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Identification of Malicious Behaviour of Vehicle on VANET Using SOM classifier

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Abstract: The vehicular ad-hoc network now a day's growing field of research, due its infrastructure or rapidly change topology. VANET is sub part of MANET and combination of nodes and roadside units. VANET uses high movable nodes as compared to MANET. VANET provide wireless communication among vehicles and vehicle to roadside unit for sharing information and safety purpose of drivers and passengers. There are various malicious activities performed in network like bogus information attack, ID discloser, sybil attack etc. All these attacks try to distract drivers. In this paper we work on Dos attack in AODV routing protocol. When malicious node sends fake requests frequently to other nodes it creates a blockage in network then node is not able to respond to other nodes. In this paper Artificial Neural Network in VANET is used; so neural network helps to train the node and uses the back propagation and adjust the weights. For the identification of malicious node SOM classifier is used. SOM observe the behavior of nodes and classifies as the normal node and malicious node in the network.

Keywords: VANET, ANN, DOS Attack, AODV, security, SOM classifier.

I. INRODUCTION

The wireless ad hoc network (WANET) allows more flexible mode of communication than traditional wired networks as user shouldn't be restrained to a physically fixed region. In addition not like mobile networks there is not any constant communication infrastructure. In Vehicular ad hoc network (VANET) which is a subclass of WANETs, the nodes are the vehicles and road Side Units (RSU). Thus the links are subject to frequent disconnections and can get a little time for communication. As a result it's essential to curb disruptions prompted by way of regularly altering topology. This in turn presents an elevated hindrance for the routing protocols, as speedy reconstructions of routes are necessary. The implementation of Mobility Prediction and Routing Protocols in VANET is fundamental; in view that of continually and speedily changing topology. With the aid of utilizing the nonrandom mobility patters of the node we can predict the long term state of the network and take correct measures thus in well-timed fashion. Therefore we can cut back overhead by way of doing away with the transmissions of manipulating packets and time required to process them, which might be needed to route reconstruct[1].

To address these problems and detect these misbehaving MPRs, we propose a cooperative detection mechanism using Artificial Neural Networks (ANN). ANN is computer programs that method information in a way simulating the human brain neural performance. It is made of hundreds of neurons or processing elements (PE) arranged in an input layer, an output layer and several hidden layers. In the context of the problem we are addressing, the ANN is used to analyze the collected observations from all the watchdogs [2] for detecting the misbehaving vehicles. Each vehicle plays the role of watchdog to overhear its one-hop away MPR. Before using the Neural Network, a back-propagation learning algorithm is used to train the network and adjust neurons' weights. In summary, we are proposing a cooperative detection technique based on ANN to detect the misbehaving MPRs. Our technique is able to:

- Aggregate the watchdogs' observations to come up with a final cooperative judgment.
- Benefit from the previous detections experience of the continuous learning.
- Improve the detection probability and reduce false alarms.

II. VANET

VANET is methodology to attain intelligent inter vehicle communications (IVC), seamless web connectivity accelerated road security resulting, necessary emergency alerts and accessing comforts & entertainments with improved transportation system's efficiency [3]. It includes a huge variety of technologies comparable to the vehicle communication process; Global Positioning System (GPS), video cameras, digital mapping, and sensing applied sciences together with developed information processing tools.

It provides crucial and well-timed information to users and traffic management techniques to beef up traffic efficiency, cut down traffic congestion and improve road safety. VANET is a novel class of MANET and a noteworthy part of Intelligent Transportation System (ITS) Up to date research work areas in VANET emphasizes on design of protocol or modify the present one, data sharing, safety and privacy, network formation and so on.

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A VANET has some specified features regardless of being a particular case of a MANET and imparting some identifying characteristics, equivalent to low bandwidth, brief transmission variety and omnidirectional broadcast:

• Highly dynamic topology: a vehicular network is extremely dynamic due to two factors: speed of the vehicles and characteristics of radio propagation. Vehicles have high relative velocities in the order of 50 km/h in urban environments to more than 100 km/h on highways. They may likewise move in various directions. Hence, vehicles can rapidly join or leave the network in a brief timeframe, prompting frequent and quick topology changes.

• Frequently disconnected: the exceedingly dynamic topology results in incessant changes in its network, in this manner the connection between two vehicles can rapidly vanish while they are transmitting data;

• Geographical communication: vehicles to become to regularly rely on upon their geographical location. This differs from other networks where the target vehicle or a group of target vehicles are defined by an ID or a group ID;

• Constrained mobility and prediction: VANETs display very dynamic topology; however vehicles more often than not take after a specific mobility design compelled by roads, streets and highways, traffic lights speed limit, traffic conditions, and drivers' driving practices. Subsequently, given the mobility design, the future position of the vehicle is more possible to be anticipated.

• Propagation model: normally, VANETs work in three situations: highway, rural, and city. In a highway, the propagation model is normally thought to be free-space, yet the sign can endure obstruction by the reflection with the divider boards around the roads. In a city, its environment makes the correspondence complex because of the variable vehicle thickness and the nearness of structures, trees, and objects, acting as obstacles to the signal propagation. Such obstacles cause shadowing, multi-path, and fading effects. Usually, the propagation model is assumed to not be free-space due to those characteristics of the communication environment. In rural environments, because of the complex topographic structures (fields, hills, climbs, dense forests, and so forth.) it is important to consider the signal reflection and the attenuation of the signal propagation. Therefore, in this scenario, the free-space model is not appropriate. As in whatever other network, the propagation model in a VANET must consider the impacts of potential impedance of wireless communication from different vehicles and the presence of to a great extent sent access focuses [4]

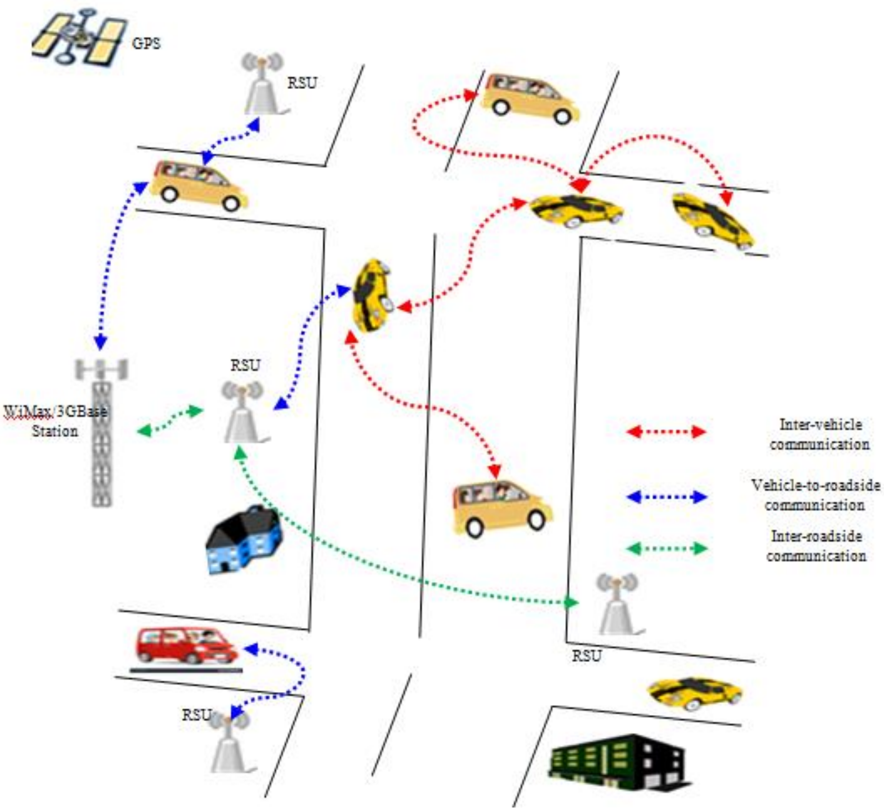

Figure1. A structure of VANET

Basically, Communication Models are as follows:-

(a) Vehicle to Vehicle (V2V): V2V involves direct communication between vehicles in their communication range. V2V is an automobile innovation intended to allow automobiles to "talk" to each other. VANET is framed among the vehicles for trading data for example safety information.

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(b) Vehicle to infrastructure (V2I): Vehicle to fixed Infrastructure (V2I) in which each vehicle is commutate with a fixed road infrastructure i.e. RSU through devoted short range communication(DSRC), Wi-Fi, 3G or 4G networks.

(c) Vehicle to Broadband Cloud Communication: In these sorts of communication Vehicle speak with a broadband cloud by means of utilizing wireless broadband component for example 3G/4G, LTE, Wi-MAX and so on. It receives the data from the central office.

III. CHARACTERISTICS OF VANET

VANET is a utilization of MANET in any case it has its own specific attributes which can be portrayed out as:

(a) High Mobility: The nodes in VANETs as a rule moving at quick. This makes harder to anticipate a node's position and making insurance of node protection whose position is quickly evolving [6].

(b) Network topology: Due to high node mobility and irregular speed of vehicles, the position of node changes as often as possible. As an aftereffect of this, network topology in VANETs tends to change every now and again [6].

(c) Unbounded size of the network: VANET can objectify for one city, some urban communities or for various countries. This suggests network size in VANET is geologically unbounded [6].

(d) Frequent trade of data: The ad hoc nature of VANET spurs the nodes to accumulate data from substitute vehicles and roadside units. Thus the data exchange among node gets to be frequent [6]

(e) Time Critical: The data in VANET must be conveyed to the nodes within time confine so that a choice can be made by the node and perform activity in like manner [6]

IV. SELF-ORGANIZING MAP (SOM)

A SOFM or SOM is a sub set of ANN which is trained with help of unsupervised learning and to create a small dimensional (normally two-dimensional), the input space of the training samples to representation, which is called as a map. A ANN contain special of part SOM which is contain input space topological properties. They are used some features in SOMs like that low-dimensional views in create the SOMs and high-dimensional data are useful for visualizing. In ANN, operate the two modes in SOMs: mapping and training. Without help, categories a fresh input vector in which "mapping", while create the map by input in which "Training" like that (a competitive process, known as vector quantization). SOMs consist of object called neurons or node. Related with, all nodes of similar dimension of weight vector such as a place in the map space and the input information vectors. The usual collection of node is a two-dimensional normal spacing in a hexagonal or rectangular grid.

The SOMs (self-organizing map) define by grouping from a bigger dimensional input space to a smaller dimensional map space. This technique is designed for placing a vector from records space onto the map and searching for the host with the nearest (smallest distance metric) weight vector to the information space vector. As one number of host perform in a direction by SOMs which is known as K-means, larger SOMs rearrange information in a direction that character is fundamentally topological. It is also general to use the U-Matrix. The U-Matrix value of a particular host is the normal distance between the host and its closest neighbors. For example, we might believe the nearest nodes as 4, 6 nodes in a hexagonal grid in a square grid.

V. AD-HOC ON DEMAND DISTANCE VECTOR

Ad-hoc on demand distance vector is reactive routing protocol that is uses an on- demand method for finding paths. It established routes between hosts only when wanted by source hosts for transmitting data packets; therefore, it is also well-known as source initiated routing protocol. It used terminus sequence numbers to make sure the cleanness of the routes. AODV mostly involves in two procedures, one is path detection and other is path maintenance. Path detection method includes path discovery, forward-path setup and reverse-path setup. The path discovery process begins at any time a source host wants to associate with another host for which it has no routing information in its table. In AODV each node acts as both a host and routing node, each node must maintain a routing table that contains information about known destination nodes. In routing table maintained the information about source address, destination address, hop count, destination sequence number, broadcast ID etc. In AODV message contains RREQ, RREP, RERR, HELLO message [15]. RREQ message is used to determine a path to send packets from source to destination. Every neighbor host either re-broadcast the RREQ to its own neighbors after growing hop-count if they are not destination host or satisfied the RREQ by replying by Route reply (RREP) information return to the basis host if they are destination host. When link failure occur or destination not find out then RERR message to source and link repair or node capable to find the destination then nearer node send hello message to source that means now active and ready to send packet to destination[17].

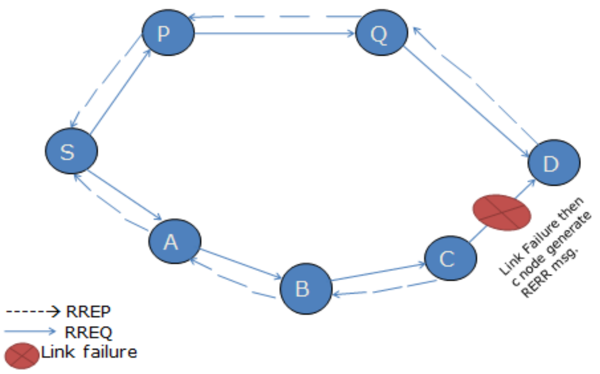

Figure 2. Ad-Hoc On Demand Distance Vector Process

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VI. LITERATURE SURVEY

In [7] Empirical propagation models have discovered support in both research and industrial groups owing to their speed of execution and their constrained dependence on point by point knowledge of the terrain. In spite of the fact that the investigation of empirical propagation models for mobile channels has been thorough, their relevance for VANET frameworks is yet to be legitimately accepted. Since site estimations are costly, propagation models have been produced as a suitable, low cost, and helpful option. This paper a diagram of well known spread models for wireless communication channels is presented. Among the contenders, model of the HATA, OKUMARA models and the COST-231 Hata model demonstrate most promise. In this paper, a comprehensive set of empirical channel models has been provided to investigate the best suitable environmental conditions for different models.

In [8] VANETs are a promising correspondence circumstance several new applications are imagined, which will enhance traffic management and safety. By the by, those applications have stringent security prerequisites, as they influence road traffic safety. Besides, VANETs present a few security threats. As VANETs present few unique service components of classical security are not generally appropriate. Thus, a plenty of examination commitments have been exhibited as such. This chapter aims to depict and analyze the most illustrative VANET security developments.

In [9] Localization (area estimation) of a vehicle in VANET has been concentrated on in numerous fields since it can give an assortment of services like navigation, vehicle following and collision detection and so on. Global Positioning System (GPS) and Inertial Navigation System (INS) both are to a great degree significant procedure for repression by utilizing Kalman Filter it is conceivable to consolidate these two frameworks to show signs of improvement precision of localization. Presently day's commonplace limitation methods join GPS beneficiary estimation and estimations of the vehicle's movement by INS. Nonetheless, when the vehicle traveling through an environment that make a multipath impact, these systems neglect to create the high localization accuracy that they accomplish in an open situation in view of loss of satellite sign in a multipath range, for example, territories with high structures, trees, or passages. In this new propel restriction strategy is proposed to enhance localization accuracy. Additionally ANN is utilized to distinguish multipath environment and after that by utilizing an elder Mead Optimization strategy we can lessen the localization error of a vehicle when it travelling by multipath atmosphere.

In [10] this context, researchers have offered quite a lot of protocols, including cluster-oriented methods to overcome such challenges. In cluster-oriented methods, it's of critical significance to pick a sustainable cluster with due regards to the high speed and density of nodes. The proposed approach is known as the intelligent Based Clustering Algorithm in VANET (IBCAV), the present project seeks to make stronger routing algorithms in VANETs by employing inter-layered ways, attention of the present site visitor's waft as well as combo of more than a few explanations on the basis of a clever method established on ANN. Right here cluster size, speed and density of nodes are the reasons which have taken into consideration. Subsequently, our simulated outcome exhibit that the IBCAV outperforms higher then AODV, DSR and epidemic routing in terms of the packet delivery ratio, end-to end delays and throughput.

In [11] VANET have turned out to be an enormous technological know-how within the present years considering the fact that of the emerging generation of self-driving cars for example Google driverless cars. VANET have additional vulnerabilities compared to various networks, for example wired networks, considering these networks are an autonomous mobile vehicles set and there is not any fixed protection infrastructure, no high dynamic topology and the open wireless medium makes them extra at risk of attacks.
It is principal to design new tactics and mechanisms to raise the security these networks and look after them from attacks. On this paper, we design an IDS for the VANETs utilizing ANNs to detect Denial of Service (Dos) attacks. The fundamental position of IDS is to realize the attack making use of a data generated from the network habits equivalent to a trace file. The IDSs use the points extracted from the trace file as auditable data. In this paper, we endorse anomaly and misuse detection to detect the malicious attack.

In [12] address the concern of detecting making trouble vehicles in VANET utilizing (VANET QoS-OLSR); Quality of Service-Optimized Link State Routing protocol VANET QoS-OLSR is a clustering protocol that can build the dependability of the network while keeping up the QoS necessities. However, in this protocol, vehicles can misbehave either by under-speeding or over-speeding the road speed limits after clusters are formed. Such misbehavior leads to a widely disconnected network, which raises the need for a detection mechanism. Most of the existing detection systems are non-helpful as in they depend on one-sided judgments, which might be untrustworthy. Others employ cooperative detection scheme with evidence-based aggregation techniques such as the Dempster-Shafer (DS) which suffers from the (1) instability when observations come from dependent sources and (2) absence of learning mechanism. To defeat these confinements, we propose a cooperative strategy utilizing ANN, which can (1) total aggregate and keep the one-sided decisions, and (2) benefits of the previous detection experience of continuous learning. Simulation results show that our model improves the detection probability and reduces the false alarm rate.

In [13] project seeks to amplify routing algorithms in VANETs by utilizing between layered strategies, familiarity with the existing traffic flow as well as combinations of more than a couple causes on the

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groundwork of an intelligent approach centered on ANN. Right here cluster size, speed and density of nodes are the factors which have taken into consideration. Sooner or later, our simulated results show that the IBCAV outperforms higher than AODV, DSR and epidemic routing in terms of the packet delivery ratio, end-to end delays and throughput.

In [14] an effective procedure is proposed to detect and defend against UDP flooding attacks underneath distinct IP spoofing types. The framework makes utilization of a storage-efficient data constitution and a Bloom channel arranged IPCHOCKREFERENCE detection system. This lightweight method makes it quite effortless to set up as its useful resource requirement is reasonably low. Simulation outcome regularly confirmed that the method is each effective and robust in defending towards UDP flooding attacks beneath specific IP spoofing types. Especially, framework outperformed various in accomplishing a better detection rate yet with decrease computational and storage costs.

VII. PROPOSED WORK

Step 1. Run vehicle in normal scenario
Step 2. Extract feature from a trace file
Step 3. Normalize trace file
Step 4. left ← T
While (T)
If (left==T)
Left ← behavior right ()
Else
Left ← behavior left ()
End if
End wile
End

Step 5. if (condition==match)
Create vector, w.
{

$$D=\sum_{i=1}^{n}(l_{i,n}-w_j(t))^2$$

$$W=w_j(t+1)=w_j(t)+n(t)*(li,n-wj(t))$$

}

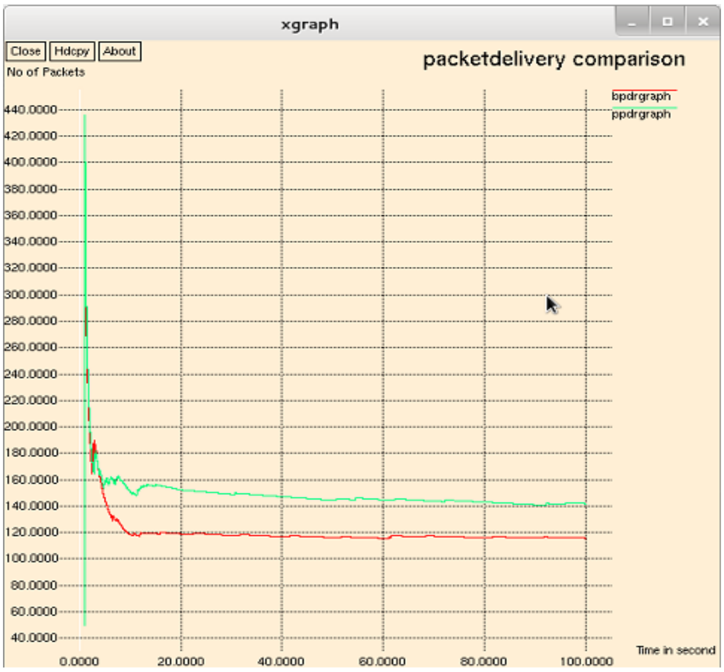
Step 6. Now we have two cluster arrays
Step 7. On the basis of cluster we find malicious behavior
Step 8. Exit.

VIII.RESULT SIMULATION

Table 1. Simulation parameters

Parameter	Value
Number of node	50
Protocol	AODV
Attack	DOS
Simulation time	100ms
Mac	802.11
Prop	Two Ray Ground
Initial energy	10 joule
Antenna	Omni antenna
Channel type	Wireless
X	2000
Y	2000
Type of traffic	CBR
Transport protocol	UDP

Packet delivery ratio:
Define as the ratio of packets delivered from source to destination. The graph 1 represents a PDR graph between base approach and the proposed approach. The packet delivery ratio of the proposed approach is better than the existing approach.



Graph 1.Packet delivery ratio

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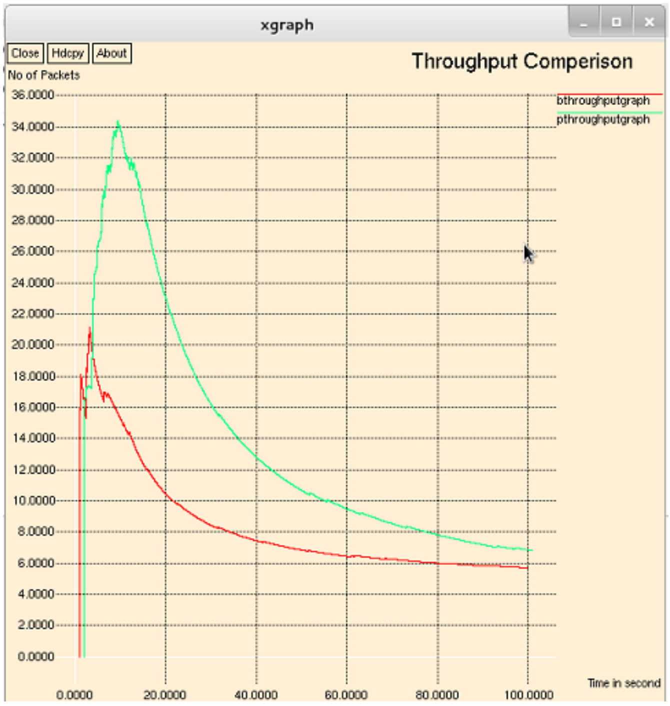
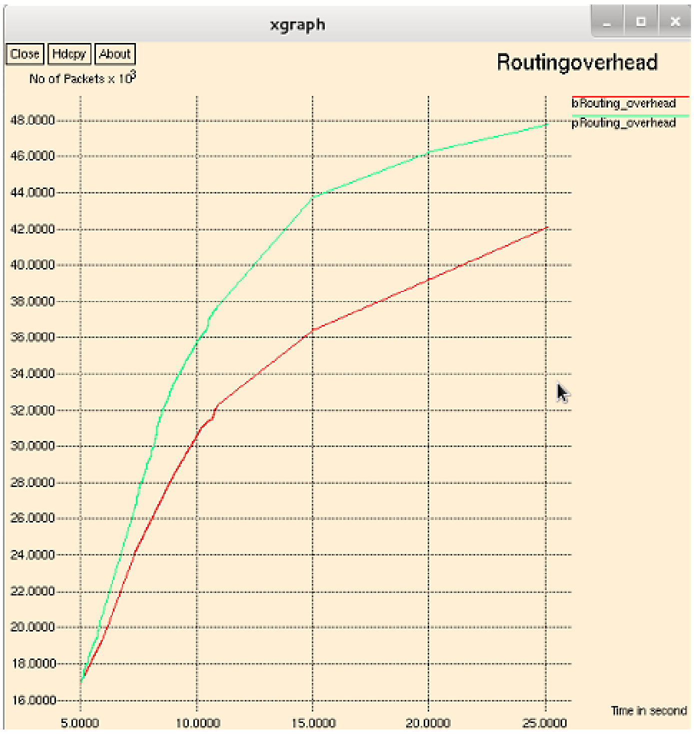
Throughput:
Per second transfer of data on bandwidth is known as throughput. The graph 2 represents a throughput graph between base approach and the proposed approach. The throughput of the proposed approach is better than the existing approach.



Graph 2.Throughput

Routing Overhead:
The routing overhead is defined as data of data and flooding of data in the network transmitted by an application, which utilizes a bit of accessible transfer rate of communication protocols. The graph 3 represents a routing overhead graph between base approach and the proposed approach. The overhead of the proposed approach is more than the base approach. Since the overhead should be minimum but as the routing increases in the proposed work the overhead also increases.



Graph 3.Routingoverhead

IX. CONCLUSION

The reason behind the VANET is safety of driver and enjoyment while travelling on road. In this paper we used artificial neural network for training the nodes and for classification purpose we use SOM classifier. Previous method uses the ANN classifier for detection of malicious node and we used SOM classifier to identify the malicious vehicle on the basis of behavior in network. This technique helps to find the misbehavior node and improve the traffic efficiency, passenger comfort and more secure communication in network as compare to ANN classifier. So, therefore the combination of both these techniques will increase the efficiency and will provide more security.

REFERENCES

[1]. Prof. Uma Nagaraj, Amit Bharane, Bhushan Chaudhari and Ankit Naidu,"Mobility Prediction and Routing in Vehicular Ad hoc Network", International Journal of Engineering Research and Applications (IJERA), Vol. 2, Issue 2,Mar-Apr 2012, pp.1514-1518.

[2]. Amjad El Khatib, Azzam Mourad, Hadi Otrok, Omar Abdel Waha, Jamal Bentahar," A Cooperative Detection Model Based on Artificial Neural Network for VANET QoS-OLSR Protocol", 2015 IEEE.

[3]. Rajeshwar Dass, Rohit Sangwan and Ishan Girdhar," Vehicular Ad Hoc Networks", International Journal of Advanced Trends in Computer Science and Engineering, Volume 1, No.4, September – October 2012, pp: 121-129.

[4]. Felipe Domingos da Cunha, Azzedine Boukerche, Leandro Villas, Aline Carneiro Viana, Antonio A. F. Loureiro," Data Communication in VANETs: A Survey, Challenges and Applications", 2015.

[5]. Mr. Pawan Sharmaand Prof. Angeeta Hirwe," Implementation in Vehicular Communication with Various Approaches & Techniques",International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-3,March 2016, pp: 455-463.

[6]. E.A Feukeu, S. M. Ngwira, T.Zuva "Doppler Shift Signature for BPSK in vehicular Network: IEEE 802.11p" IEEE conference on Mechatronics and Automation

[7]. Komal Sharma and Jyoteesh Malhotra," A Comprehensive Survey on Various Empirical Channel Models in VANET", Australian Journal of Information Technology and Communication Volume II Issue I, pp:35-43.

[8]. Arturo Ribagorda," Overview of security issues in Vehicular Ad-hoc Networks", 2010,www.igi-global.com.

[9]. Mr.Ashitosh A. Salunkh and Mrs.Sunita S. Shinde," Proposed Technique to Improve VANET's Vehicle Localization Accuracy in Multipath Environment", INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY 3(1): January, 2014, pp: 103-105

[10]. Mehrnaz Mottahedi, Sam Jabbehdari and Sepideh Adabi," IBCAV: Intelligent Based Clustering Algorithm in VANET", IJCSI International Journal of Computer Science Issues, Vol. 10, Issue 1, No 2, January 2013, pp: 538- 543.

[11]. Khattab M. Ali Alheeti and Anna Gruebler, Klaus D. McDonald-Maier," An Intrusion Detection System Against Malicious Attacks on the Communication Network of Driverless Cars", 2015 IEEE 12th Consumer Communications and Networking Conference (CCNC): CCNC 2015 Workshops - IEEE CCAN2015, pp: 916-921.

[12]. Amjad El Khatib, Azzam Mourad, Hadi Otro, Omar Abdel Wahab and Jamal Bentahar," A Cooperative Detection Model Based on Artificial Neural Network for VANET QoS-OLSR Protocol", 2015 IEEE.

[13]. Mehrnaz Mottahedi, Sam Jabbehdari and Sepideh Adabi," IBCAV: Intelligent Based Clustering Algorithm in VANET", IJCSI International Journal of Computer Science Issues, Vol. 10, Issue 1, No 2, January 2013, pp: 538-543.

[14]. Karan Verma, Halabi Hasbullah and Ashok Kumar," An Efficient Defense Method against UDP Spoofed Flooding Traffic of Denial of Service (DoS) Attacks in VANET", 2012 IEEE, pp: 550-555

[15]. Dolly Tewatia," Performance Improvement of AODV Protocol In Vehicular Ad hoc Network (VANET)", INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH AND GENERAL SCIENCE VOLUME 3, ISSUE 3, MAY-JUNE, 2015 ISSN 2091-2730

[16]. Tajinder Kaur, A. K. Verma, " Simulation and Analysis of AODV routing protocol in VANETs", INTERNATIONAL JOURNAL OF SOFT COMPUTING AND ENGINEERING (IJSCE) ISSN: 2231-2307, VOLUME-2, ISSUE-3, JULY 2012

[17]. Sonali B. Wankhede," Analytical Study of Neural Network Techniques: SOM, MLP and Classifier-A Survey", IOSR Journal of Computer Engineering (IOSR-JCE), Volume 16, Issue 3, Ver. VII (May-Jun. 2014), PP 86-92.

[18]. Mayurai Patel and Amar NathDubey "Analyzing the effectiveness of Cluster based H-MANET for Scaling number of Nodes" 2nd International Conference on Innovations in Information Embedded and Communication Systems ICIIECS'15, IEEE-2015