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An Improved Version of Particle Swarm Optimization (I-Pso) Based Routing Scheme for Vehicular Adhoc Networks (Vanet)

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Abstract*: A special kind of Mobile ad-hoc networks (MANETs) is Vehicular ad -hoc networks (VANETs). The higher moving vehicles speed is the major issues relative with it. This affects the network instability and topological changes of communication routes. For VANETs, routing protocols is the difficulty that the research group mainly focus on. For vehicular communication, the familiar protocols of MANET proactive routing are used extensively. For VANET, they are not sufficient ones. In dynamic circumstances, route instability is the major issues with the protocols. To resolve the denoted issues, this work merges the PSO and multi-agent system methods and devised an improved PSO (i-PSO) algorithm. To examine the efficiency of our method, we have performed some experimentation. Superior results are exhibited by the proposed technique.

Keywords : MANET; VANET; PSO; Routing

I. INTRODUCTION

The objective of the Smart Transport Framework is to offer an enhanced level of security and well-being to the drivers [1]. This objective can be perfectly accomplished by VANET. The ability possessed by a vehicle here is that it can converse with the others (vehicle-to vehicle, V2V) for trading an alarm message, car influx, and so forth, or with the other roadside access points for accessing the internet, and so on. Fig. 1 demonstrates a case of VANETs condition..

In contrast to the various types of ad hoc systems, the vehicle is observed to shift with fast worth [2]. An extremely unique type of topology is the highlight of this system, further it builds the likelihood of communication links failure. The process of developing an effective routing protocol for VANETs is thus considered as a noteworthy test. In VANET, the routing protocols are classified into three different types[3]: position dependent routing protocols, topology based routing protocols and cluster based routing protocols. In the position type of strategies [4] the individual nodes are observed to maintain its land organizes similar to that of its neighbor's positions by means of utilizing the GPS administrations. Here it does not impart any routing data to the neighboring nodes nor would maintain any routing tables nodes. Hence the information from the GPS gadget is thus utilized. The highlight of the position based protocol is that it does not require a route revelation stage. Hence it appears to be a fitting material for the fast node. In any situation, this class possesses the necessities of positions for the purpose of deciding the required administrations.

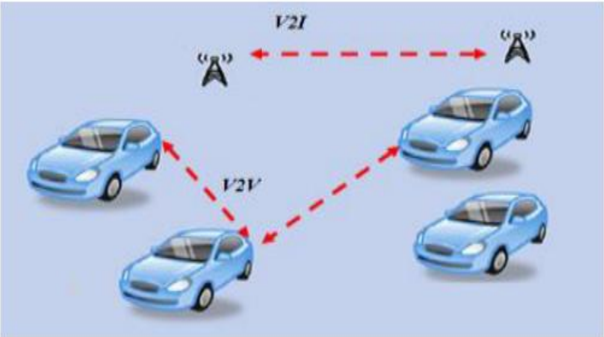

Fig. 1. Architectures of VANET

Topology based routing protocols rely on the trading data state about the link for perfectly forwarding the information packets towards the concerned destination nodes from the source nodes [5]. Hence the need for placing the same into classes arises. The additional quality of the reactive type of protocol is its interesting routing strategies [6]. Only when a node decides to transmit, a route would emerge. The fact here is that a refreshing type of routing table is not required.

The proactive methodology is also called as the table driven plan as the data contents of all the associated nodes of a network is stored and updated at frequent intervals in the routing tables. These routing tables are usually traded among the neighboring nodes. Any modification in the network topology would be immediately updated in the routing table by refreshing the same frequently. Continuous applications possessing a minimum level of idleness would always prefer the proactive type of routing protocol. In any type of transmission there appears an unused way which usually occupies a significant piece of the restricted bandwidth.

In Cluster-based routing protocols the system is usually partitioned into a number of clusters. Everybody would possess a solitary director or a cluster-head. These heads are responsible for dealing with its cluster individuals (intra cluster) and its neighbor's clusters (inter-cluster).

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The intra-cluster communication usually happens by making use of the direct links, the inter-cluster type of communication on the other is performed by making use of the cluster headers links. These types of protocols are observed to be the most critical ones in offering the required security levels to the concerned communication link. One of the major issues in VANET is the production of clusters similar to that of the determination of the cluster-head. The exhibition of a cluster based methodology is excessively identified with the choice way of the administrator node.

After the commencement of certain examinations it has been found that the topology based protocols are the most utilized protocols, particularly the proactive type of protocol has been utilized to a great extent as it possesses a minimum level of delay. Yet these protocols appear to be unreasonable as they are incorporated in the vehicular communication mode. One of the most significant issue of major concern is the overflow of the control packets among the nodes, this overflow happens for the purpose of identifying and maintaining a link way. Another observation here is that certain routes inside the network always remain unused. For the purpose of overcoming the above limitation numerous papers are devising new strategies for enhancing the performance of the proactive routing protocols in order to make them appropriate for VANET. Certain specialized properties such as learning, collaboration and self-sufficiency remains unutilized by a few works, on the other hand incorporating every one of these properties into the vehicle would suitably enhance the routing process in VANET. In addition, the related works don't utilize the clustering strategy to give soundness of found routes.

The organization of the remaining paper is as follows: Segment 2 verifies the related works performed for upgrading the proactive protocols for making the topic reasonable for VANET. Area 3 presents and describes the proposed methodology. Area 4 portrays the recreation results. Segment 5 concludes the paper and illustrates the future work.

II. ENHANCED PROACTIVE PROTOCOLS FOR VANET

In order to overcome the limitations of the proactive protocols in vehicular situations massive levels of studies for upgrading this class in order to make them appropriate for VANET is being performed. In [7], the authors have integrated the idea of MOPR[8] in the proactive routing protocol Optimized Link State Routing (OLSR) to anticipate the following position of the vehicle for retaining a strategic distance from the link failure. Applying an expected approach may not be the best solution for guarantying the strength of a link in a powerful condition. In [9], an improvised adaptation of the OLSR has been introduced and suitably named as the FR-OLSR. Enhancement and improvisation in the presentation of OLSR has been brought about by minimizing the existing weakness in the routing data. The reproduction part has been found to portray a decent conduct as far as the packet conveyance and packet delay factors are concerned, on the contrary the solidness of the route is not taken into consideration. In [10], the authors have suitably upgraded the DSDV proactive protocol. The basic idea of this paper is to minimize the update time frame so as to enable the routing table to increase the number of updates. The limitation of this technique is that the authors did not focus on the issues related to the link failure as a result of which the same was found to reflect in the vehicular communication.

In [11], an improvisation of the DSDV based on a multi-specialist framework (MAS) has been proposed and has been named as the MA-DSDV. The authors have portrayed the benefits of the operator innovation procedure here, wherein an adoption of the same can suitably improve the routing execution factors such as that of the transmission delay, the control packets and the dropped packets in comparison with the conventional DSDV. The drawback in this strategy is the failure in identifying the steadiest route; this would obviously increase the number of dropped packets with an expansion in the total number of nodes. This paper has been found to incorporate the clustering procedure strategies adopted in the previous methodologies for the purpose of enhancing the security of the communication link and on the PSO computation for suitably upgrading the cluster-head determination stage.

III. OPTIMAL CLUSTERING METHOD

The performance of the routing protocols can be affected by the vehicle developmental procedures similar to that of the link dependency factors. Certain specific factors such as that of the speed esteem, the number of neighborhood vehicles with appropriate separations can be used for establishing the appropriation of the vehicles. Clearly, offering a definite link that possesses a high connectivity feature is the responsibility of these elements.

As far as the previous works are considered it has been observed that a vehicle is gone about as an operator. This feature enables the vehicle to appear familiar with its encompassing condition and thereby take a choice independently in the event of link failure. As illustrated in fig 2 the fabrication process is accomplished off the way with a condition of low thickness and minimum separation among the neighbor's. Hence there appears a certain level of degradation in the performance of the links that would essentially legitimize the colossal computation of dropped packet rate.

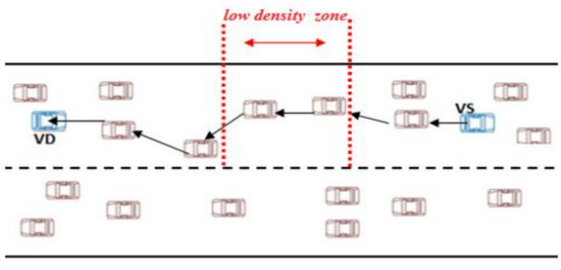

Fig.2. Drawbacks of MA-DSDV

As far as the transmission of information in the MA-DSDV is concerned it has been observed that it takes place over the arrangement of clusters (Fig. 3) with a suitable optimal cluster-head. The responsibility of the cluster is to guarantee a decent connectivity and soundness of the concerned links. In the VANET selection of a cluster head is considered as the major difficulty in its clustering process. This way essentially opts for the accomplishment of the PSO computation.

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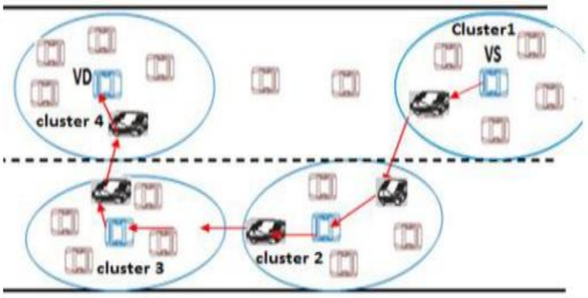

Fig.3. Proposed forwarding data scheme.

Three different highlights are considered in the process of choosing a cluster head. Initially the cluster head is expected to possess a base normal separation relevant to its cluster individuals. The second consideration is the velocity rate which must appear at its normal speed level. The final requirement is that the vehicle acting as the cluster head must possess a maximum benefit of the neighboring vehicles number. With respect to the above illustrated parameters, the fitness function F has been characterized as follows:

$$F = Minimize\left(\sum_{it=1}^{Nit}\left[W1.D_{vi,vj} + w2.\left|Avg_{Vi} - S_{Vi}\right| + w3.N_{Neighy_i}\right]\right) \quad (1)$$

A. Improved Particle Swarm Optimization (IPSO)

To upgrade the refined pinpointing search capacity and to strike a harmony among investigation and abuse of accessible PSOs, the accompanying enhancements are proposed.

B. Velocity Updating

As observed from (1), since the two irregular parameters are autonomously generated, unavoidably there are cases in which they are both excessively enormous or excessively small. In the previous, both the individual and social encounters gathered so far are abused and the particle may be headed out from the nearby ideal. For the last case, both the individual and social encounters are not completely utilized, so the particle probably won't almost certainly locate the neighbourhood ideal. In this manner, the union performance of the calculation is undermined. As it were, the two irregular weighting parameters mirroring the encounters of his own and his mates are not totally autonomous. By displaying this thinking capacity into a refreshing equation and taking note of the entirety of the two inter-related weighting parameters can be set to 1, one single arbitrary parameter that incorporates the subjective and social encounters of the particle for refreshing its velocity is proposed. Accordingly, the velocity is refreshed by utilizing Eq. (2):

$$\vec{v_i}(r+1) = w\vec{v_i}(r) + c_1 r_1\left(\vec{p_i}(r) - \vec{x_i}(r)\right) + c_2(1-r_1)\left(\vec{p_g}(r) - \vec{x_i}(r)\right) \quad (2)$$

It ought to be noticed that the communication between various particles in the proposed inquiry strategy is set up in a progressive manner.

IV. PERFORMANCE EVALUATION AND RESULTS

In this segment, we assess the performance of the two methodologies portrayed in the past segment. The performance aftereffect of our projected strategy has been accomplished against the MA-DSDV protocol. The parameters of the mimicked system have been presented in Table 1.

Table 1. Simulation parameters

Parameters	Values
Simulation Time	50s
Transmission Rate	54Mbps
Simulation Area	1300 x 700 m^2
Examined Protocols	MA-DSDV,PSO-C-MADSDV
Transmission Range	150m

Experiments are performed for quantifying the performance of our introduced methodology. The performance of the introduced methodology can be verified by examining the system measure (up to 50 vehicles). Further it has been observed that the subsequent case manages the impact of the expansion in the speed esteem (up to 60 m/s) on the assessed after effects of the i-PSO similar to that of the MA-DSDV. Assessment of the methodology is accomplished by following measurements: rate of dropped packet, normal of routing overhead and throughput.

This section establishes the recreation results that have been obtained from the computation of a stipulated number of vehicles at [10, 50] interval, further the associated developmental speed is held at a consistent rate of around 30 m/s.

Correlation of Throughput: Fig.4 illustrates the performance level of the MADSDV and the improved variant i-PSO protocols with respect to the throughput parameter. It further establishes the fact that i-PSO outflanks the MA-DSDV with an increase in the number of vehicles. Fig. 4 clearly portrays that the throughput estimation of i-PSO is higher than that of the previous form. Another confirmation offered by this protocol is the effective and safe delivery of the information packets to the selected destination nodes.

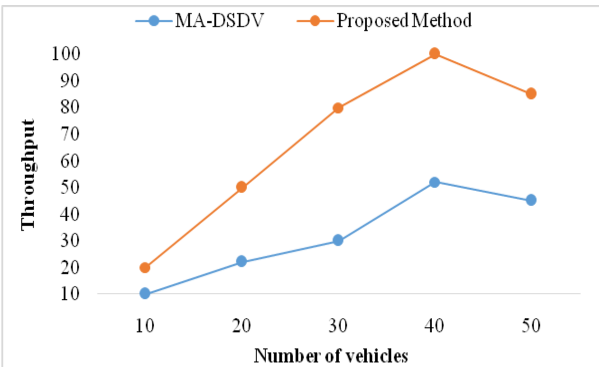

Fig. 4. The throughput vs. number of vehicles

Correlation of Rate of the dropped packets: Fig. 5 represents the existence of an avoidable contrast between the two protocols at [10, 35] interval in correspondence to the normal and the dropped quantity of packets. With respect to the number of vehicles this technique has been found to perform better than that of the MA-DSDV. Correlation of the Overhead: Fig. 6 represents a considerable reduction in the routing overhead of i-PSO in comparison with the MA-DSDV. The strategy here is that transmission of information over a huge number of vehicles would ultimately minimize the routing overhead preferably in contrast with the MA-DSDV approach.

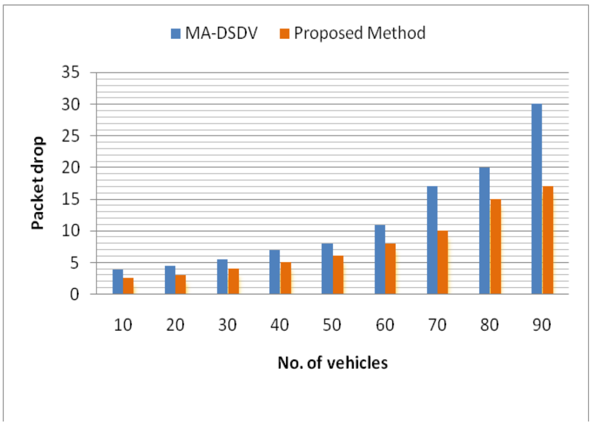

Fig. 5. The rate of dropped packet vs. number of the vehicles.

Correlation of the Overhead: Fig. 6 represents a considerable reduction in the routing overhead of i-PSO in comparison with the MA-DSDV. The strategy here is that transmission of information over a huge number of vehicles would ultimately minimize the routing overhead preferably in contrast with the MA-DSDV approach.

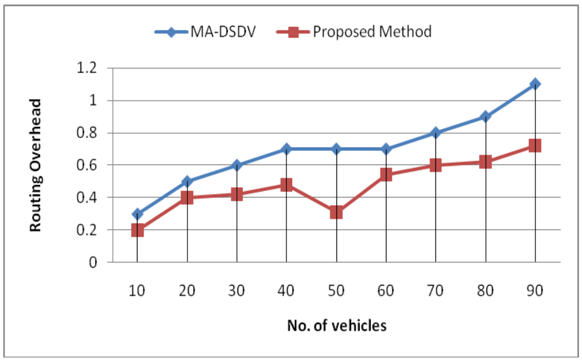

Fig. 6. The overhead vs. number of the vehicles.

V.CONCLUSION

This paper introduces a novel transmission methodology for the purpose of enhancing the circulations of the vehicles in VANETs. With the help of an optimal cluster head the information is transmitted through a huge gathering by utilizing the benefits of the PSO enhancement calculation. Cluster shaping is accomplished by making use of the following factors such as that of the Vehicles thickness, speed worth and separation between the neighbors'. This obviously offers the dependability level of the links. This feature has been found to successfully diminish the normal number of dropped packets and thereby diminishes the unused ways number. Essentially the methodology has been observed to enhance the throughput just as that of the normal of the routing overhead.

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