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Reliable and efficient data dissemination scheme in VANET: a review

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ABSTRACT

Vehicular ad-hoc network (VANET), identified as a mobile ad hoc network MANETs with several added constraints. Basically, in VANETs, the network is established on the fly based on the availability of vehicles on roads and supporting infrastructures along the roads, such as base stations. Vehicles and road-side infrastructures are required to provide communication facilities, particularly when enough vehicles are not available on the roads for effective communication. VANETs are crucial for providing a wide range of safety and non-safety applications to road users. However, the specific fundamental problem in VANET is the challenge of creating effective communication between two fast-moving vehicles. Therefore, message routing is an issue for many safety and non-safety of VANETs applications. The challenge in designing a robust but reliable message dissemination technique is primarily due to the stringent QoS requirements of the VANETs safety applications. This paper investigated various methods and conducted literature on an idea to develop a model for efficient and reliable message dissemination routing techniques in VANET.

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1. INTRODUCTION

This introductory chapter presents an overview of the complete work presented where the introduction to the vehicular ad-hoc network (VANET) is discussed as an integral part of an ITS. This is a detailed description of work done in the past on the data message routing that leads this work to formulate a problem followed by the possible solution. Further discussion is made towards the proposed approach and scope of this work, followed by future plans. Vehicular ad-hoc network (VANET) has been identified as one of the components for intelligent transportation systems (ITS) [1].

VANET is a type of network that is established on the fly based on the availability of vehicles on roads and supporting infrastructures along the roads, such as base stations. These road-side infrastructures are required to provide a communication facility, particularly when enough vehicles are not available on the roads for effective communication. Hence, the nodes in VANET may now include vehicles on roads or road-side units, which their mode of communication may be in vehicle-to-vehicle and vehicle-to-infrastructure. On the other side, intelligent transportation systems have offered a wide range of ITS applications. However, the specific fundamental problem in VANET is that chance for effective communication between two fast-moving vehicles is only available at the time when a stable link is established between them, but this has happened only in a few seconds [2, 3]. Therefore, message routing is a problem for many safety and non-safety of ITS applications. The challenge in designing a robust but reliable message dissemination technique is primarily due to the stringent QoS requirements of the ITS safety applications [4].

2. QUALITY OF SERVICE (QOS) IN VANET

QoS assistance helps to enhance networking activity and allow it easier and properly coordinate knowledge exchanged across the network and to increase network efficiency. The concept of QoS is a network arrangement or guarantee to provide the customer with a variety of quantifiable pre-specified service functionality including network latency, latency variances, usable capacity, packet loss (loss rate), etc. etc. The IETF RFC 2386 defines QoS as a collection of connection specifications that the network should satisfy for a packet stream from source to destination [5]. The capacity of the network to provide unique QoS is dependent on the network's properties, which extend throughout the critical elements of the network.

The property included contact latency, transfer, failure levels, and error rate for the transfer relation. Of the nodes, hardware characteristics provide operating speed and storage capacity. In addition to physical node characteristics and communication relations, QoS control algorithms that operate at different network levels often help QoS in networks. Regrettably, the features of MANETs show weak support for QoS [6, 7]. The actual transmitting power with comparably small errors and the failure rate is weak and time-varying. Other potential wireless devices that nodes may use at the same time to connect MANETs [8, 9]. In order to support QoS, each technology requires a MAC layer protocol. The QoS structures around the MAC framework would also be readily matched to the different simple wireless technologies. It will be a task to encourage various standard standards of service in a continuously diverse setting. The stochastic trait of communications quality in a MANET allows it difficult for a system to obtain guarantees [10-12].

3. ISSUES AND PROBLEM IN DATA DISSEMINATION

Vehicle networks can have two types of implementation: the first, using pure ad hoc communications, and the other, using infrastructure to allow communications. These types of networks pose new and demanding challenges, mainly in the case of the absence of infrastructure, speed, and topographic conditions in which the nodes are mobilized. In extra to the above, conventional routing protocols cannot be applied to this type of networks in the same way as in conventional networks, since they are not prepared to adapt to the variable conditions that may arise in the environment in which they are used. They play vehicular networks. On the other side, considerations of security and quality of service arise that must be adapted to the conditions of this type of network [13, 14].

Unlike traditional wired networks, in an ad-hoc wireless network, each of the nodes works simultaneously as a station and as a router. For each node to be able to communicate with the rest, it is necessary to maintain information of the network to which it belongs and have an algorithm that governs the sending and receiving of packages. The routing protocol is defined as a set that forms the routing algorithm and the information about the conditions of the network. The protocols of routing in ad hoc networks must adapt quickly and correctly to frequent and unpredictable changes in the topology of the network, making minimum use of memory, transmission power and bandwidth [15, 16]. The routing process is defined as the act of transmitting information from one source to a destination source, that is, node to node. A routing process is considered as the selection of paths from a source to a destination within a network. A routing protocol for ad-hoc networks allows the network to be fully organized on its own, and its main objective is the correct and efficient establishment of routes between a pair of nodes. Messages are delivered correctly and timely [17].

The construction of routes must occur with a minimum overload in the headers of the control packets and minimum consumption of bandwidth. There are many routing protocols have been proposed in order to cover the different needs depending on the different environments and traffic conditions. The great variety of existing protocols means that there are several criteria for their classification, which in turn reflect the most important aspects considered for their design. The planning criterion assumes the classification most widely used in the literature and attends to the moment in which the route is calculated from one source node to another source (destination node). While in the proactive protocols, the updated information is kept at all times, in the reagents, the route to the destination is searched when the need to establish a communication arises. At the end of any vehicular communication network, the following questions need to be answered prior to design an efficient and reliable message dissemination scheme in VANET for QoS of intelligent transportation system implementation.

- What method of optimization can be effectively deployed to provide a stable link between any two communicating nodes in VANET?
- How to build a reliable and efficient route/path for connecting a sender node and a receiver node and suitable for QoS routing in VANET?
- What performance parameters shall be used such that QoS of the ITS application is acceptable?

In order to solve the above questions, the hypothesis can be made is that if a stable link can be established between any two communicating nodes in VANET (V2V or V2I), there is a great chance that a reliable and an efficient messages dissemination/routing can be made in the network to support the QoS achievement for the ITS implementation.

4. ROUTING IN VANET

Based on the routing protocol, communication between mobile nodes may be single-hop or multi-hop in VANET. The routing protocol also decides the end-to-end path between source nodes and destination nodes. Low latency and the dependable end to end data delivery are the two main factors for efficient routing protocols. However, route maintenance, route discovery, and sudden changes in the topology are the key factors in designing efficient routing protocols [18, 19]. Numerous routing protocols have been proposed in the literature to provide reliable and efficient routing in VANET. These can be classified as shown in Figure 1.

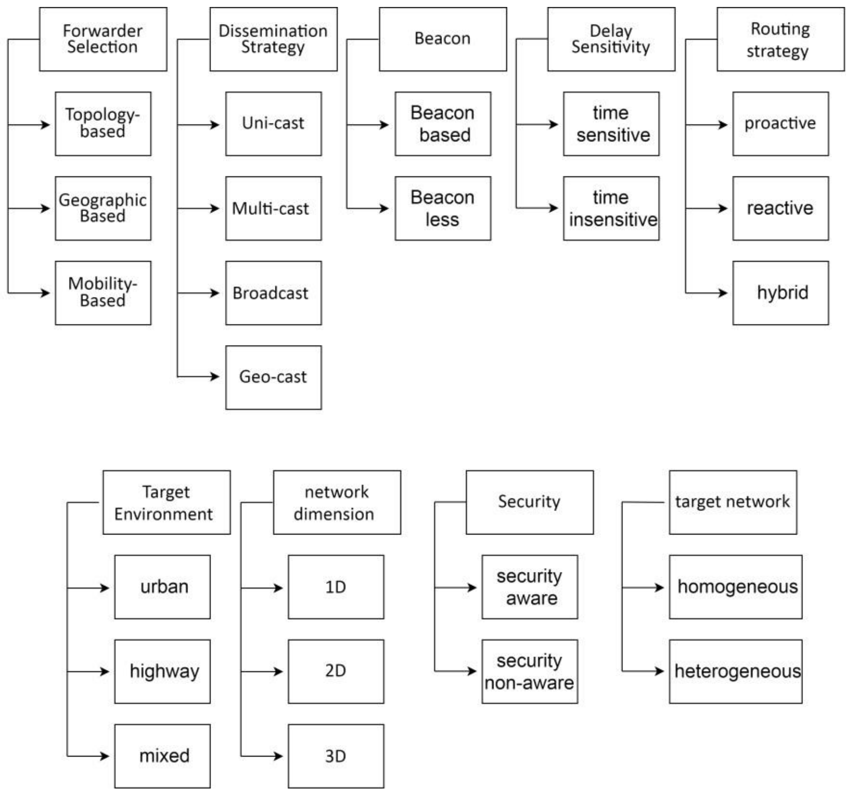

Figure 1. Types of routing protocols

5. ALGORITHM BASED ROUTING IN VANETS

The development of routing protocols in VANET was based on various models and approaches. Some of them are regarded as famous models in the literature in various applications. We present here some of them. Various researchers have developed routing protocols for VANETs based on meta-heuristic optimization models. Some researchers have adopted multi-objective optimization for this purpose and used it to optimize existing routing protocols and to make it more suitable for VANETs. In the work of [20], the firefly was used as multi-objective optimization for OLSR for VANET based on a developed framework. More specifically, the framework consists of three stages: 1- generating the scenarios for creating the network road and the traffic, 2- formulating the weighted cost function and 3- optimizing the protocol parameters using considered parameters related to the time of holding the message, the refresh time of the link status, and hello message etc. However, the evaluation has not generated the MOO evaluation measures the number of non-dominated solutions, hyper-volume, set coverage, … etc.

The literature contains a significant amount of works using meta-heuristic approaches for optimization of the VANET network in its different layers. In the context of applying meta-heuristic for optimization of MAC layer in VANET [21], a MOO framework for optimization of MAC and the physical layer was proposed. The framework aims at the optimization of three objectives: throughput, packet loss, and latency. The solution is proposed to include various parameters in the protocol of the two layers. For optimization, the framework was evaluated based on the non-dominated sorting genetic algorithm NSGA-II. The work of [22] has proposed using a genetic whale optimization algorithm for assisting in selecting a root channel for transmission. The protocol was named as a modified cognitive tree routing protocol MCTRP. The protocol can be categorized under effective channel utilization in VANET. Another aspect of applications of meta-heuristic optimization in VANET is controlling data dissemination and preventing broadcast storms. In the work of [23], the authors have aimed at optimizing link stability and lifetime as well as minimizing the number of obstacles within the selected route. The optimization function was formulated as a single objective function with including the two terms. Next, the approach has used discrete particle swarm optimization.

A complexity analysis has proved the feasibility of the method in real-world applications. Some researchers have proposed meta-heuristic based optimization for establishing multi-cast-based routing in VANETs. An improved shuffled frog-leaping algorithm-based [24] QoS constrained multicast routing (ISFLABMR) was proposed. The goal is to find the optimal sub-tree for message dissemination. This sub-tree is the optimal multi-cast tree from available options of the multi-cast tree between the source and the destination. The formulation of the fitness function has aimed at optimizing various QoS parameters, more specifically, jitter, latency, and bandwidth, in order to reduce the transmission cost of multi-cast routing. Apart from that, some papers have focused on meta-heuristic based VANET security, such as the work of [25], where swarm algorithms of artificial intelligence were proposed for countering routing attacks.

The literature of VANETs routing protocols included many techniques based on meta-heuristic approaches. In the work of [26], an approach of selecting routes based on their fitness values is proposed using genetic. The routes were found using a greedy approach, and then the best route was selected based on genetic. After proving the superiority of the approach over other benchmarking routing protocols, the author stated that the algorithm suffers from slow computation, and its combination with heuristic can increase the performance of the algorithm. This concern of speed of genetic algorithm was indicated by other authors such as [27] in their work where genetic was applied in both serial and parallel ways, and they proved the superiority of a similar way when using multi-core architecture. Other researchers have developed metrics for route optimization. The metrics include information about signal strength, path loss, transmit power and frequency such as the work of [28], in addition to the new metrics, an improved genetic-based routing algorithm was proposed. The approach uses a non-probabilistic selection approach using k-means clustering. The author also has stated about the real-time concern and regarded it as a future investigation. It is observed in the literature that significant amount of meta-heuristic based routing has focused on the problem of multi-cast routing and its result on the congestion in the network.

An example is a work of [29], where a micro-artificial bee colony was used for multi-cast routing. The algorithm is proposed for achieving QoS-constrained VANET with maximizing network lifetime and minimizing delay cost. The solution of the algorithm proposes a bit-based encoding for the route between the source and the destination inside a spanning tree. The algorithm also proposed incorporating an energy model that is suitable for electrical efficiency. On the other side, the optimization considers only a small part of the population, which makes it more computationally efficient. A similar work for developing meta-heuristic based multi-cast routing is the work of [30] where firefly was improved by using Levey distribution, and bit string coding was proposed for searching for the path that achieves the best cost which is represented by minimizing the energy consumption and E2E delay using a single objective function.

6. DATA DISSEMINATION IN VANET

The data dissemination is a crucial part of VANET for various applications, particularly related to safety, to alert the drivers about the traffic incidents in their local region. An example of data dissemination in VANET is shown in Figure 2. Although VANET inherits many concepts from traditional mobile ad hoc networks (MANET), VANET is defined by its high mobility and frequent disconnection, and data dissemination is an integral part of the network. This key difference is the reason for VANET that traditional MANET routing data dissemination methods like AODV and DSR are not applicable in it. Unsurprisingly many techniques of data dissemination have already been proposed for VANET. These techniques can be distinguished into different categories as being Unicast [31], Multicast [32], or Broadcast. The techniques of data dissemination in VANET can also be distinguished as one relying on the existence of an infrastructure [33] and another one relying on zero infrastructure support [34]. For the intent of this study, the techniques of data dissemination in VANET have been classified into two categories: (1) Those Techniques which presume the existence of end-to-end connectivity between vehicles. (2) Those Techniques do consider the lack of connectivity between vehicles. Techniques like VGrid, MURU [35], and PBR [36] are the example of the first category.

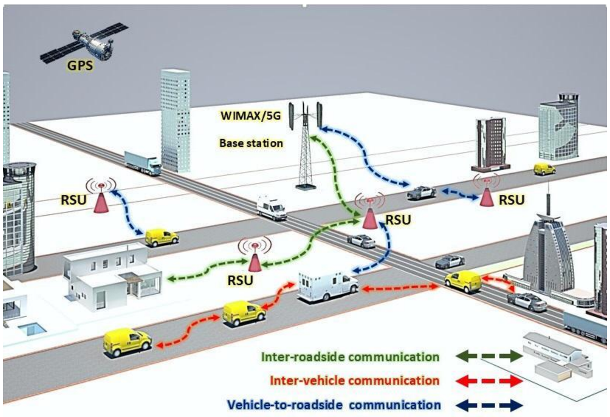

Figure 2. Data dissemination in a VANET

The VGrid Data dissemination technique is a position-based, on-demand routing protocol that creates a path from a static source node to the vehicles present in a destination area. Another technique is MURU. It is a multi-hop routing protocol proposed for discovering strong routes in urban VANET. MURU aims to reduce the probability of path-breaking by using movement data of all vehicles and by using a unique parameter stated as expected disconnection degree factor to choose the utmost strong route from source to destination [37]. MURU prudently assumes that there will be several routes between destination and source and its aim to choose the one that is highly established. Position-based routing (PBR) protocol is used where packet forwarding decisions are taken based on power awareness. Connectivity-aware routing (CAR) was proposed for the uncertain end-end to connectivity in VANET. The fundamental concept of CAR is to find out the connection route between the destination and source. It does not matter whether the route is the shortest one or not; this is accomplished by using a path detection process before the actual data can be sent.

Moreover, this is because a longer entirely connected path is better than the shortest path, which may further experience the connectivity issue at some point. Directional propagation protocol (DPP) [38, 39] makes use of the directional pattern of the vehicles and data to disseminate the packet. DPP demonstrates real traffic situations where vehicles form groups on the road, and these groups might get detached from each other. Furthermore, a real traffic situation reflects in research where detached vehicles might make a cluster with each other. A hybrid routing protocol is also presented, where packets can be directed inside the cluster, but to associate these clusters, it depends on a prior infrastructure. Even though the real traffic conditions are reflected in the hybrid routing protocol, its dependence on pre-existing. The major disadvantage of all existing techniques of data dissemination is that either they do not take account of frequent VANET disconnection such as VGrid, MURU and PBR or techniques that take account of disconnections, these techniques have to go through many disadvantages such as routing loops and wasting the limited resources by sending redundant messages in their data dissemination.

6.1. Quality of service (QoS)-based data dissemination

In VANETs, some of the applications are delay-sensitive. We have other efficiency criteria, such as applications relevant to health. Therefore, an adequate data distribution service consistency (QoS) program needs to be developed to guarantee the transmission of data. Wahab [40] proposed a new QoS system management protocol transmission that can route a packet as soon as possible from the source node to the destination. Throughout this protocol, a new metric is created to allow various weights for the routing path between nodes, from which algorithms to build and maintain routes are established. This protocol can overcome a storm and easily recover if a connection fails. This protocol can solve through consideration of one compromise between QoS requirements and strong versatility restrictions, Waheb et al., introduced a new QoS clustering algorithm [41]. The proposed algorithm was developed to shape and sustain stable clusters while meeting QoS requirements.

6.2. Delay-based data dissemination

The delayed data distribution approaches have been established to cope efficiently with the diffusion problem. Such solutions rely on nodes used to pick a relay node for forwarding data packets. UGAD [42] uses a responsive pause algorithm for suppressing broadcast in city VANETs. At intersections, the UGAD lets vehicles retransmit easily by setting priority preferences. Furthermore, cars run two separate kinds of control mechanisms to satisfy the need for transport.

As a consequence, the packet arrival ratio is increased while the redundant transmission is reduced. A comprehensive method for deciding specific vehicle objectives according to the delay criterion. TVBR [43] proposes a timer-based vehicle backend network protocol in which each node takes distribution decisions only through information stored in the header, its current state, and local calculations. This protocol uses node times to select a relay node to forward the packet. However, if the protocol is not correctly configured, the time quantity impact will lead to the dissemination stop. In [43], when evaluating data dissemination, an assessment model is proposed in order to characterize the actions of incorrect forwarding systems. The results obtained from several simulations help gain insights into the false transmitting issue that affects the use of VANET-based networking protocols. The suggested model is used to determine the proper dimensioning of the message flow admission control and pacing control processes, thereby limiting network charges to an acceptable data rate point.

6.3. Probability-based data dissemination

Probability dependent schemes allow receivers to forward packets that are likely to reduce the reliability of the information. Wisitpongphan [44] and Tonguz [45] propose two probability-based, weighted-p-and slotted-p-based, cross-hop transmission protocols. The other node transmits the packet with a higher likelihood under the Weighted-p Protocol. However, following the gap in this procedure, the chance of forwarding decreases. Therefore, the enhanced intensity would contribute to more inefficient contact and a hurricane. The future forwarding region is split into many sections of the Slotted-1 Protocol, with different waiting times. The node that is further from the sender will wait for less time. However, since the traffic movement varies over time, it is hard to assess correctly the number of time slots that should be separated. Panichpapiboon [46] expands the concept of a system for probabilistic broadcasting. The likelihood of re-transmission is calculated by the spatial function of the inter-vehicle delivery, which enables the IF system to minimize the amount of duplicate re-transmissions efficiently. Therefore, the IF principle can be extended for every inter-vehicle separation distribution. Mostafa [47] presents a modern, efficient, and low-collision packet-forwarding system focused on probabilistic re-transmissions for VANETs. It operates in a distributed way where every node retransmits a packet with a pre-defined probability. The likelihood is calculated by many parameters, including the node number, the inter-vehicle gap between the nodes, and the next-hop propagation path.

6.4. Push-based data dissemination

The push-based distribution of data is suitable for some programs that promote local and public interest data. This scheme can create low containments during data transmission and collisions. Schwartz [31] suggests a protocol to disseminate push-based results. When utilizing an efficient distributed deletion strategy, the diffusion tempest issue with dense density may be minimized throughout the network. It can effectively control the disconnected network, based on the Carry-and-Future communication strategy. The newness and robustness of the current procedure are part of the new definition. However, in a dense environment, the power control system does not significantly reduce the network load. Mondal [48] proposed to guarantee secure and effective data transfer with one relative position-based data distribution system. The relative position-based addressing method is configured initially to define the planned receivers efficiently. A one-way broadcast protocol will then be proposed to make a set of candidate’s nodes store messages to improve the packet delivery rations and to reduce packet delivery delays. Nevertheless, this paper has not addressed the problems of intrusion, scalability, and accessibility.

6.5. Pull-based data dissemination

For personal or private details, pull-based data distribution is most suitable, where vehicles can request data information explicitly. Bai [49] Proposes a unicast-based data distribution architecture on-demand for VANETs. The system will scatter data as response messages if any question messages are issued. The real automobiles that just disseminate data are observed. This scheme, however, will increase the overhead calculation. Lakas [50] presented a capable and fast transmittal device for vital security messages. The key to VMP is that it defines several trustworthy transmitters with differentiated delays and utilizes the cooperative transmission mechanism to support the transmission of the data. It needs, however, cross-cutting. A peer to peer VANET application is proposed in [51] to track and avoid obstruction in public transport and to share details on public traffic. The application uses a push-based geo-cast system to collect and disseminate information efficiently. The program will raise the amount of knowledge shared between vehicles by incorporating a caching scheme.

6.6. Cluster-based data dissemination

In order to deal with some issues and challenges caused by the particular characteristics of VANETs, most of the proposed solutions are to self-organize the vehicular network by creating dynamic clusters. Singh [52] proposed one protocol for multiple target regions for complex and dispersed distribution of information. This procedure comprises two primary components: configuration of geocasting and management of geocasting. The former uses route connecting and main points to minimize the overall period for transmitting the word. Lastly, the concept of regional autonomy divides each region into many small areas in order to decrease the redundancy of information and dynamic maintenance costs. The suggested procedure will minimize the probability of the same message and avoid the loss of valuable data. An algorithm for VANETs is suggested for hybrid backbone-based clusters [53]. The algorithm creates cluster heads and chooses them, taking into consideration the number of links and versatility for vehicles. In the context of the growth of a cluster, nodes with reasonably large communication initially create a backbone called a leadership. The leadership then takes part in unit heads and company reorganization depending on the relative average pace of vehicles. In [54], a VANET mobile clustering scheme is suggested to shape clusters that are spread using the Affinity Propagation algorithm. Their clustering algorithm takes into consideration several variables, such as their average cluster head time, their average participant time, the average rate of cluster-head shifts, and the total number of network clusters.

In [55], VANET's was introduced for a modern cluster-based emergency data transparency system. First, the weight value for each node is calculated by taking into account different metrics. The cluster head was chosen for the node with the minimum weight value. Cluster preparation and repair systems will be provided. Recently, several techniques and algorithms have been proposed. A study was presented in [45]. The proposed method was focused on the design and delivery of a new Distributed protocol for the deployment of multi-hop engines. The system was supposed to function in all traffic schemes, including Dense and sparse extreme scenarios Traffic systems. DV-CAST is a distributed transmission protocol that only utilizes knowledge from local topology to handle VANET messages. Quality of this is seen in terms of precision, usefulness, and scalability. The current DV-CAST Protocol is outstanding. In another work [46], the definition of IF is extended to be specific to any distance distribution of the intervehicle. In this study, each vehicle should rebroadcast the received information from the network. However, this mechanism would lead to a useless occupation of the radio channel and would minimize redundancy. While in [47], the researchers have introduced a new reliable, low-collision vehicle ad hoc network packet forwarding system based on a radio diffusion probabilistic. The collision-aware reliable forwarding scheme (CAREFOR) was proposed to work in a distributed network form as each car receiving a packet would resend this packet to pre-defined likelihood. This opportunity was exploited by various physical influences, such as the density of the vehicles in the region, extracted from the vehicle environment vehicle transfer and reception, and, eventually, the next-hop transmission system. However, the convergence of all these variables into one probability enabled each driver to determine that a new automobile will accept this message, which will be possible whether the message is returned.

The study of [31] provided a reliable and straightforward mechanism for the transmission of data in crowded and space-saving vehicle networks. The simulation findings revealed that the proposed protocol improved the transmission ratio and improved robustness in various path conditions compared with DV-CAST. [48] Proposed a new scheme to efficiently disseminate the message (RPB-MD) dependent on the relative location and disseminate vehicle communications in the field of interest effectively. The RPB method model was suggested to describe the relative position based on Desired zone-of-relevance receivers accurately. To guarantee a strong coverage level and Low distribution time, DGBR was implemented to have a spatial greedy transmission routing. The message of high reliability is carried in the nominee nodes community. Besides, to ensure performance, the time parameters of the protocol are tailored to a document wide distribution of road characteristics and cars. The feasibility of the protocol was analyzed to show the strength and confidence of RPB-MD. The findings of the simulations revealed that RPB-MD could manage a strong output level, minimal overhead relative to current representative structures, reasonable pause, and fast reliability of the network under specific vehicle densities and transmitting rate of data. Bai [49] proposed a crucial function in road safety, detection of traffic accidents, and reduction of traffic congestion by disseminating messages among vehicles. The periodic broadcasting was indicated as an efficient approach to serve the requests of many vehicles without selecting any route between source and destination. In [50] a study was presented a robust program for the rapid diffusion of safety communication through critical space, known as vehicle multi-hop broadcasting protocol (VMP), through lowering the end-to-end latency and re-transmission ratio while retaining high message arrival speeds, the VMP demonstrated improved results than previous contested systems.

In [51] proposed a VANET technology peer-to-peer exchange of knowledge on highways, allowing vehicles to identify and mitigate traffic congestion. Amid caching, they have shown that. The quality of gathered traffic information was maintained, and similar data were achieved for the average decrease of congested road travel. Another study was presented in [52]. The researchers suggested the knowledge sharing system SmartGeocast for many target areas, with two protocols, namely the configuration of geocasting and the management of geocasting. The suggested SmartGeocast protocol demonstrated that the risk of obtaining repetitive messages could be minimized when attempting to minimize the loss of essential details. Moreover, a clustering algorithm focused upon hybrid backbone is suggested for VANETs. The definition of the number of links and versatility of vehicles is used for clusters and the collection of clusters. The findings of simulation have shown similar cluster stability in metropolitan environments in the proposedalgorithm. [53].

Another article proposed a modern, intelligent transmission-based secure and effective data distribution method, with a goal to resolve recurrent disconnection problems during data delivery. A detailed network and traffic analysis for different metrics, such as latency, packet transmission ratio and efficiency. The suggested densely variable approach increases average PDR and performance by 31.50 percent and 25.30 percent, respectively, relative to state-of-the-art protocols [54]. A new hybrid was proposed in [55]. The proposed technique was namely new hybrid relay class Selection of nodes in which the strongest aspects of current communication protocols are used optimized accessibility terminology, contact times, and use of bandwidth minimizing their vulnerabilities. The findings of this working study indicated that the current hybrid solution improved reachability by up to 10% relative to standard models, which are more successful. This progress is accomplished because there is a small reduction in contact times and messages saved re-transmission ratios. The study of [56] intended to refine the method of discovery of suitable paths for the effective distribution of data in VANETs, including the Encoding and Decoding phases. The method suggested protects the stability and the likelihood of obstacles event as objective using Euclidean distance in the polar coordination framework. Extensive models are used for performance measurement strategy, such as packet distribution partnership, total overhead routing. The findings indicated that the suggested algorithm was in the current literature greater than other associated structures.

In [57], the author proposed a technique of transmission utilizing a time-barrier method to eliminate communications that may disrupt the network. The presented approach was focused on the idea that a supernode should be used to disperse the message rapidly. To avoid unwanted propagation, which can also trigger the issue of the transmitted hurricane, the time barrier methods are modified in order to resolve the problem. While in [58], a modern, efficient clustering simulation versatility (MPECS) system was proposed. The basic concept of MPECS was to split the whole region into separate areas by the Voronoi graph; in order to enable each vehicle to estimate its lifetime and cost of becoming the cluster head in its current location. The proposed technique has shown evidence of significant MPECS capabilities enhance clustering design reliability with reduced overhead, finally, in [59]. This study suggested a modern scheme of data distribution focused on clustering and CBD. A classification algorithm was initially introduced by driving Vehicle directions utilizing which vehicles may cluster their data with enough contact time. The simulation indicated that the new CPB configuration had improved the performance of the systems regarding knowledge distribution, total communication duration, and the transmission ratio of packets. Table 1 summarizes recent studies (see Appendix).

7. CONCLUSION

This paper has presented a literature review on various VANET techniques, their routing protocols, security measures, and quality of services. Based on the literature conducted, the future development to be done in this research has also been initially proposed that will include analysis, designing, and modeling of a technique of stable link for message dissemination followed by the proposal to develop a modeled message dissemination technique. In this research, studies on various factors that influence the incident detection and monitoring based on the literature have been conducted. This review paper discusses the introduction, motivation, problem formulation, objectives, and scope of the work and significance of this work. The paper also includes a comprehensive literature review conducted in the field.

APPENDIX

Comparison of data dissemination schemes.

Table 1. Comparison of data dissemination protocols

Characteristic	Features	Map	Simulation	Advantage	Study
Manage the storm and network link issue	Work in all transport environments, detecting neighborhoods, removing broadcast and forwarding of stores	Highway	NS2	Powerful against various kinds of conditions of vehicle traffic, very scalable and stable especially in dense traffic, strong network connectivity	Tonguz et al. 2010 [45]
Redundancies will be minimized thus maintaining transparency	Generalize the reckless travel definition	Highway	Matlab	Redundancy package cap	Panichpapiboon and Chen 2013 [46]
Provide a robust low-collision transport network	Job dispersed function	Highway	Java	Performance in small re-transmission numbers	Mostafa et al . 2014 [47]
Prevent the question of transmission	Distribution of spatial data	Highway	OMNeT++	Small backup, no overly large load Higher output volume	Schwartz et al. 2011 [31]
Reduce interruption in contact	Dissemination of related position-based message	Highway	NS2	Robust and secure, good availability, appropriate overhead connectivity, strong network usability	Liu and Chigan 2012 [48]
Avoid channel obstruction, escape diffusion wind, solve secret terminal problem.	Hierarchy: Root approval agency, intermediate base stations, leaf stage vehicles	Highway	Processing Units	Higher operation block and mean answer time, higher efficiency	Mondal and Mitra 2016 [49]
Prevent loss of packets and address storm diffusion problem	Designation of multiple sponsoring candidate	Highway	Qualnet	Great availability, small channel expense	Bai et al. 2009 [50]
Detect and prevent road haulage	Geo-cast protocol based on Pull, determines the optimal routes proactively	Urban	RISIM	Reduce the amount and reaction time of transmission	Lakas Shafqa 2011 [51]
Reduce the expense of communications and servicing	Dynamic transmission and delivery of suspicious information	Urban	NS2	Reduced traffic and data diffusion period, ratio and efficiency improvement in data receipt	Zhang et al. 2013 [52]
Coordinate coordination between nodes, help to enhance collaboration and eradicate the issue of secret terminals	Cluster formation and cluster head selection	Urban	NS2	Reduce latency and connectivity expenses and improve network reliability	Singh and Bali 2015 [53]
The relation stability is the basis for selecting the next transmission node and a greedy algorithm for data transfer	Smart, secure and reliable data distribution protocol focused on transmission	Urban	NS-3	The suggested program is best for PDR and efficiency, with a small latency increase	Chahal et al. 2019 [54]
Selection of hybrid relay nodes which attempts to leverage the best characteristics of established messages	Accessibility of communications, contact time and the usage of bandwidth eliminating any limitation	Highway	NS2	The process is better than traditional approaches	Osama et al. 2019 [55]
Stability of the relation determined in the Euclidean polar system by distance	A modern DPSO algorithm with meta-heuristic interest.	Urban	NS-3	The suggested solution is stronger relative to certain criteria found than the other protocol	Manisha et al. 2019 [56]
A time limit system for raising communication overhead	Technique to reduce the overhead of communications utilizing a time constraint method	Urban	NS-3	Latest approach aims to minimize pollution by broadcasting	Shah et al. 2019 [57]
Effective clustering scheme (MPECS) dependent on mobility prediction	MPECS is recommended for enhancing VANETs' performance.	Urban	NS2	Current strategy aims to reduce pollution by transmission networks	Tharwat et al. 2019 [58]
Scheme for the provision of data on clustering and likely broadcasting (CPB)	Clustering guidance and probabilistic radio programming	Urban	NS2	Enhanced packet transmission efficiency, knowledge distribution and average time to transmit.	Liu et al. 2018 [59]

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