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IMPROVED ROUTING VANETS BASED ON AVAILABLE CRITERIA AS BANDWIDTH AND MOBILITY USING VAGUE LOGIC

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Abstract

Vehicular Ad-Hoc Networks (VANET) as Mobile Ad-Hoc Networks (MANET) subcommittee has recently attracted great attention. In such networks, from a source, for vehicles on the road, based on the flow of information, requests are used. In these networks, in comparison to vehicles, it has more routing, higher speed and faster changing topography. In the traditional network, for the procedures provided, leads to access through. In this regard, for temporary networks, an efficient routing protocol is proposed. In the present study, for a temporary network called FBVANET, a routing protocol was proposed. It works based on the mobility of the mobile nodes and the available bandwidth. This is for routing, in terms of ambiguous logic, can select multiple options and then use the network to increase the rate. This is an important step in evaluating performance routing protocol. As proposed, each node, as an autonomous agent, operates based on selecting key criteria such as available bandwidth and vehicle driving rate. Proposed protocol performance AODV compared it to a known protocol. It is shown that the proposed protocol is the best.

Keywords:

VANET, Fuzzy Logic, AODV Routing Protocol

1. INTRODUCTION

In recent years, in wireless and computing communications, significant improvements to transport systems set up a better solution. The design of smart cars is a continuous process. In which case, to provide efficient services to cars, passengers, have computer and communication skills. To reduce traffic congestion and to improve road safety, to strengthen existing smart traffic systems, smart cars are used collectively.

VANET communication has many applications such as inter-user chat, field development and emergency alerts for sports players. Because of this, mobile suppliers and many car manufacturers, temporary net jobs, seriously supports research into integration into products, the transportation system of the transport sector in efficient vehicles, integrating car infrastructure. In private automobiles, to install wireless communication tools, to promote public-private partnerships, in the existing transport system, for road side accessories, it also seeks to provide infrastructure. In the intelligent transport system, take a new step. Such a system, to provide new business and public services and to reduce traffic congestion, it also has the potential to increase security. Approximately ten percent of vehicles communicate and with computer interests, by fitting, the above mentioned opportunities can be provided.

Currently traffic monitoring systems, face higher costs. For example in cross-sections, the cost of maintaining and using surveillance cameras is very high. Using efficient vehicles reduce infrastructure related costs including maintenance, computer operation and equipment. On VANET road, increases the communication area. In addition, these are security, stabilized devices, to improve existing transportation systems, can provide accurate and accurate information on the condition of vehicles on the road. Further, based on each individual passenger and needs, to customize information services, car computing systems are allowed.

In the modern world, the need to connect to the network has led to increased research on mobile networks. In cars and vehicles, because many hours of life are spent in people, internet access plan for car passengers, has received great attention. Then, to make road trips safer, intelligent transport systems were introduced. Generally, since lack of awareness on road conditions and human error numerous road accidents occur. This network, for automatic control systems, changing the current vehicle control settings will help. Further, at certain sections of the road, between vehicles, dissemination of information is, will significantly reduce accident rates. For example, than other cars in the road, about blind spots, text tasks, slippery roads and accidents, progressive cars can inform other drivers. To change the path, or to take the necessary reactions, may provide more time.

In this field, increasing the conduction of research, and optimal routing, and knowledge of various neurotransmitters, led to the addition of other applications of temporary networks. VANET systems, in comparison, by high-speed vehicles, classified. They can lead to rapid topographical change. Namely, in traditional net cases, media and routing access methods provided in the VANET plan, cannot meet the requirements.

For routing this protocol, to select a specific path, vague logic can be used. Further, may increase the net-work utilization rate. This is to evaluate the functionality of the routing protocol is the most important criterion. In proposed method, each node, acts as an autonomous agent. Based on important criteria such as available bandwidth rates and vehicle movement, chooses paths. Proposed protocol in terms of performance, compared with the AODV protocol. Above, to compare the performance of specific methods, among the factors used, includes package delivery rates and performance delays.

2. RELATED WORKS

In this section, the authors will review the literature on VANETs.

In paper [6] for urban intersections, in the new hybrid CPN model and signal control strategy, and its application have been explored. This signal, control strategy, for urban sections, with the new hybrid Petri model, the comparative and control reference was explored based on the model. On the Petri network, the simplest identification change in the cross-sectional model is the streaming mix. Through the new model enhancement steps and

waiting areas, allows real-time communication. In paper [9] Hybrid Petri model, a sample reference is used as an adaptive control mechanism. The predicted traffic flow is, by supported directional machine, measured accurately. Finally, this model, with usage data, provides continuous development results. This is in the Petri traffic flow model, allows to develop an effective and new control strategy.

In paper [3] [12] routing protocol, based on a cluster, to reduce the overlays of the spreadsheets, in VANETs, the required routing is provided. Using this technique, have increased the size of the AODV protocol. Using more clustering also reduced the complexity of routing operations. However, in this protocol, before launching a cluster based routing protocol, cluster heads should be reserved.

In paper [5], using a genetic algorithm, at the intersection, to reduce urban traffic, once proposed. At the intersection, traffic light control, major traffic upgrade, is one of the problems. In the first stage, genetic algorithm for a binary variable, with a primary population, starts. Then, the new generation, involving mutated gene operators. Finally, when setting up the solution, optimal values are selected. So at the meeting, behind the red lights, to determine the appropriate rotation, to reduce the waiting time, the genetic algorithm has been developed. CPN controlled, for transport flow models, an integrated modeling approach was introduced. In this research, urban transport, signal control system, intelligence is the center of the transport system.

In paper [7], using microcontrollers and IR sensors, intelligent traffic lights and for density control, once proposed. Traffic congestion is, in the contemporary world, is a serious problem. Behind the red lights, significant delays, this may be the cause of the congestion. In this study, in a given city, using the microcontroller, to investigate improving traffic light restrictions, efforts are being made. This system, multi-traffic control lights and microcontroller based, reduces traffic using surveillance system. In different places, regarding the traffic situation, to inform people, this system will be used.

In paper [8] the network model of another Petri, through visual and modeling analysis, a network of road traffic signals is provided. Model of Petri Networks, to control the intersections of a complex system, the red lights are used for the dynamic behavior of the group. The method used in this paper, designed based on a component. This reduces the problem and increases the modules. Further, it functions as a modern computer practice. With the given location, considering the relevant time intervals, based on the components of the Petri Web, the key components are determined.

In paper [10] to develop real-time urban transport, a hybrid model is provided. In urban areas, this hybrid model, used to predict the mode of transport. To check the status of the system, by hybrid network are formed.

Based on the microscopic model of the forecast intervals, for urban traffic control, an approach to self-illumination systems is presented. In this study, transport of electronic systems, given urban road, introduce self-regulatory signals. Each agent, on a short horizon, to predict the consequences of its potential control measures, used interval micro transport model. The evaluation of the proposed traffic control system was done in a development context. Proposed approach is developing experiments show that it results in improved performance.

3. FBVANET ALGORITHM

Intrinsic energy of VANETs and due to the high cost of routing, the main criterion of these networks cannot be based on narrow hierarchy. Namely, in these networks, the narrow path should not be a fixed path. Hence the need for intelligent routing protocol. They can select paths for the routing process. Specifically, fixed ways can reduce routing costs. And select quality services.

For different networks, all of the proposed artificial intelligence techniques, in swarm intelligence, each agent only, since part of a problem cannot be solved, it in addresses, leads to a lack of autonomy. In the present study, for a temporary network called FBVANET, a routing protocol was proposed. It works based on the mobility of the mobile nodes and the available bandwidth. To further determine the suitability of the outgoing connection, ambiguous logic algorithm can be used. Routing tables for a given terminal and, updates path stability rate, if the correct connection is found, extract the node path record and save. Because of this, selecting the path for data transfer and routing. In the proposed protocol, with the help of nodes autonomy and their local data, able to make decisions, under different conditions, can prevent autonomous failure of connections between terminals.

In the proposed method, the authors do not need a model of the environment dynamics, and it is assumed that the agents do not have any information about the full details of the network, and in the beginning of the simulation process, the field value of the steps for all states is initialized by zero. It is also assumed that the network notes are equipped with GPS and their speed can be obtained via GPS.

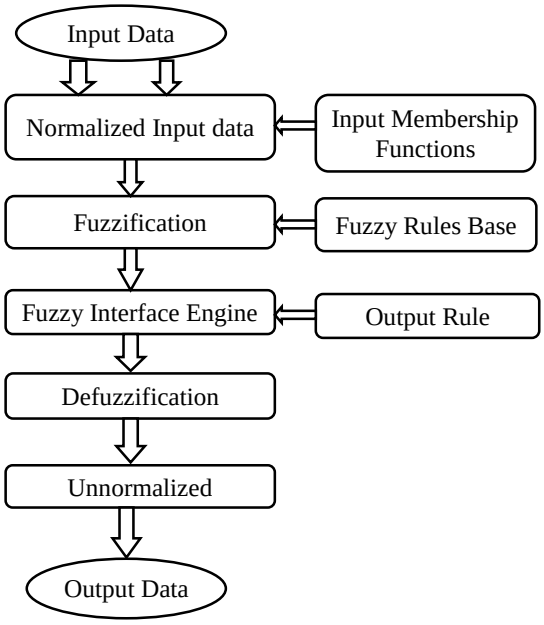

Fig.1. Fuzzy Surveillance System

For the proposed protocol, this paper considers two different scenarios. In the first case, ambiguous logic for all network nodes, used to train. Thus they are on the network, the nature of each connection can be determined. Because of this, based on the two criteria mentioned above, there will also be a path stability rate. In the second situation, to routing, AODV's instruction was given.

This paper is used to train the nodes, since using logic, this method will be discussed in the following sections. The protocol proposed in this paper, uses ambiguous logic. To use the MANET, in this situation, the suggested ambiguous logic algorithm is a controller. This control mechanism is, considered vague control. In principle, to design an ambiguous constraint, using competent agents, need to find obvious and intrinsic relationships in the system. Further obscure databases and control rules should be used accordingly. Thus this sheet can estimate the path rate. The module for this controller is shown in Fig.1.

As shown in the Fig.1, for the above system, using ambiguous control, includes three steps. They will be discussed in the following three steps.

3.1 FUZZIFICATION

In this project, obscure packages are defined for ambiguous output and input variables. In the inference machine, as ambiguous packages to use and appropriate, changing inputs is referred to as blur. In other words, fuzzification is the interface between the guessing machine and the actual inputs.

In the proposed protocol, for ambiguous system input, two parameters are considered. One is the speed of the vehicle and the other is the available bandwidth. As shown in Fig.2, for each input, with membership functions shaped by trapezoidal, two ambiguous sets are defined. The reason for using trapezoidal-shaped membership functions is their accuracy. As shown in Fig.3, with triangular shaped member functions, three obscure sets are used for release variable.

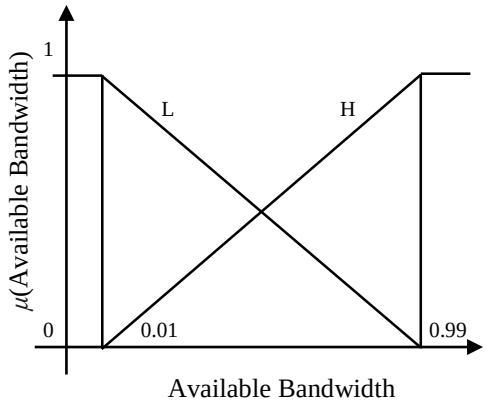

Fig.2. Available bandwidth

3.2 FUZZY INFERENCE ENGINE

At the hypothetical point, according to the value parameters of the available bandwidth and inference speed, to calculate the stability of the connection, vague rules are used. Every vague rule consists of two parts. An earlier part, if the bandwidth is high and the operating speed is low, as a consequence, connection stability is high. As proposed, the ambiguous inference machine is considered to be the minimum mamadani type.

To achieve the four vague rules, for each input parameter, two ambiguous sets are defined. All four of these rules are defined in Table.1.

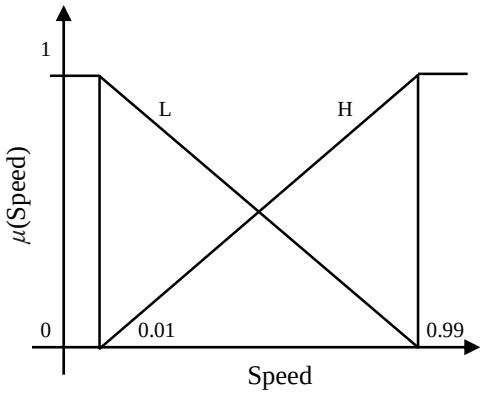

Fig.3. Vehicular Mobility Speed

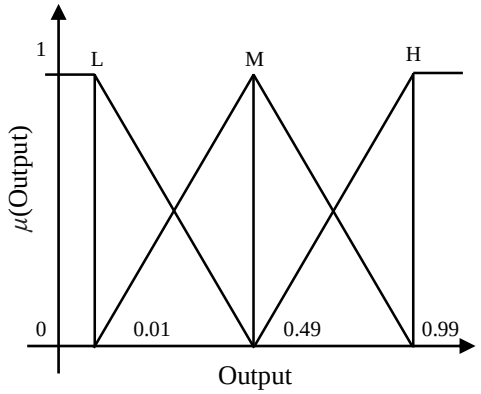

Fig.4. Output variable

3.3 DE-FUZZIFICATION STAGE

To translate an ambiguous output into a number value, De-fuzzification is used. In proposed mechanism, the mean of the maximum de-fuzzification is used. This variable is calculated in Eq.(1).

$$\text{Stability rate} = \frac{\sum_{m=1}^{n} b^{-m} \prod_{j=1}^{l} \mu X_j^m (A_j)}{\sum_{m=1}^{n} \prod_{j=1}^{l} \mu X_j^m (A_j)} \quad (1)$$

The parameters of this formula are: j = route index, n = number of fuzzy rules, l = number of membership functions of the input variables, $\mu X_j^m (A_j)$ = Fuzzy value of membership functions and b^{-m} = Output centers.

Table.1. Fuzzy Rules Database

Sl. No	Input		Output
	Available bandwidth	Speed	Link stability
1	Low	Low	Medium
2	Low	High	Low
3	High	Low	High
4	High	High	Low

The FBVANET protocol is the Bellman-Ford distance-vector mechanism. It is used in mobile environments. To update the routing table of a given terminal, to determine the relevance of the

output link used this paper uses vague logic. Thus, if the correct connection is found, node path record can be saved and extracted, because of this, increasing the stability of the paths. The important difference between the Bellman-Ford method and this method is that broadcast the entire routing table. But only a small part of it, sending on request, this feature leads to savings in battery life and bandwidth usage of mobile nodes. So one of the key features of the proposed protocol is, to act as needed, when one node wants to send a package to another node, the path is detected. This process involves two phases, path maintenance and route discovery. The function of the proposed protocol is described in the example below.

3.4 ROUTE DISCOVERY PHASE

With a map of the nodes of a temporary mobile network, can be described. Two more vehicles, through the radio system,if they can communicate directly with each other, this means that these two nodes are connected to each other. At these two ends, one more than the other, since it has a powerful transmitter, A can interact with B. At the same time B cannot interact with A. For simplicity though, all communications can be considered symmetrical and bilateral. Both nodes, when they are within range of each other radio, to their contact, it should be noted that there is no guarantee. There may be obstacles between them, such as a mountain or a building. It is said that the ends are connected to the GBS and that their speed can be obtained through the GBS.

To understand the function of FBVANET, with multiple mobile nodes, a mobile temporary network should be noted. In which, in the source node S, to a process goal node, going to send a package. In FBVANET protocol, there is a table at each end. And the key goal of this table is address. And in each of the posts in this table, there will be information about neighboring nodes and set. They are in the process of package resources, the package should be sent. The source node checks its routing table to find the path to the destination. In which, if find a way, it sends data through the path. S selects its routing table. Now, suppose we do not find any way related to D, now D needs to find a way. When required, as route discovery takes place, these protocols are referred to as the on-demanFFd protocol.

To find the target D, creates the path request package including its parameters. According to them the opposite field is connected by zero, the route broadcasts the request package worldwide. The package is supplied to the intermediate nodes. The template of the route request package is shown in Fig.4.

Path request package, when it reaches an intermediate node, it is processed as follows. First, to determine if the package has already been processed or received, the attribute pair is searched in the local table. If the package copy is active, it will be removed and the process will end there. If the package is not a duplicate, in the future, to avoid processing similar packages, in the attribute pair register table, multiply the set. It really is, prevents the formation of routing situations. If no way is found, starting the process of finding a path to the source node, creates a path request package. Then, broadcast the path request package. Each intermediate node that receives the path request package, extract data into the package, then using the ambiguous rule table, the package reception determines whether the connection is stable or not. If the link is appropriate, neighbor connection at intermediate end, the table will be updated

3.5 ROUTE MAINTENANCE PHASE

At the target node, to measure the path rate, vague system is used. The ambiguous logic system is implemented as follows. This is from the path request package, separate the two input parameters, and gives them to the vague control system. Ambiguous control system, first of all the parameters, normalizes between [0, 01, and 1]. For each parameter, consider a gap. In the path request package, the value of one of the parameters is θ assumed to be. Then equation two is used. To perform the normalization process,

$$N = \frac{\theta - a}{\theta - b} \tag{2}$$

In the next step, based on the ambiguous package member function, clarifies numerous input values. Also this rating is sent, via a vague hypothetical machine. According to a more ambiguous machine Table.1, using the ambiguous rule database, determines the ambiguous output. And if Mamdani is given as an implication, the de-fuzzification method is used. The output of the obscure system by itself has a constant rate. Also used to determine its use. The path stability rate can be calculated using a relation 1.

Source address
Request ID
Destination address
Source sequence number
Destination sequence number
Step counter
Available bandwidth
Mobility speed

Fig.5. Route request package format

Source address
Destination address
Destination sequence number
Source sequence number
Step counter
Life time
Available bandwidth
Mobility speed

Fig.6. Reply package format

4. RESULTS AND DISCUSSION

The Fig.7 shows the results of the network performance ratio. The horizontal axis indicates the creation time in seconds. And the vertical axis shows the performance rate in bits per second. As the picture shows, the performance ratio in FBVANET is higher than AODV. Most protocols used in VANETs, consider the final link between the nodes. A VANET had multiple nodes with different transmission limits, one node from the other nodes, can receive sent data. For other nodes, if data cannot be sent, according to the Fig.7, after completing the FBVANET protocol

training process, can determine the appropriate connections. If the connection was deemed appropriate, data can be sent from that link. So there is more to it than AODV.

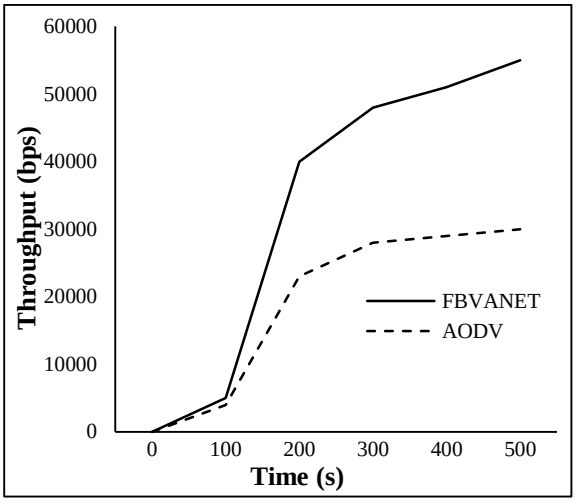

Fig.7: Network throughput rate

In Fig.8, on the network, shows the results of the delay parameter. Creation time in horizontal print seconds and shows end-to-end delay on vertical axes. According to Fig.8, with any increase in creation time, the total network delay of the FBVANET protocol was less than that of AODV.

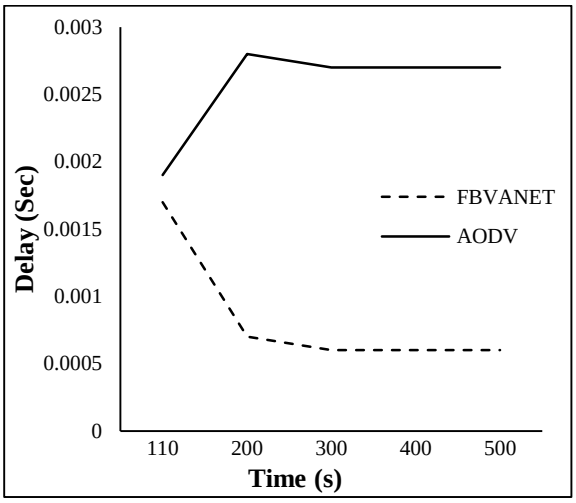

Fig.8. Total network delay

The Fig.9 shows the frequency of data loss over the network. The vertical axis shows the frequency of data loss per second. In Fig.9, FBVANET's data loss frequency is lower than that of AODV.

In the network, the results of the data set distribution scripture are shown in Fig.10. The vertical axis represents the data set distribution rates. The FBVANET data set distribution rate is growing faster than AODV. With the highest probability of developing ways, delivering packages to the destination.

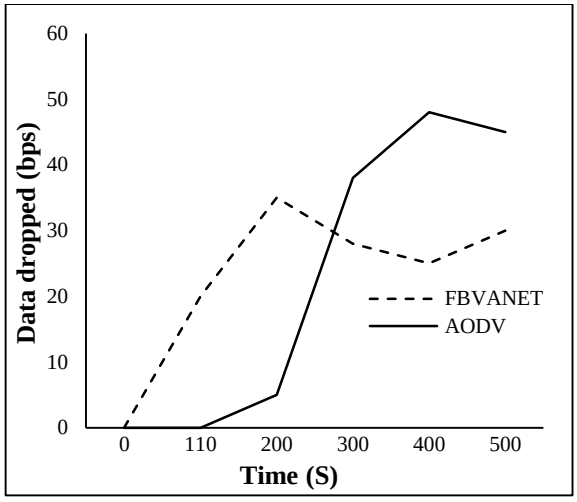

Fig.9. Data loss frequency

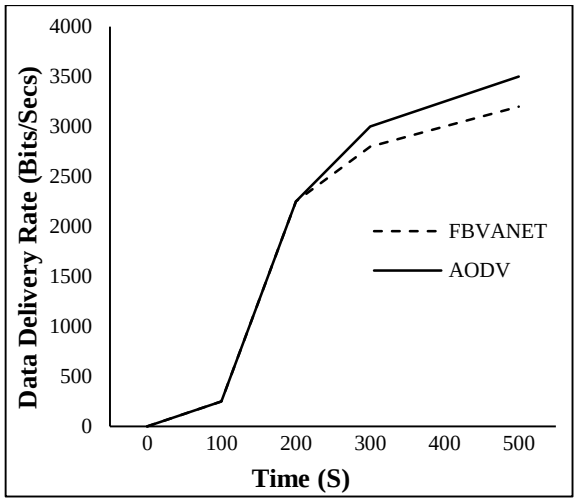

Fig.10. Data package delivery rate

5. CONCLUSION

To evaluate the performance of the protocol, parameters such as delay, data package delivery rates, data loss frequency and end-to-end delay were measured. Compared to the proposed mechanism with AODV, showed excellent performance. In the proposed protocol, with the help of nodes autonomy and their local data, able to make decisions, under different conditions, can prevent autonomous failure of connections between terminals. Full reaction, package delivery reliability and network performance of the proposed routing protocol help improve the ability to extend the protocol associated with AODV. To deactivate the path in VANETs, although movement at the nodes is considered to be the main cause, other causes such as congestion are caused by a lack of data sets. So this paper has solved the problems in VANETs using the proposed protocol.

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