Evaluation of the Mobility Aware Energy Efficient Multipoint Relay Link Optimized Routing Protocol for Vehicular Ad HOC Networks

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Abstract--- Vehicle Ad Hoc networks need an effective routing technique to address network layers parameters to improve the packet delivery ratio, traffic density, and packet delivery duration for any unexpected vehicle movement. This paper has endeavored, by changing the standard OLSR-protocol, to create a new VANET routing scheme called Energy-efficient multipoint relay link optimized routing protocol. The paper also strengthened the OLSR predicting node development strategy by using real-time position information to classify nodes. On the NS-2 platform, the proposed approach was applied and evaluated. We have estimated various quality device parameters latency, packet delivery, efficiency, overhead management of valid correlations. The fitness results reveal that the EEMPR-link optimized routing protocol methodology introduced beats OLSR by considering specific routing criteria into consideration.

Keywords--- VANET, Energy-Efficient Protocol Multipoint Relay Link Optimized Routing Protocol and Routing Issues.

I. Introduction

Massive traffic development allows enormous numbers of citizens to experience real mishaps resulting in the loss of their lives as well as injured as a consequence of disasters or unexpected accidents happening on Indian road networks. Traffic delays, as well as traffic mismatches, are a massive loss of time and fuel. But, in the absence of an opportunity, the frame generated that will offer vehicles relaxed and sophisticated data found under road transport circumstances, both unforeseen opportunities and mishaps may be combated. Vehicle Ad-hoc (VANETs) are different kinds of mobile ad-hoc networks that frame a vehicle framework while traveling on the lane by moving wireless vehicles. The usage of direct communication from vehicle to vehicle and RSU (Road Side Static Nodes) makes the transfer of data from vehicles conceivable. Vehicles and RSU fitted with a trans receiver network that acts as a node to shape a keen communications mechanism that mix sensors, details, GPS monitoring, and controls to lessen roads and parking spots and malfunctions. It begins organizing vehicles to vehicles (V2V) and vehicle to roadside unit (V2R) correspondence as part of the ITS's critical contact network. One vehicle communicates with a separate vehicle explicitly or with intermediary vehicles through a V2V communications method. One vehicle communicates with a different vehicle expressly or with intermediary vehicles through a V2V communications method. In the latter example, the vehicle transfers messages directly to the RSU. In VANET communication between vehicles and vehicles to RSU, the DSRC standard, particularly IEEE 802.11p s used. A Modern IEEE 802.11 is modified to follow IEEE level 802.11p, explicitly to decrease the overhead and regular decline in the signal. At least two or more nodes of a VANET (Vehicle Ad hoc Networks) have some peculiar issues. The fundamental complexities in integrating standard remote conventions and technologies that are not unique to VANETs include aspects such as fast vehicle rates, no signal range, increasing traffic familiarity, and message heads. Route platooning is a successful technology for enhancing route limits, traffic health, and performance. Dynamic network topology and growing aspects of communication contexts agree on an exceptional check for the usage of VANET conventions. Routing protocol arrangements should describe as stable, secure, low speed, and network device stack in specific in VANET. Different specifically assigned VANET routing protocols were suggested and addressed at a late stage. VANETs vary from other ad-hoc network schemes because of the continually evolving network topology and the complexity of the vehicle node moving sequence quality. Here, in the implemented paper, the network carrier node can be selected conveniently with the EEMPR Connection

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configured Routing Protocol. With a smooth logic algorithm, the Protocol suggested takes into account efficiency, car agility, and bandwidth durability and takes into account a better long-term research algorithm.

The paper can be structured as follows: Section 1 depicts the brief review of the VANET infrastructure and its routing issues. Section 2 in which a literature survey is being reported on strategies to reduce VANET routing issues. The routing issue overcoming mechanisms were then addressed in section 3. Section 4 then poses the results of the suggested method, and the conclusions were examined.

II. Literature Survey

Li, Z., Wang, C., & Jiang, C. J. (2017) In which an electronic feedback solution was suggested for load balancing in-vehicle networks. Yu et al. (2015) Propose a two-sided matching concept partnership-game model for cooperation between cloud sponsors to share their idle resources. Bi et al. (2016) Propose for the delivery of emergency services a regional multi-hop transmitting network (UMBP).

UMBP has a current forwarding node sorting scheme utilizing iterative partition, minischlitts, and black burned to pick neighboring remote nodes easily, and the asynchronous conflict between them essentially selects a single forwarding node. Ucar et al. (2016) Introducing a new architecture known as VMaSC-LTE, combining the multi-hop clustering IEEE 802.11p and the wireless 4 G network of the fourth generation. Long-term deployment (LTE) to meet the DPDR and a low delay for minimal use of cellular networks. F. Liu, Z. Chen and B. Xia, (2016) This essay discusses the transfer of data from car-to-vehicle (V2V) through network coding on two-way road networks where vehicles are going in opposite directions.

P. He, P. Cheng, L. Cai, J. Pan (2016) Reduce the delivery of data in large-scale VANETs of buses and taxis. X. Cao, L. Yan, and D. Zhang, X. K. Sung (2016) are designing a communication model for Wiener to determine the probability of connection, with vehicle behavioral secure and dysfunctional situations in mind. A. Togou, A. Hafid, and L. Khoukhi, (2016) Propose the distributed routing protocol SCRP that pre-transmits E2EDs for the whole routing route. G. L. Wan, Han, L. Shu, N. A new on-grid DOA approximation algorithm based on CS strategies proposed in Feng, (2016) where the existence of unknown reciprocal coupling is significant. The vectorizing operator extends the array opening to account for the transparency deficit by discarding the data obtained by the arrester.

This paper proposes an off-grid DOA estimation algorithm focused on sparse Bayesian analysis (SBL) to tackle the effect of grid malfunction.

Pierre, J., & Pierre, J. (2017) conducting study and introduction in the routing protocols of the vehicular ad hoc network of the system introduced for the identification and prevention of security attacks. For optimal path options on the mobile ad-hoc network, Sarkar et al. (2009) suggested an Enhanced-Ant-AODV.

III. Problem Statement

Data and information are quite commonly exchanged in a vehicle environment amongst vehicles, roadside systems, and the internet. It promotes driving and health for men.

Due to the properties and application characteristics of the VANET, protection is essential and a more challenging task.

The exchanging of knowledge and data communication in the sense of VANET, through the usage of the Protocol has, however, been a difficult challenge because of the complexity of this network that varies very frequently and rapidly with low-quality links, rendering the routing, accessibility, and protection of VANET more complicated. A useful framework, therefore, expected to solve all these problems.

IV. Proposed Methodology

The OLSR, though, does not provide adequate QoS, path management and load balancing processes, etc. Some changes may be required to escape the issue of vehicle deflation and to establish a road maintenance strategy. This shows that EEMPR-link optimized routing algorithms give a heuristic technique that is powerful for VANETs.

Current operations primarily concentrate on creating a robust VANET data storage routing algorithm with such a EEMPR-link Routing Protocol. The EEMPR-link optimized routing protocol contains several tunable parameters and methods to automate efficient data storage, which was illustrated in figure 1.

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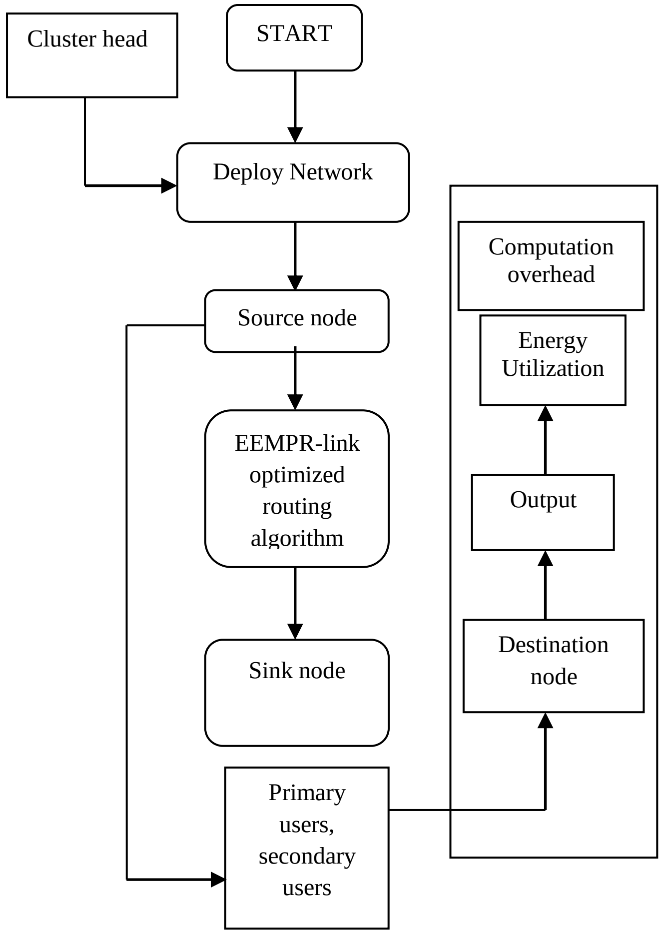

Figure 1: Proposed Approach Schematic Description

System Model

A field of interest occurs for any data point. In this field, data should be maintained (some nodes in this region should be established). We assume that the data is missing because of the vehicles that hold the data outside the region of concern. Information and details are transmitted down to the region concerned by the root node. Selecting the node can be defined as a problem that can be represented as,

$$D_{cn}=\sum_{l=1}^{l=m-1} OC(k_l,k_{l+1})\frac{1}{m}.(m-1) \quad (1)$$

Where k_l is the node for the data carrier, l is the number of data carrier nodes used by the entire time domain, and OC(k_l, k_l +1) is the network link between k_l and k_l +1. The data in the network is S, and the contact time between k_l and k_l+1 is OC(k_l, k_l+1). D here is the distance from k_l to the center area of interest. First, consideration must be provided to latency between the current data carrier node and the next node, as low-throwing links that increase channel time required for data transmission.

Vehicle velocity is also critical as a parameter, as the next carrier node's location and speed affect future output. Considering this, there would be the probability of getting multiple traffic control nodes within the network. One single node would randomly act as a sink node among the total nodes, which gives a clear understanding of the direction of the path. We are then using a new protocol to address the issue in the paper. The frequency, vehicle speed, and bandwidth efficiency of the whole network were taken into consideration employing a fuzzy logic algorithm to evaluate the decision's long-term outcome. The fuzzy logic compares the next data carrier node and then chooses the next data carrier node

EEMPR-Link Optimized Routing Protocol

To pick the transmitting route, the default OLSR routing protocol uses the hop count as the metric. The energy effective nodal direction is not taken into consideration. It is quick to pick the path with poor connections. The route

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is frequently blocked, affecting network efficiency, especially in an environment where network topology is rapidly changing. The regular OLSR protocol is not essential if the node runs more quickly, and the topology of the network is modified significantly.

We, therefore, recommend a protocol on EEMPR-link routing. We define N_0 as the original node energy, typically a fixed value, and $N_1$is the node i residual energy to reflect the node R_E residual energy ratio of the node can be represented as:

$$R_E=\frac{N_1}{N_0} \qquad (2)$$

The Protocol suggested selects the heads of the cluster using a distributed strategy. To establish a secure cluster, the Protocol shall take into account the vehicle velocity, the number of neighbors, and the channel state between the cluster header and cluster representatives for cluster header collection. The car's speed is known to be sluggish vehicles, which are excellent at resisting repeated shifts in cluster heads. Neighbors amount in the same direction is the vehicle's long-term speed. The node sends the necessary information in the proposed Protocol by means of messages. Unless the source node requires the packet to be distributed through the target node, the source node must initiate the exploration process of the route when the target node is not clear. For itself and all neighboring units, the sink node calculates the competence value for any post. The node is called a cluster head Node by way of the next post if it holds the maximum integrity ranking in its setting. The head of the cluster is chosen along the way. we may build a connected network for the selected cluster heads. The first sink node will provide guidance for the measurement of the energy-saving neighbor node direction. The Fuzzy reasoning is then usually using F_{ij}, which can be represented as relative mobility between the i and j nodes which can be expressed as:

$$F_{lm}=\sqrt{(F_{lx}-F_{mx})}\text{^}2+(F_{ly}-F_{my})\text{^}2 \qquad (3)$$

F_{lx}, F_{mx},F_{ly}, F_{my} represents the fuzzy vehicular movement of a node. Then it can be normalized between the nodes.

$$\sigma_{lm}=\frac{F_{lm}}{F_{lm(1)}}=\frac{\sqrt{(F_{lx}-F_{mx})}\text{^}2+(F_{ly}-F_{my})\text{^}2}{|F_l|*|F_m|} \qquad (4)$$

This paper explores in detail the remaining energy of nodes and their relative stability in the EEMPR- link routing protocol. The standardization process focused on energy consumption and relative mobility levels. We choose the correct enhancement factor for different networks. The less energy from the residual node, the lower the relative mobility as well as the stability of the node. Thus, the lower the NF_l is, the lower the high stability energy-efficient node.

$$NF_i=\sum_{i=0}^{N} \; NF_i=\sum_{i=0}^{N} \; [\alpha(1-n_i)+\beta\sigma_{lm}] \qquad (5)$$

The cumulative route stability is NF, and the number of nodes is N. The function is determined to choose the best EEMPR link route.

Path selection[source, destination]=min[NF(k)] K Σ [1,m] (6)

Where m is the number of various directions, it then chooses the lowest NF value energy-efficient path. Upon choosing an energy-efficient route, the data can then be transported to the destination. A limited overhead interaction is important for the expected route. It can be put at the end safely. This destination node recovers the RREP packet along the original route if it reaches the destination node, and the packet records the final NF of the connection sequence. A number of RREP packets are provided during a certain time in the source code. In terms of formula (6), the direction to the smallest NR is chosen as the route of contact.

V. Results and Discussion

Here we have the EEMPR-link routing protocol applied, and the simulation can be done. The performance would be more reliable because the EEMPR link routing protocol is introduced to avoid effective, trustworthy routing, but the outcomes will be better. The key goal is to locate a quick traffic-free route and deliver an information packet in one attempt to the target. The overall success of the proposed approach will, therefore, be measured in this portion. The findings and the feasibility of the suggested approach are measured and contrasted by the following measurement criteria.

1. Packet Delivery Ratio: This applies collectively to the number of packets that are transferable by the sender received by the receiver.

P = (Pr / Ps) *100 (7)

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P is the transmission ratio of the packet, Pr is the sum of packets obtained and Ps the volume of packets forwarded.

2. Control Overhead: The number of packets generated for the data volume sent to the destination.

3. Average End-to-End Delay: That's the duration it requires for the entire process of communication regardless of the time amount it requires to relay the signals.

$$AD = (Ps-Pr) / Pr \quad (8)$$

Here Ps is the moment-sent packet, and Pr is the time-consuming package.

4. Throughput: The volume of data transmitted successfully throughout the communication cycle

$$Throughput = (Received\ packets\ {*}packet\ size)/simulation\ time \quad (9)$$

5. Accuracy: Precision is the calculation of the similarity of the product to the normal value.

$$Accuracy\ (A) = (TP+TN)/(TP + TN + FP + FN) \quad (10)$$

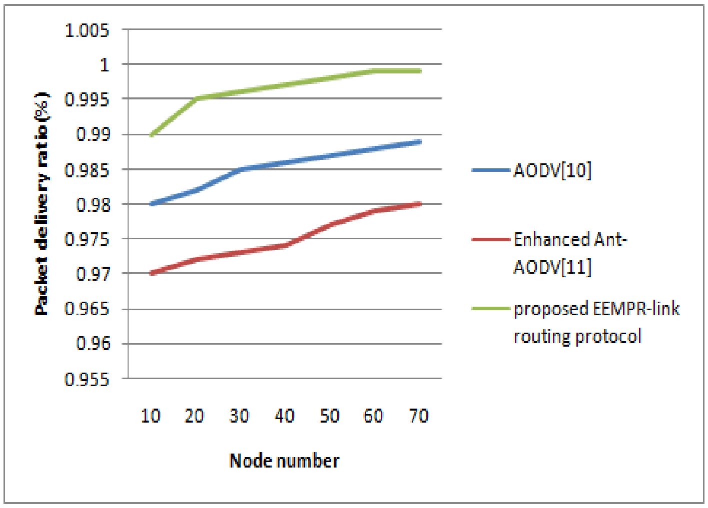

Figure 2: Node Number Vs. Packet Delivery Ratio

Figure 2 shows that, as correlated with the other current Protocol, the packet transmission performance for the new Protocol is higher. In a limited amount of time, this procedure eliminates congestion and can quickly locate the shortest path. The Protocol quickly detects traffic during the phase of path recovery prior to data transmission, so that the decrease in data is steadily reduced to instantly improve the amount of packet distribution.

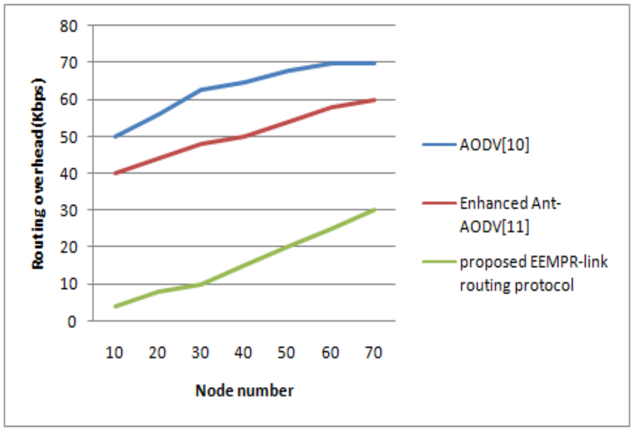

Figure 3: Node Number Vs. Routing Overhead

Figure 3 indicates that, relative to the other current Protocol, the routing overhead for the proposed Protocol is smaller. By locating the link split and seeking the shortest route, the message can be submitted afterward. But nothing but more packets would be open.

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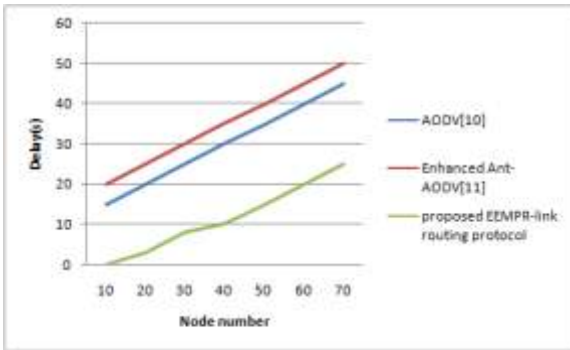

Figure 4: Node Number Vs. Average End to End Delay

Figure 4 indicates that the current protocol end-to-end latency is shorter than the other Protocol currently in operation. This procedure avoids over-crowding in this way. The implementation The crowding with the vast number with shipments adds to a gap in the transmission of knowledge because of the uncertainty. And even though the connection is damaged, the data can be sent back to the source again, and the new path can be identified, and the cycle retrieved. But the short route and the failure of the connection was therefore found here in the approach before the cycle was begun. The time gap has therefore been eliminated here.

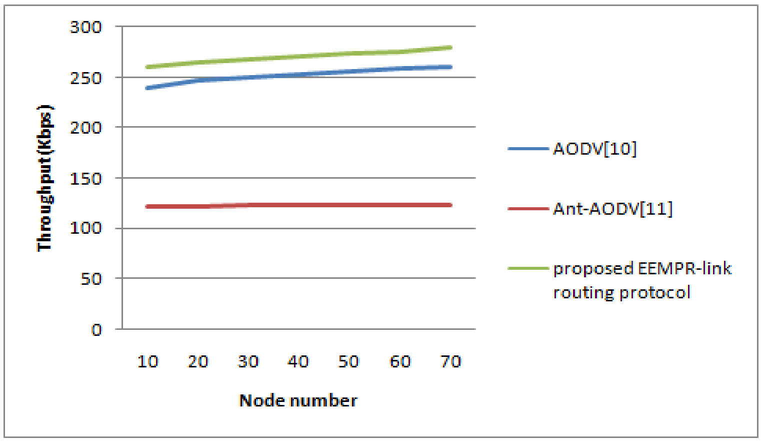

Figure 5: Node Number Vs. Throughput

Figure 5 indicates that, as opposed to all other current protocols, the new Protocol achieves a higher rate of throughput. The relation and shortest path can be quickly identified before the data passes the road. These factors are in a good efficiency ratio.

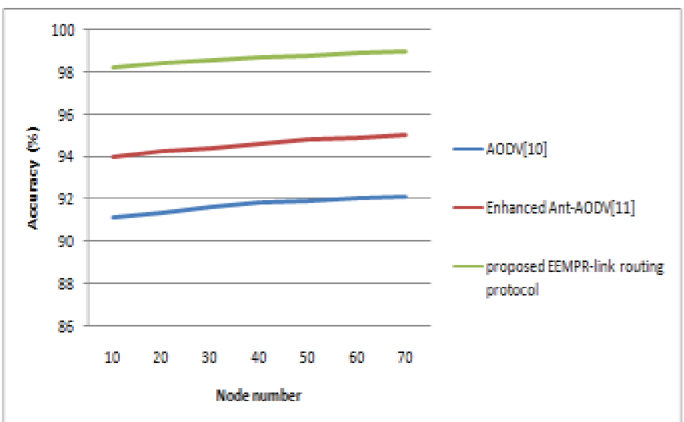

Figure 6: Number of Nodes Vs. Accuracy

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The exactness of the suggested approach, as seen in Figure 6. Compared to other current approaches, the new approach will become more reliable. The findings were found to be very effective in the shortest route forecast and safe data storage due to the suggested new method.

VI. Conclusion

We need to store data in vehicle ad hoc networks. The Protocol considers power, speed, and efficiency and calculates the long-term success of the EEMPR connection routing system by using limited analysis. The Protocol also utilizes a system of group communication for data transfer to the network provider node. We have also evaluated the benefits of the new approach over potential alternatives in machinery models.

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