehicle mobility and changeable [9] traffic environment. Due to its open access intermediate, it is more flat to security attacks. The black hole attack is one of the main security threats in VANETs. In black hole attack, when there is any route request, one spiteful node present it for having the shortest path to the destination node or to the packet it wants to intercept Shurman et.al [1]. When the mean node receives an RREQ message, directly sends a false RREP message over its route, handover high succession no. before other nodes send a true one.

VANET ARCHITECTURE

Wireless ad hoc networks have the feature to be infrastructure less and do not depend on fixed infrastructure for statement and distribution of information. The structural design of VANET consists of three categories:

- Pure cellular or WLAN,
- Pure Ad hoc and
- Hybrid.

1.1.1 VANET Characteristics

Vehicular ad hoc network may use fixed cellular gateways and WLAN or WiMax access points at transfer intersection to connect to the internet, meet traffic in order or for routing purpose. This network planning is called pure cellular or WLAN. VANET can consist of both cellular network and WLAN to form a network. Stationery or fixed gateways around the road sides also provides connectivity to vehicles. In such a situation all vehicles and road side plans form pure mobile ad hoc networks. Hybrid building consists of both infrastructure networks and ad hoc networks mutually. No central authority is necessary in VANET as nodes can self put in order and self manage the in order in a spread fashion. Since the nodes are mobile so data broadcast is less dependable and sub optimal Ranjanet.al [3].

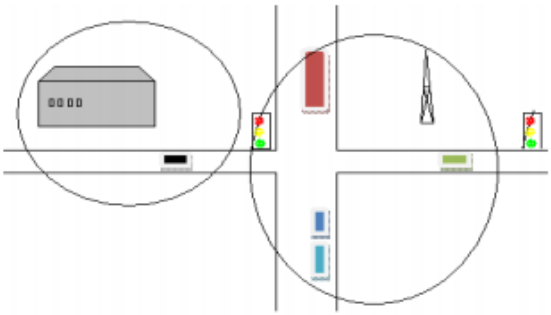

Figure no: 1.1 a) WAN cellular

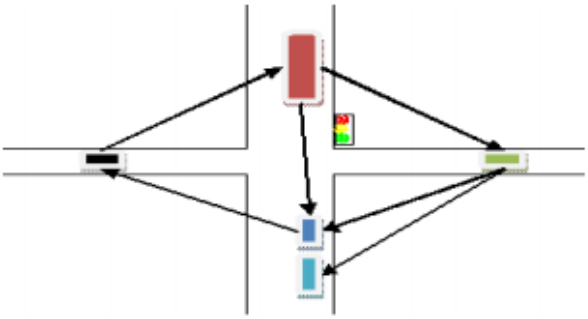

Figure no: 1.1 b) pure ad hoc

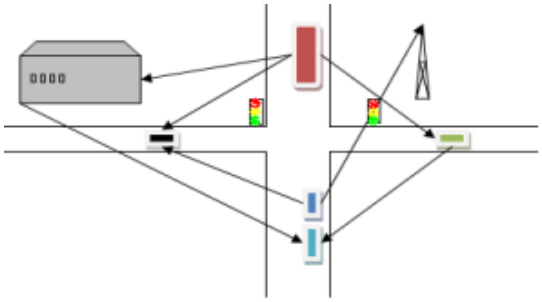

Figure no: 1.1 c) VANET architecture

1.2 Attacks in the VANET

To get better guard from attackers we must have the information about the attacks in VANET against security needs. Attacks on different security requirement are given below Maria et.al [4].

• **Impersonate**: In imitate attack attacker assumes the identity and human rights of an authorized node, either to make use of network property that may not be available to it under normal situation, or to disrupt the normal functioning of the network. This type of attack is performed by active attackers. They may be insider or outsiders. This attack is multi layer attack means attacker can use either network layer, application layer or transport layer susceptibility. This attack can be performed in two ways:

a) False attribute possession: In this system an attacker steals some property of lawful user and later with the use of attribute claims that it is who that sent this message. By using this type attack a usual vehicle can claim that he or she is a police or fire protector to free the traffic [11].

a) **Sybil**: In this type of attack, an assailant use different identities at the same time.

• **Session hijacking:** Most verification process is done at the start of the session. Hence it is easy to hijack the session after link establishment. In this attack attackers take control of session between nodes.

• **Identity revealing:** A usually a driver is itself owner of the vehicles hence getting owner's individuality can put the privacy at risk.

• **Location Tracking:** The location of a given instant or the path followed along a period of time can be used to trace the vehicle and get in order of driver.

• **Repudiation:** The main danger in denial is denial or attempt to denial by a node involved in communication. This is diverse from the imitate attack. In this attack two or more entity has common identity hence it is easy to get impossible to differentiate and hence they can be repudiated.

• **Eavesdropping** is a most common assault on confidentiality. This attack is belonging to network layer attack and passive in nature. The main objective of this attack is to get access of confidential data.

• **Denial of Service:** DoS attacks are most famous attack in this category. In this attack attacker prevent the legitimate user to use the service from the fatality node. DoS attacks can be carried out in many ways Murthy et.al [5].

VANETs face distinctive securities dangers i.e. assault that are completed against them to upset the typical execution of the systems. In these assaults, dark gap assault is that sort of assault which happens in Vehicular Ad-Hoc systems (VANET) Nathan et.al [1].

2. PURPOSED ALGORITHM

A) ARTIFICIAL BEE COLONY OPTIMIZATION

ABC algorithm is a new intelligent optimization algorithm implying the winged animal swarm practices, which was proposed by analyst Kennedy and Dr. Beernaert in 1995 [7]. In ABC calculation, every individual is called "Burrowing little creature COLONY", which speaks to a potential arrangement. The calculation attains to the best arrangement by the variability of a few particles in the following space. The ANT COLONYs seek in the arrangement space taking after the best ANT COLONY by [10] changing their positions and the wellness oftentimes, the flying course and speed are controlled by the objective function.

ABC Algorithm

The algorithm uses the honey bee swarms behavior. It is very simple and robust method. When the performance of the ABC algorithm is compared with other algorithm like GA, DE, PSO, then its founds to operate in its best efficiency.

In ABC algorithm, one bee is waiting to choose the food source then this food source is visited by one of the bee from group. In this food position tells the solution available.

The position of the food is represented using following formula:

Ft= 1/ 1+f

Where is fitness calculation?

Pseudo Code of ABC

- Initialize population.
- Evaluate population.
- For cycle 1.
- Repeat.
- Find food source positions
- Apply greedy selection to get new solutions.
- Calculate the probability values for all solutions.
- Get new positions of food.
- Again apply greedy process.
- Optimize the position of food to get new positions.
- Do for cycle + cycle+1
- Until cycle = MCN.

3. SIMULATION MODEL FOR PURPOSED WORK

The Purpose work of this research work is as follows:

1. To design a vehicular ad-hoc network with N number of vehicles, V number of velocities in such a manner that

$$G \in (N_i, V_i),$$

where G is the subset including N and V.

2. To design and develop a suitable fitness function for artificial bee colony to minimize the latency and congestion of the traffic using mat lab in such a manner

$$\text{Total delay estimated} > C\ (E_1\ \text{fit\_function}) < \Sigma_{i=1}^{n} = E_1(Ni, Vi)$$

Where E = power or energy at all vehicles considered at the light point.

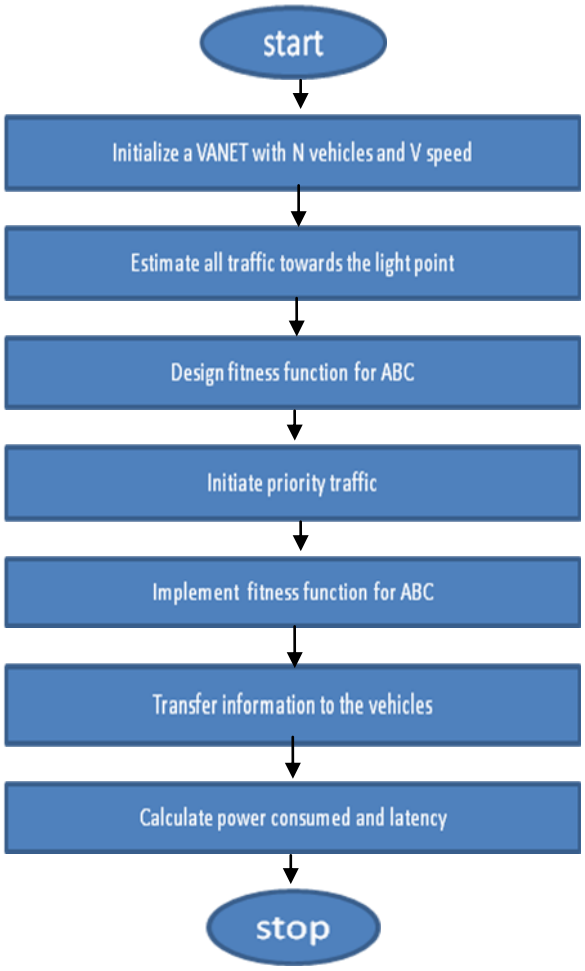

Figure no: 3 Flow chart of proposed work

4. COMPUTATION PARAMETERS

The whole simulation has been taken place in MATLAB environment using various parameters like: Delay, Error Rate, Energy and Throughput.

1. Delay: The average time taken by data packet to reach the destination and includes all delays caused by buffering during route discovery latency, queuing at the interface queue. Mathematically, it can be defined as: Avg. EED=S/N, Where S is the sum of the time spent to deliver packets for each destination, and N is the number of packets received by the all destination nodes.

2. Error Rate: The error rate is the numeral of bit errors per unit time. ER is a unit less performance measure, often expressed as a percentage.

3. Energy: Energy with current values within the square brackets. The values shown above are the defaults. The user enters a desired number and is then prompted for a new value for the selected parameter.

4. Throughput: Throughput is the rate of invention or the rate on which a bit can be processed. When used in the framework of communication networks.

5. RESULT ANALYSIS:

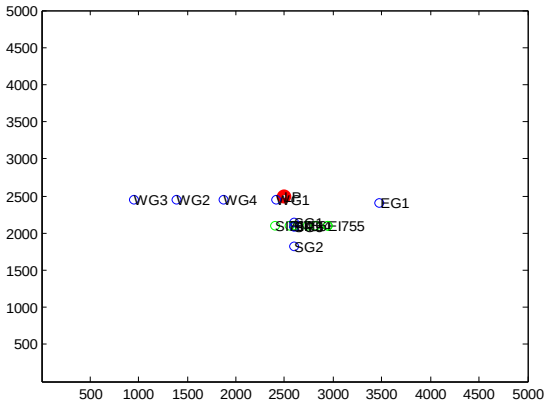

Figure no: 5.1 Main Architecture having vehicle

This figure shows that,set of vehicles from all the directions namely, EAST, WEST , NORTH AND SOUTH, in range of 5 km sq of area. A platoon denoted by a red circular object approaching from with a speed of 40 km per hour towards the central point. After reaching the central point ,the platoon may move to any direction. The main idea behind in designing such a system is that the other vehicles shoud wait for the best time so that the system remains normalized. For this purpose ,basically two algorithm has been purposed and they have been named as base algorithm and base algorithm with ABC. The base algorithm states that the vehicle approaching from north side may move towards any direction i.e. EAST,WEST or SOUTH with the same speed. In addition to this, the other traffic would start moving when a platoon vehicles would reached to another central point.this sort of system is often seen in each and every city once in a month.this causes a heavy problem for normal daily life uses. Hence another proposal has been presented in artificial bee colony algorithm decides that after what distance the vehicle should start moving. The following results shows a comaparative analysis for the same.

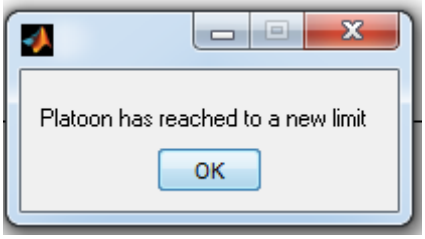

Figure no: 5.2 Platoon Message

This figure shows that, platoon has reached to a central point.

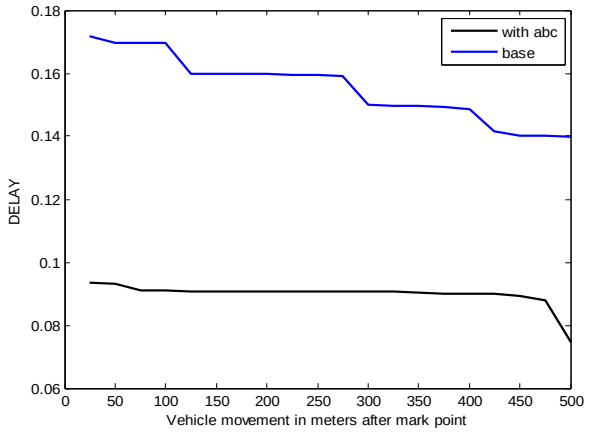

Figure no: 5.3 Delay

This figure shows that, The End to End Delay is a significant parameter for evaluating a protocol which must be low for good performance. Above figure shows the end to end delay with optimization algorithm using ABC and base method. Above figure shows the comparison of end to end delay with and without optimization. It has been seen that for proposed approach it founds to be small.

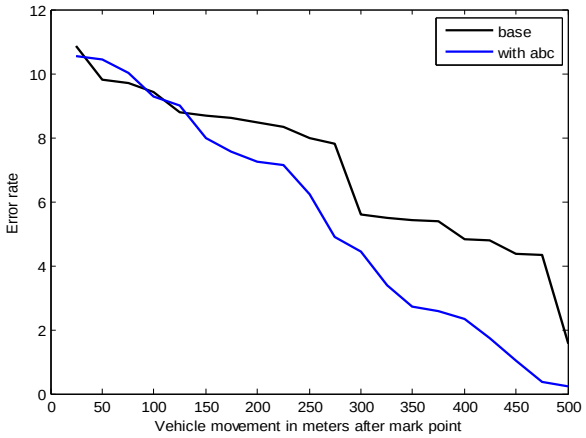

Figure no: 5.4 Error Rate

Above figure shows the error rate compensation with ABC algorithm. Error rate is the measure of the number of errors found in the network during vehicle communication. It has been seen that value of error rates has been reduced when ABC has been utilised.

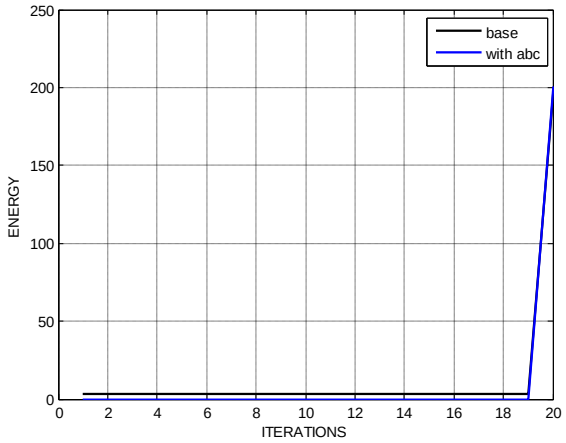

Figure no: 5.5 Energy

Above figure shows the energy consumption during utilization of proposed algorithm. For effective technique energy has to be minimised. It has been seen that energy consumption with ABC algorithm is lower than the base.

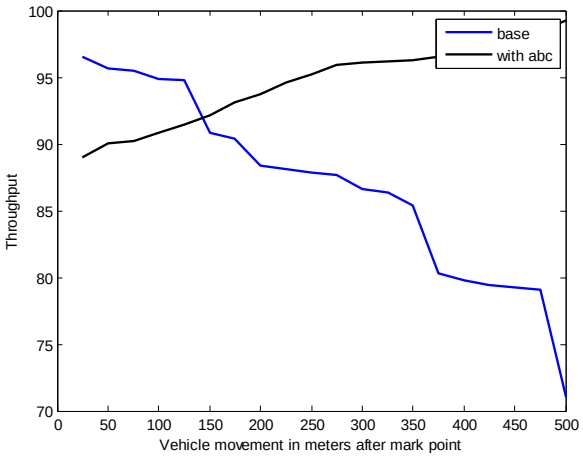

Figure no: 5.6 Throughput

Throughput is the number of vehicles sent over the network in given time without doing congestion. Above figure shows the throughput value after compensation through ABC algorithm and base algorithm. It has been seen that value of throughput is being enhanced in the figure.

COMPARISON RESULT ANALYSIS

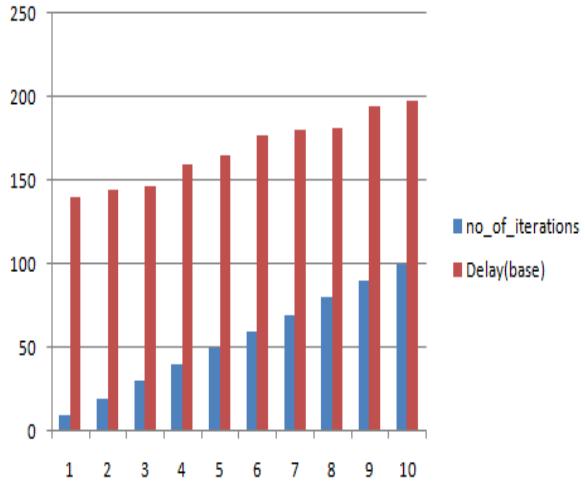

Figure no:5.7: End to End Delay (BASE)

The End to End Delay is a significant parameter for evaluating a protocol which must be low for good performance. Above figure shows the end to end delay without optimization.

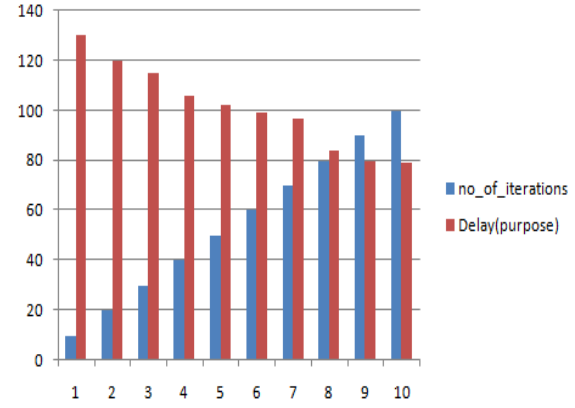

Figure no: 5.8: End to End Delay (Purpose)

The End to End Delay is a significant parameter for evaluating a protocol which must be low for good performance. Above figure shows the end to end delay with optimization using proposed algorithm. It has been seen that for proposed approach it founds to be small.

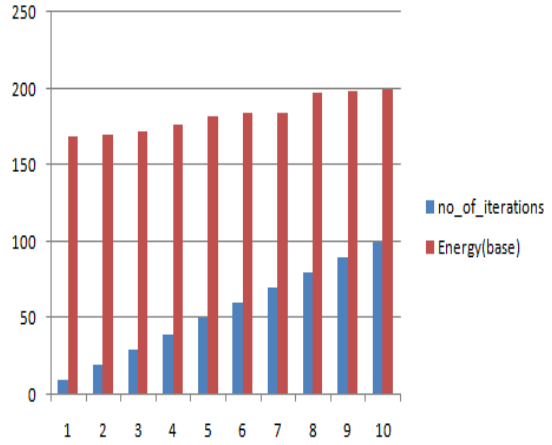

Figure no: 5.9: Energy Computation (BASE)

Above figure shows the energy consumption during utilization of base algorithm. For effective technique energy has to be minimised.

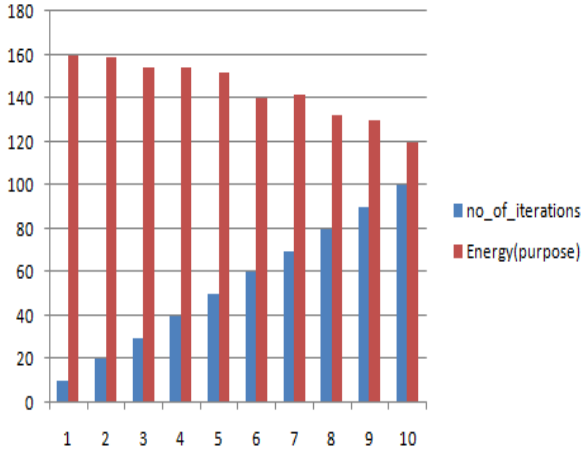

Figure no: 5.10: Energy Computation (Purpose)

Above figure shows the energy consumption during utilization of proposed algorithm. For effective technique energy has to be minimised. It has been seen that energy consumption with proposed algorithm is lower than the base.

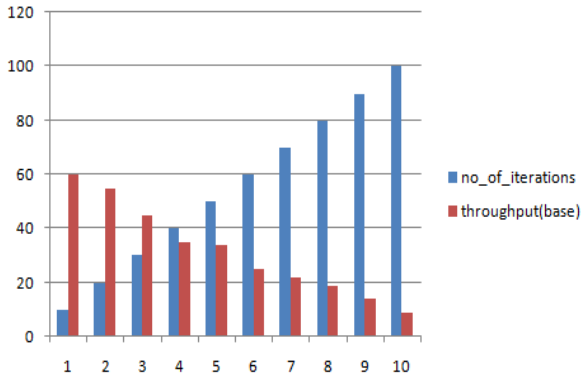

Figure no: 5.11: Throughput(BASE)

Throughput is the number of packets sent over the network in given time. Above figure shows the throughput value of base paper algorithm.

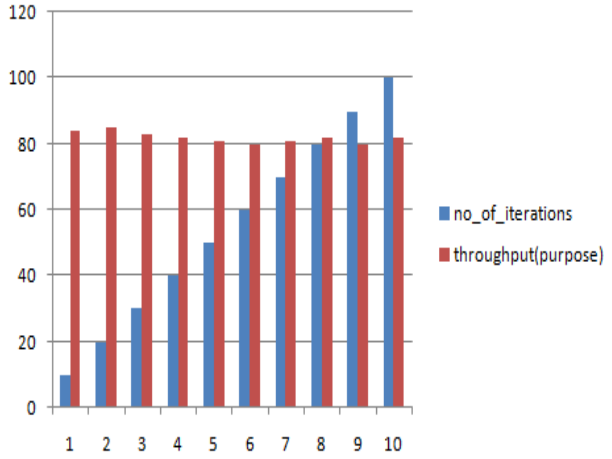

Figure no:5.12: Throughput(Purpose)

Throughput is the number of packets sent over the network in given time. Above figure shows the throughput value using proposed algorithm. It has been seen that value of throughput is being enhanced in the figure.

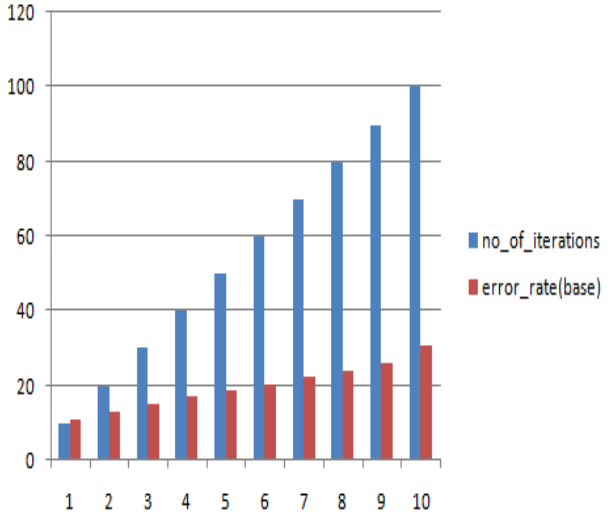

Figure no: 5.13: Error rate(BASE)

Error rate is a significant parameter for evaluating a protocol which must be low for good performance. Above figure shows the error rate without optimization.

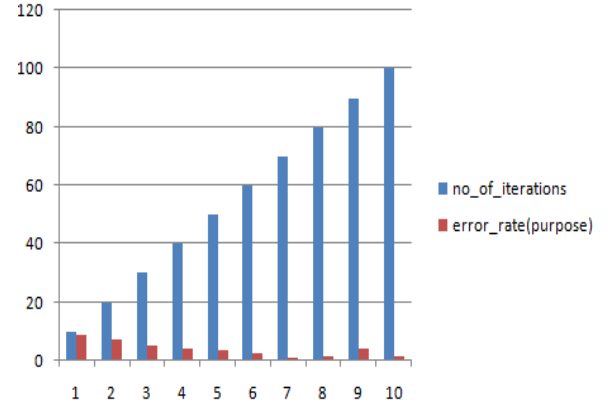

Figure no: 5.14: Error rate(Purpose)

Error rate is the number of packets sent over the network in given time. Above figure shows the error rate value using proposed algorithm. It has been seen that value of error is being enhanced in the figure.

6. CONCLUSION AND FUTURE SCOPE

This paper presents the network with a new intellectual algorithm ABC to perform the vehicle to vehicle communication to avoid congestion. In planned method each vehicle can pass the information to other vehicle. As a vehicle get some collisions it will inform to the follower vehicles about its status so that they can execute the decision regarding the route change at earlier stage to pass up the congestion. From the research it has been found out that proposed algorithm ABC has better throughput, less delay, less error rate and less energy consumption in comparison to previous method.

Future scope lies when the priority vehicles are coming from two different directions at the same time and a priority is needed to both of them. Also, the scope lies in the use of BFO (Bacterial Foraging Optimization) algorithm that can optimize various more parameters on the basis of its optimization algorithm.

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