AI BASED NOVEL ADAPTIVE URBAN MOBILITY MODEL (AUMM) FOR LOW POWER VEHICULAR NETWORKS

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Abstract

The communication in Vehicular Ad-hoc networks (VANET) is turning into a significant and famous exploration point in wireless networking because of both opportunities and difficulties it presents. VANETs are self-organizing, distributed transmission networks comprised of moving vehicles and represented by high-mobility nodes. The vehicular mobility models assume a critical part in assessing various difficulties like traffic, security, and client application-based challenges. Most of earlier studies created models that better relate to urban mobility. However, none of the previous researchers proposed a necessary level of mobility models for modeling and simulating low power and lossy networks i.e IEEE 802.15.4 LLN's. The urban/city environments have many Road Side Units (RSU) which may even be utilized RPL protocol in routing of communication data. This paper proposes novel methodology to develop a unique urban mobility model for getting accurate control mechanism and efficient coordination among vehicles in vehicular networks. The proposed model results in efficient performance with better PDR, lower EED, little OH and better consumption of power.

Keywords: **VANET, RPL, Urban Mobility, RSU, ITS, Vehicular Communication**.

1. Introduction

There is a growing interest in designing and deploying Intelligent Transportation Systems (ITS) applications and systems. ITS has grabbed the attentiveness from many scientists across the world. The purpose of introducing Intelligent Transportation Systems is to make development concerning the effectiveness of road safety level and the transportation system through advanced applications, protocols, and standard. In addition, the greater number of vehicles gives the cause for improving road safety and inter-vehicle communication. As a part of ITS, Inter-vehicle communication or transmission together with VANET systems has become the emerging research field. [13] VANETs are certain type of Mobile Ad-Hoc Networks (MANETs) and comprise of a bunch of vehicular nodes mobile on road lanes and able to communicate with each other with or without a fixed transport and communications infrastructure.

The high mobility of nodes is a defining feature of VANETs, making the mobility model a critical aspect to consider when evaluating any protocol. There are various protocols can be used for vehicular communication i.e., to dispatch the information from source to sink. The exceptional protocol must be selected so that it is suitable for the area to be applied.in urban contexts. The implementation and assassination of routing conventions for VANETs in urban areas are of great use for road safety. [14]

Mobility models govern the node's location in the given topology at any moment, which has major impact on connectivity of the network and output. In VANETs, the mobility model has been categorized into two types. First one is urban mobility model, and the other is highway mobility model. In this paper, the major part is to concentrate on urban mobility models that effectively imitate many dominant factors that in urban can take place in urban context. [1]

The urban or city mobility model is portrayed generally by high density (traffic) with vehicular nodes having average slow speed and many intersections. Urban or city mobility models have many of roadside units (RSU) which may even be utilized in routing of communication data. The topology of the urban or city vehicular network plays primary role in traffic optimization, not only in terms of mobility patterns but connectivity. So, traffic in urban vehicular environment has several issues and challenges that generally do not exist in highway environment.

To apply different routing protocols for VANET systems it is necessary to test and evaluate those protocols before applying them in the real world. The evaluation can be performed using VANET simulation tools. To obtain accurate results of simulations in VANET, the chosen mobility model must therefore be realistic.

2. Problem Statement

Even though node mobility and topology modifications are shared by both MANET and VANET, VANETs environment are more complex and much more accuracy is required. The topology changes are frequent because of high-speed node movement results in connectivity link disruption, traffic congestion, delay problems. Hence, reliable, and fast communication among the vehicles becomes an exciting research field. The primary goal of vehicular communication is to improve safety on the road, efficiency on transportation, route planning, and safety applications. The communication is either Vehicle-to-Vehicle (V2V) or Vehicle-to-Infrastructure (V2I) in form of messages. [13] The messages provide facts like as position, speed, direction, and other vital information that aids in dealing with emergency situations. For suppose when an event like accident will happen or traffic congestion will be there, that will be detected by a vehicle. The information fastly delivers to other nodes in the network. Thus, the future vehicles will be smart enough to communicate with their surroundings in many ways. Various models have been developed by researchers as discussed above in literature survey section. However, it requires some enhancements in various aspects to make it suitable for VANETs communication paradigm. For data transfer, VANETs make use of a variety of sophisticated wireless technologies such as Dedicated Short-Range Communications (DSRC). IEEE 802.11 technology serves as the foundation for this standard. The most sophisticated is the IEEE 802.11p-based Wireless Access in Vehicular Environment (WAVE) standard. If density is more in traffic, Vehicle-to-Vehicle(V2V) communication can't be feasible with respect to IEEE 802.11p. Still, in high vehicle density scenarios IEEE 802.11p results in poor performance. IEEE 802.11p increases the likelihood of a collision, arising in loss of packets and poor network performance. Furthermore, IEEE 802.11p has manageability and reliability issues. To avoid these problems, there is a need for a novel methodology. [15]

Previously, it was advocated not to utilize Routing Protocol (RPL) in Intelligent Transportation Systems (ITS). In order to prevent the aforementioned difficulties, such as when density of traffic is high, or to obtain a rapid connectivity in an urban area, IEEE 802.11p is used. As a result, it is vital to establish a Routing protocol (RPL) relying on IEEE 802.15.4. [2, 3, 4] RPL is being promoted in this article, it works successfully for long-distance communication and may be adapted to use for specialized short-distance communications in mobility and crowded regions. However, RPL is primarily intended for static networks and is not suitable for mobility networks. Furthermore, the study suggests incorporating mobility in relation to the RPL protocol. As a conceivable need, a customized algorithm based on the mobility model of nodes in urban contexts is created in addition to RPL. The modified algorithm is built in such a way that it is also RPL compatible. As a result, it may be possible to accomplish efficient communication between vehicles in an urban area. The excellent performance of VANETs in highly mobile and congested environments, i.e., urban environments.

3. Review of Literature

In this section, different existing mobility models developed to deal with the urban vehicular movement are discussed. To simulate VANETs various urban mobility models have been developed. Almost all these urban mobility models mainly deal with movement of nodes at intersections, and they ignore movements in road lanes. Some of the existing models include Random Way Point model, Manhattan mobility model, City Section Mobility model, Rice University Model, Stop Sign Model, and Probabilistic Traffic Sign model, Traffic Light Model. [4]

The widely used Random Way Point model assumes nodes initially distributes in random manner in the network and can move freely in the urban environment without obstacles or interruption. [7] The nodes randomly select the destination and move towards in a given time. When the node reaches that destination, it pauses there for a time called pause time. The node selects a new random position when the pause time expires and moves to the new position. Like this way the node continues to move till the simulation ends.

The Manhattan mobility model is another generated map-based model, proposed to simulate an urban environment. [12] Simply the model uses grid road topology. The nodes move in either horizontal or vertical direction. A probabilistic approach is used to determine the direction in which the vehicles can move at intersections of grids. The possible directions are straightforward, left, or right. The probability of each decision is set by the authors respectively to 0.5, 0.25, 0.25. [4]

City Section Mobility model is a combination model obtained from the Manhattan mobility model and Random Way Point model. Since it follows the rule of RWP, primarily the pause-time and uncertain way of choosing the destination, inside a created map-based region. At each progression of the vehicle's development an irregular point is chosen from the created road map, toward which it proceeds along with the shortest path. It produces feasible motion to a segment of a city. [12]

In the Stop Sign Model (SSM), each road at a convergence has a stop sign. Any vehicle moving toward the crossing point should stop at the sign for a predetermined time frame. Vehicles moving towards convergences stop at a sign for a particular time frame. The movement of vehicles is compelled by those in front. Since a city layout is probably not going to have stop signs at each crossing point, this model may not be reasonable. [12]

The next model is the Probabilistic Traffic Sign Model (PTSM). It is obtained by refining SSM further by replacing stop signs with traffic signals at intersections. Vehicles stop at red traffic signals and move through intersections at green signals. A probabilistic scheme is used to approximate the operation of traffic signs without the coordination among different directions in this model. [12]

Traffic Light Model (TLM) is further improvement of PTSM. It is realistic intersection mobility model. In TLM, the coordination of traffic lights at intersection is achieved. [12]

It is seen with the various existing mobility models developed by the researchers; the key points of those models are shown in the below table.

Table 1: Research issues on Mobility Models

Mobility model	Advantages	Disadvantages	Research issue
Random Waypoint Mobility model	It includes Pause times. It is the most used mobility model for VANET simulations	It assumes that there are no barriers in the network area and that vehicles can move freely.	Not appropriate for VANET applications, where vehicles cannot pass freely in the simulation area, suitable for prevalent routes, which are confined by many factors (crossings, stop signals and traffic lights, the presence of other vehicles ahead of the vehicle, and so on)
Manhattan Mobility Model	Uses grid road topology. At a crossroads, vehicles can switch lanes.	The speed is determined by the preceding movement's direction. There is no control system at the junctions.	The vehicles keep moving ahead without pausing, which is impossible. This means that there is no system of control at junctions.
City Section Mobility	CSM is a combination of RWP and Manhattan, including the pause-time and random destination selection. At each point, the vehicle takes the shortest path, providing practical results for a section of a city.	The maximum speed limit of the road, as well as the security distance, limit the speed of nodes.	At specified crossroads and destinations, there will be no pause times. There is no control mechanism at intersections in this model
Stop Sign Model	It is the first model with a traffic management system. It is built on the basis of real-world maps. The speed of nodes has no effect on the outcome (maximum speeds).	As all the existing models demonstrate, a node should never overtake or pass its successor. At intersections, they make a queue of nodes, which has a significant impact on connectivity and vehicular mobility.	The issue with this model is that the stop signals are placed in impracticable manner.
Probabilistic Traffic Sign Model	The PTSM is an advancement over the SSM. Traffic lights are used instead of stop signs in this model. It is more realistic than the SSM since it simulates traffic light behavior and avoids long wait periods at crossroads.	Vehicles approaching a crossroads from different directions do not communicate with one another.	There is some control mechanism at crossroads, but no coordination among vehicles.

Traffic Light Model	TSM is the most accurate intersection mobility model available. It avoids the PTSM and SSM's heavy approximative approach by allowing vehicles to coordinate at crossings.	When the pause-time at the intersections is increased, SSM produces efficient results than TSM when the pause-time is kept same.	The performance difference between single-lane and multilane models is negligible below 100 nodes.

4. Proposed Approach

To transport messages from vehicle node to vehicle node (or) vehicle node to RSUs, an efficient routing method is suggested. The customized algorithm is designed to obtain routing and implements the vehicular communication in efficient manner. The topology of VANET have strong influence on message transmission performance. At the same time, the density of vehicles also impacts the vehicle communication even more. A road with high density is in favor of vehicle communication, since large number of vehicles means more chances of communication. The EED of one-hop message transfer is considerably shorter than the delay of message transport by vehicle nodes. When traffic density is increased, message delivery time is reduced. The regularity of city road density can be exploited to aid message transmission in VANETs.

In the VANET model, there are two communications possible either V2V or V2I. Firstly, when a vehicle enters the network, it sends information to root node and moves linearly with pause times. Secondly, in VANETs, the store carries, and forward strategy is used to transmit the messages from source vehicle to the destination vehicle or RSU. The location and the surroundings of the vehicles travel along the road lanes will have the direct contact with the vehicle nodes which are located within the road network. The demographic information and the travel route of the vehicle information is generated based on GPS-based navigation systems, also further defines the motion vector to the node itself. Whenever a vehicle is travelling along the lane there will be two possible conditions with respect to transmission range. Besides, any two vehicles can communicate with each other given that the distance between them is less than or equal to the threshold distance ($D_{threshold}$), It is also known as a vehicle node's transmission range. Therefore, if a vehicle is in the transmission range of another vehicle, then V2V communication is possible by finding the nearest vehicle ($veh_{nearest}$) among others. Simply the vehicle checks for the availability of vehicles surrounding to it within the transmission range. If any nearest vehicles are detected by the system, it will continue to communicate with the vehicle which are nearer within the chain. The data transmission is an integral part of the study, where the system is designed to communicate with the nearby node and the neighbor vehicle to send and receive the data. In addition, if vehicle is not in the transmission range of another vehicle, then V2I communication is possible.V2I communication is the communication between the vehicle and any Road Side Unit (RSU). In the road network, RSUs are randomly placed. The bunch of RSU units are placed randomly on the road network based on the regular and mass movement of vehicles. The respective locations shall be in the middle of the road lane, intersection and the junctions etc. Therefore, there is a need to identify the sharp location for placing the Roadside Unit and further to initiate the pause time to the vehicle for better connectivity. The targeted RSU locations are assumed to be known during the handover of data. The data will hand over to Road Side Unit (RSU) and also the vehicle to carry the transmitted data to further in the road network. Finally, the calculation of the path-weight for each lane and data shall communicate along the path with minimum weight, therefore high connectivity is possible with the vehicles along the minimum path-weight.

4.1 The algorithm is as follows

```
D_threshold=sensor-range
1.Vehicle enters into the network and sends information to
route node, and new node move linearly and have pause times
θv =angle formed between the vehicle motion vector and to its destination.
  distance_v = current distance between vehicle and destination
2.If θv> 90^0 and distance_v <= D_threshold:
        //It means intersection.
        // control mechanism using PTSM
        //vehicle_state represents the current state of vehicle
        i)  if vehicle_state is idle:
                Speed of vehicle will be zero and does not change position
        ii) if vehicle_state is in forwarding mode
                if there is any vehicle ahead:
                        Decelerate
```

```
        if vehicle approaching stop sign:
            Decelerate moderately to stop

3.elif θv<=90⁰
    for RL start to RL end          #RL-RoadLane
        If RL!= RL end and  then
            Path-weight=[]
            For vehicle in RL do
                Generate_vehicle_info(vehicle_i) do
                D_cover=(t_current-t_neighbor)*vehiclespeed_i
                If D_cover>D_threshold :
                    Vehicle is not in transmission range
                    #V2I need to be done
                    If RSU_device is identified then initiate pause-time
                    Handover data to RSU_devuce
                    Carry data further
                Else:
                    vehicle is in transmission range
                    #V2V need to be done
                    Find veh_nearest  vehicle
                    If veh_next available then
                        Send data
        Find RL_weight and add it to path-weight
    Pt_selected=min(path-weight)
//Function
Generate_vehicle_info(vehicle):
    current_node=vehicle(source_GPS)
    Get_information(currentnode,neighbor):
        Current_node_speed    = get speed of current node
        Neighbor_node_speed=get speed of neighbor node
        Current_node_position=get position of current node
        Neighbor_node_position=get position of neighbor node
        Calculate the time of t_current_node
        Calculate t_neighbor_node
```

5. Simulation Configuration

The Cooja simulator was used in the study to assess the performance of the proposed model. Contiki OS's Cooja application focuses on network behavior. Contiki is indeed a publicly available, extremely portable, and multifunctional Internet of Things operating system. Cooja is an extensible Java-based simulator for Contiki OS. Mobility plugin should be enabled in Cooja to support mobility [10, 11] and it supports the IEEE.802.15.4 standard. In Cooja simulator, there are propagation models namely UDGM, DLUDGM, DGRM, MRM. Before starting a new simulation, the propagation model must be selected.

The main simulation parameters used are as follows: The mode of propagation is distance loss UDGM, the type of mote is Sky mote. The messages are transmitted with a rate of success of 100 percent (Tx) and received with a rate of success of 30m, 60m, or 100m (Rx). The time of simulation is 1,800,000ms. The total number of nodes considered are 10,20,40,60 and 80.A 250X250 squared area is used as simulation area and the type of topology is Random. MRHOF is the objective function used. [5, 6] The mobility models are Random Waypoint Model, Stop Sign Model, Probabilistic Traffic Sign Model, Traffic Light Model, Proposed Model.

6. Metrics Taken for Evaluation

The metrics [8, 9] taken for the comparison are Average consumption of power, PDR, EED and OH of messages.

6.1 Average Power Consumption

a. P (mw) = (E∗ I ∗ V)/ (R_TIMER ∗ Runtime) … (1)
Where P=power, E = Energest_value, I = Current, V=Voltage.

b. Average Power (mw) = P (mw) /n … (2)

Where n = Total number of nodes

Energest_value: The time that a processor is in a state. Ticks are used to measure time.

6.2 Packet Delivery Ratio (PDR)

$$PDR = \frac{\Sigma(\text{Number of total received packets by each destination station})}{\Sigma(\text{ Number of total packets sent by sender nodes})} \quad ---(3)$$

6.3 End to End Delay (EED)

$$EED = \frac{{}^{n}\Sigma_{i=1} (\text{Reception time - Send time})*1000[ms]}{\text{No of all successfully delivered packets}} \quad ----(4)$$

6.4 Overhead (OH)

$$OH) = \frac{\text{Overhead message count total}}{\text{number of data packets sent in total}} \quad ---(5)$$

7. Discussion on Results

Tables 2, 4, 6, and 8 contain several kinds of mobility models RWMM, SSM, PTSM, Traffic Light Model, and proposed system with three distinct receiving capacity ratios Rx30, Rx60, and Rx100. Each one of these ratios was determined for several nodes (10, 20, 40, 60, and 80) and included the PDR, EED, Message OH, and Consumption of Power.

Each of these kinds is made up of a mix of network(vehicles) nodes and parent nodes (RSUs). Within the simulation, sensor nodes and sink nodes are dynamic, and each node may track them by utilizing their current position. To analyze the responsiveness of the sensor nodes in the network, four primary types of mobility models were evaluated in this study. Mentioned above mobility models are evaluated under various situations in order to improve the PDR, reduced EED, have fewer OH messages, and have a less Consumption of Average Power, all of these will contribute to improved RPL performance in low-power intelligent transportation networks.

Table 2: A comparison of the packet delivery ratios of several mobility models

S No	Model	Rx Ratio	10 Nodes	20 Nodes	40 Nodes	60 Nodes	80 Nodes
1	Random Waypoint Model	Rx 30	50	86	80	86.5	82.7
		Rx 60	60	82	83.7	87.1	85.3
		Rx 100	80	90	91.9	92.4	90.9
2	Stop Sign Model	Rx 30	55	88	81.9	82.4	83.1
		Rx 60	65	82	85.5	85.3	85.3
		Rx 100	85	92	88.2	91.8	90.5
3	Probablistic Traffic Sign Model	Rx 30	60	84	79.1	86.5	82.2
		Rx 60	65	86	86.4	89.5	85.3
		Rx 100	90	90	90	92.4	87.9
4	Traffic Light Model	Rx 30	65	86	81	87.1	83.1
		Rx 60	70	86	86.4	90	86.1
		Rx 100	90	90	91.9	92.4	91.4
5	Proposed Model	Rx 30	75	88	83.7	88.3	85.3
		Rx 60	80	92	90	93.6	88.3
		Rx 100	95	96	94.6	95.3	93.5

Table 3: Mobility Models' Average PDR

No. of Nodes	RWPM	SSM	PSTM	TLM	Proposed
10	72	76.9	72.9	75.9	80
20	81	86.8	83.6	86.1	90
40	87.9	85.7	84.6	85.1	90.1
60	86.3	88.9	88.1	90	91.8
80	89.4	85.7	86.3	88.7	90.1

Table 4: A comparison of the message OverHead of several mobility models

S. No	Model	Rx Ratio	10 Nodes	20 Nodes	40 Nodes	60 Nodes	80 Nodes
1	Random Way Point Model	Rx30	230.0	204.0	163.6	228.8	233.0
		Rx60	210.0	186.0	149.1	163.5	153.0
		Rx100	149.1	132.1	106.4	123.8	119.6
2	Stop Sign Model	Rx30	235.0	208.0	167.3	230.6	234.3
		Rx60	205.1	182.1	145.6	158.2	157.0
		Rx100	155.0	138.1	110.0	125.3	121.3
3	Probabilistic Traffic Sign Model	Rx30	245.2	216.1	174.6	221.6	235.2
		Rx60	215.1	190.1	152.7	163.2	150.3
		Rx100	160.2	142.1	113.6	131.3	117.0
4	Traffic Light Model	Rx30	235.1	208.2	167.3	231.7	234.3
		Rx60	205.1	182.1	145.5	158.2	157.0
		Rx100	155.1	138.1	110.0	125.3	121.3
5	Proposed Model	Rx30	245.0	216.0	174.5	222.4	235.2
		Rx60	215.1	190.1	152.7	164.1	150.2
		Rx100	160.0	142.0	113.6	130.0	116.1

Table 5: Mobility Models' Average Message OverHead

No. of Nodes	RWPM	SSM	PTSM	TLM	Proposed
10	220.5	225.5	232	219.4	195.7
20	201.3	218.9	214	205.2	189.7
40	151.9	166.5	161.3	158.8	151.1
60	167.4	170.1	172.8	172	160.3
80	177.2	169.8	175.2	169.9	149.5

Table 6: A comparison of the EED of several mobility models

S.No	Model	Rx Ratio	10 Nodes	20 Nodes	40 Nodes	60 Nodes	80 Nodes
1	Random Way Point Model	Rx 30	1021.0	4153.5	6098.4	9138.8	10278.4
		Rx 60	935.5	3599.4	5752.8	9135.0	10276.6
		Rx 100	824.8	3459.2	5541.4	9101.9	10245.6
2	Stop Sign Model	Rx 30	1029.6	4325.2	6191.6	9177.0	10322.1
		Rx 60	981.0	3948.3	5788.8	9162.5	10311.2
		Rx 100	804.1	3735.2	5672.7	9146.4	10290.9
3	Probablistic Traffic Sign Model	Rx 30	1250.6	4460.4	6272.7	9201.2	10331.5
		Rx 60	1225.0	4364.8	6259.2	9190.8	10311.2
		Rx 100	993.6	4276.8	6251.9	9185.1	10302.4
4	Traffic Light Model	Rx 30	1200.6	4160.4	5972.7	9385.5	10331.5
		Rx 60	1103.0	3964.8	5759.2	9157.1	10311.2
		Rx 100	813.6	3676.8	476.1	8834.7	10302.4
5	Proposed Model	Rx 30	947.6	3578.6	5491.4	8885.5	9831.5
		Rx 60	861.0	3268.0	4829.2	8557.1	9811.2
		Rx 100	689.6	2983.2	4291.9	8134.7	9302.4

Table 7: Mobility Models' Average EED

No. of Nodes	RWPM	SSM	PTSM	TLM	Proposed
10	1123	1120	1195	1034	930
20	3959.8	3878.7	3692.2	3599.9	3360.8
40	5905.3	5898.9	5699.3	5596.8	5303.3
60	9144.6	9097.3	8926.9	8925.9	8421.3
80	10285.6	10149.0	10096.0	9819.9	9674.1

Table 8: A comparison of the Consumption of Power of several mobility models

S. No	Model	Rx Ratio	10 Nodes	20 Nodes	40 Nodes	60 Nodes	80 Nodes
1	Random Way Point Model	Rx30	1.23	1.58	2.32	3.26	3.61
		Rx60	1.22	1.59	1.60	2.41	2.81
		Rx100	1.26	1.60	1.54	2.27	2.70
2	Stop Sign Model	Rx 30	1.13	1.43	1.18	1.26	2.63
		Rx 60	1.19	1.42	1.22	2.1	2.35
		Rx 100	1.21	1.34	1.41	1.99	2.32
3	Probablistic Traffic Sign Model	Rx 30	1.22	1.51	2.25	3.24	3.2
		Rx 60	1.24	1.47	1.54	2.38	2.6
		Rx 100	1.22	1.29	1.51	2.22	2.49
4	Traffic Light Model	Rx 30	1.24	1.43	1.18	1.26	2.63
		Rx 60	1.23	1.42	1.22	2.1	2.35
		Rx 100	1.19	1.34	1.41	1.99	2.32
5	Proposed Model	Rx 30	1.07	1.14	1.41	2.18	2.54
		Rx 60	1.09	1.24	1.59	2.42	2.56
		Rx100	1.11	1.23	1.84	2.84	2.95

Table 9: Mobility Models' Average Power Consumption

No. of Nodes	RWPM	SSM	PTSM	TLM	Proposed
10	1.4	1.3	1.2	1.2	1.1
20	1.5	1.6	1.5	1.6	1.3
40	1.6	1.6	1.6	1.6	1.5
60	2.4	2.4	2.4	2.4	2.3
80	2.6	2.7	2.6	2.7	2.5

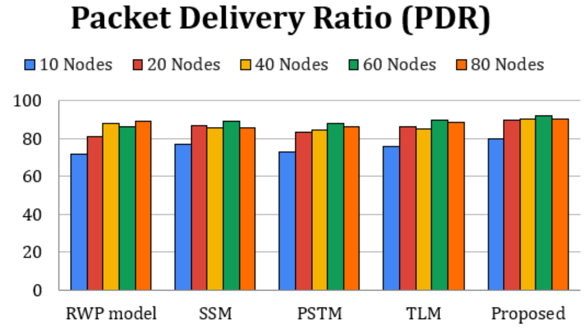

Figure 1: Average PDR for various Mobility Models

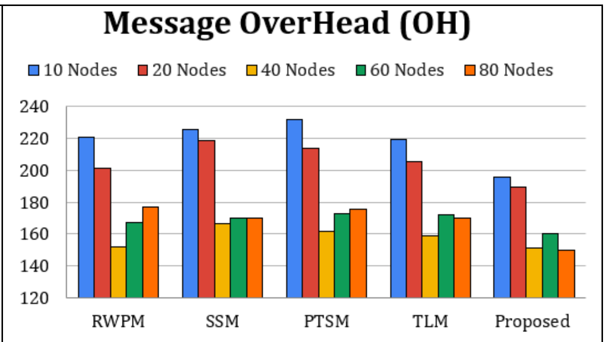

Figure 2: Average message OH for various Mobility Models

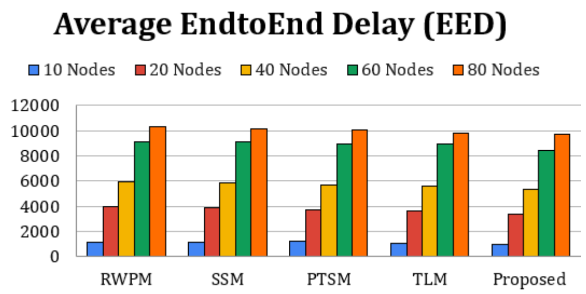

Figure 3: Average EED for various Mobility Models

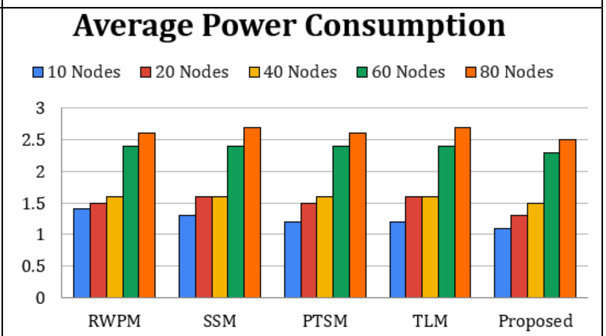

Figure 4: Average Consumption of Power for various Mobility Models

Figures 1, 2, 3, and 4 depict the outcomes of a network with 10, 20, 40, 60, and 80 nodes. Tables 2, 4, 6, and 8 provide a comparison of several mobility models according to random topology using the objective function called MRHOF. Above mentioned tables 3, 5, 7, and 9 show the findings in terms of EED between network nodes, our proposed mobility model (AUMM) shows significant improvement under 10 and 20 nodes of network environments; In the case of increasing nodes in network, it has shown slight improvement. Based on results, overhead messages are less in the case of the proposed algorithm and could get the conclusion with our proposed method improves performance of the whole network with less ratio of collisions. It leads to getting good control of communication system can be possible. The average packet delivery ratio is significantly enhanced by the proposed algorithm, which leads to low power consumption in a network and achieves efficient coordination among vehicles. ultimately results prove that the standard criteria for network are reliability and performance, and got achieved by using proposed algorithm, this suggests that it is best suited for Mobility-enabled low power and lossy networks.

8. Conclusion

In this paper, a different methodology to implement the mobility model for vehicular networks in urban VANET's is Routing Protocol (RPL) based on IEEE 802.15.4 was introduced. Further, a adapted algorithm is developed and developed in order to make it RPL interoperable. The simulation process with the proposed methodology in Cooja simulator allowed to study the performance in terms of useful parameters such as PDR, EED, OH and Consumption of Power. The performance evaluation and analysis show that our proposed methodology has better Packet Delivery Ratio, lower Average End-to-End delay, low OverHead and better Average Power Consumption as compared with existing systems. Our model AUMM achieved the far better performance in more complicated traffic scenarios. It accomplished reliable V2V transmission in an urban area.

9. Future Enhancement

As a future research study, the author intends to incorporate AI and ML into Vehicle - to - vehicle transmission and the RPL protocol. As an outcome, our future efforts will be focused on putting intelligence into Intelligent Transportation Systems (ITS) to enable them to take prompt responses. The strategy used in this article provided a chance to monitor and produce outcomes that are more fast and accurate than our suggested technique.

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