Performance Analysis of Communication Model on Position Based Routing Protocol: Review Analysis

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Research on the Vanet system has its own challenges and obstacles with the communication system between nodes being the main issue. Four categories in the Vanet system topology, namely position based routing protocols, broadcast based routing protocols, cluster based routing protocols and multicast/geocast routing protocols, have fundamental differences, especially in the concept of sending data and information between nodes. For this reason, in this study, the selection of standardization and integration of data delivery between nodes is of particular relevance. The ability to send data properly in busy and fast traffic conditions is another challenge. For this, there are many variables that must be considered to improve communication between nodes.

Povzetek: Prispevek se ukvarja z analizo topologije sistema Vanet, predvsem s protokoli z namenom doseganja hitrega prometa tudi v pogojih precejšnje obremenitve..

1 Introduction

The relentless mobility of people, the the number of vehicles on the road, and the need for communication technologies without infrastructure for intelligent transportation systems (ITS) make ad hoc vehicle networks (VANETs) an important research subject in vehicle and wireless technology. In the Vehicular adhoc network (VANET), the vehicles as nodes are self-regulated and communicated without central authority. The topology created by the vehicle varies rapidly, which makes the path unpredictable. Position-based routing, opposed to conventional routing, is more scalable and feasible [1]. Thus it has been found to be more reliable for VANET than traditional routing. Due to the popularity of the mobile internet, mobile device applications require more computing resources, and cloud computing allows mobile devices to perform application tasks that require high computing resources, assuming they maintain small specifications. It calculate resource allocation methods based on system performance and utility iterations and apply them to mobile computing edge networks, the two resource allocation methods increase network throughput and system utilities, averaging more mobile edge users [2].

However, constantly shifting topologies and node congestion will break the route the packet follows. Routing in Vehicle Ad hoc Networks is a daunting challenge due to the peculiar features of the network such as high node mobility, rapidly shifting topologies, and heavily partitioned networks [3].

Routing protocol efficiency depends on different internal factors such as node mobility and external factors such as path topology and signal blocking barriers. This requires a highly flexible approach to addressing complex situations by choosing the right routing and forwarding plan and using the necessary versatility and propagation models. Vehicle to Vehicle data transfer is one of the key challenges in VANET design since it requires a complex routing protocol design [4].

Routing protocols are very important in ad hoc networks because they are responsible for initiating and managing routes to enable multi-hop connectivity and extend the coverage area of the network. In addition, VANET routing protocols are configured for various situations taking into account the key features and shortcomings of the vehicle network, such as node mobility, congestion and bandwidth limitations [5]. VANET has a complex topology and, at the time of its running, the network will handle all kinds of applications [6].

VANET routing protocols can be categorized according to their conscious control and mobility predictability. This classification looks to distinguish protocols with optimal use of available resources and increased quality of operation (QoS) [7]. In this case, cluster-based routing protocols have centralized control and they can be very useful for preventing saturation in very congested networks. Other protocols intended for low latency implementations are dependent on the topology or location information provided on. Finally, for efficient QoS routing, there are different approaches to get the optimal protocol according to different parameters such as end-to-end latency, stability, low collision and interference [8].

While application-oriented classifications vary, common standards have been used more widely to survey and identify them. Depending on whether the car uses the

Figure 1: SLR process.

networks or not to forward packets to the final destination, the VANET routing protocols can be classified as V2I and V2V [9]. As we know, Routing in VANET can be divided into many key categories as follows: Position Based Routing Protocols, Broadcast Based Routing Protocols, Multicast/Geocast Based Routing Protocols, Cluster Based Routing Protocols [10]. A standard classification of routing protocols is provided based on a transmission strategy in which the protocols can be unicast, multicast, broadcast, or geocast.

This well-accepted description of routing protocols was included in the survey. In addition, specific protocols are further divided based on routing knowledge in topology or position-based, and cluster-based. VANET routing protocol surveys over the years indicate that forwarding requirements, particularly protocols, have progressed from using just one metric to more new proposals that use several metrics, such as vehicle speed and direction [11][12]. In this article, we focus on a position-based routing protocol developed for VANET using various metrics in hop-by-hop selection to enhance vehicle contact.

The writing of this research paper was carried out in several sections, part 1 gives an introductory description of the needs and basis for conducting research, the second part outlines the vanet technique in the document contest, as well as the presentation stages of the process by systematic literature review in this report. After that in section 3, describes the findings of the testing and data processing collected, as well as addressing and explaining the metrics used by researchers in the routing program. And the last is the inference taken from the debate in the previous part.

2 Methodology

This literature review (SLR) research phase was carried out to compile details on how the multimetric-based routing protocol on VANET makes the right routing decisions. SLR is a way of defining, analyzing, and interpreting accessible research relating to a specific research topic, area, subject, or phenomena of interest; It consists of six stages: research investigation, search process, inclusion and exclusion criteria, quality evaluation, data collection, and data analysis.

SLR was utilized as a predefined study schedule for implementing testing methods. It is predicted that research studies which lead to reviews extracted from studies can be generated by the literature review that employs SLR after considering that the SLR is exactly defining, evaluating, and distributing all studies based on intriguing happening research questions, or subject area analysis. SLR is a procedure which classifies, selects, and critically appraises the most question that is formulated to be answered by the prior studies. Before the inspection, the protocol or software is defined back in SLR process. SLR is a structured and open mechanism in which the effort that is searching is performed over many datasets and even a related approach may be repeated and replicated by other investigators.

2.1 Review protol

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) were used as a reference in leading a systematic review. Literature analysis was conducted in three stages: first, the writers scanned and compiled relevant files by using basic scanning terms and keywords. Second, the authors designed an inclusion and exclusion checklist to classify the most appropriate citations for the purpose of the study. Third, each paper was checked by them from the gathered bibliography based on distinguishing knowledge which was needed to address the study questions.

As we can see at Figure 1, 606 articles were found by database checking, and, after redundance and obsolete data had been excluded, they were 468 articles were considered for the screening process, after full-text studies evaluated for eligibility, they were 109 articles were considered for screening process, and Finally, 46 articles were chosen for full-text extraction.

2.2 Formulating of research question

In our case, this survey is useful for VANET researchers who need a good routing protocol to get better results in the implementation of new networks that rely on emergencies and data sharing. More precisely, we are targeting expanded hop-to-hop decision-making in vehicle communications. The result of our study is to validate how the use of various metrics in routing protocols strengthens the decision-making process in vehicle communications. This research question aims to find out how important the selection of metrics is in the routing protocol for VANETs, and how the use of multimetric enhances route selection. Based on this approach, our Research Questions (RQ) are as follows:

a) What problems might occur in the data communication process in using the position-based routing protocol ?
b) How to integrate routing protocols and location based services to reduce routing overhead and latency in communications

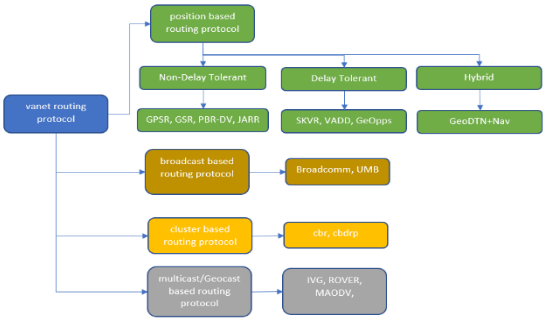

Figure 2: Taxonomy of VANET routing protocol.

c) How to improve the quality of data transfer between nodes in position-based routing protocol services in order to become even more relevant ?

2.3 Systematic searching strategies

The following database and digital libraries were selected to perform the systematic literature review, consisting of:

a) Scopus (scopus.com)
b) ACM Digital Library (dl.acm.org)
c) Science Direct (sciencedirect.com)
d) Google Scholar (scholar.google.com)
e) IEEE Explorer (ieeexplore.ieee.org)

To carry out the process of selecting the search results from the existing journal database, several vocabularies were used. Some of them “Smart city" OR "mobile smart" OR "vanet protocol" OR "protocol routing" OR "vanet routing" OR "vehicular adhoc network" are the search keywords which were used to find similar studies. In order to remove redundant records, there is a preliminary phase required. In different reputable journals, the method of looking for research findings in journals is carried out. The issues and research questions you have are included in looking for articles in journals. Researchers searched for other research data from any publications in order to get the research results in the form of as many citations as needed. The research data is further broken down and broken down into narrower research data after carrying out the search process and has a connection with current research questions. The next step of the review is focused on comparison to papers related to the research issue. And to the final list for further research, the results of the papers which have been published and focused on research questions are added.

Connections and selection of journals were made during 2016-2021 to carry out the selection process for established journals. Criteria for selection based on research questions. The basis for applying the selection to the selected journals will be this research issue.

The inclusion and exclusion requirements that we have are focused on current study issues. This is a factor to ensure that search results for publications or papers can be translated correctly and can be properly sorted based on the relevant analysis.

A research inquiry starts by identifying a topic and using it to explore many alternate mechanisms for categorizing problems and scaling them for consistency. Based on this, the period between 2016 and 2021 was chosen among the inclusion criteria to ensure standardized checkpoints with details and printed in journals and conference proceedings remain. It show at table 1. The selection of inclusion criteria is as follows :

a) Publication between 2016-2021
b) Routing communication protocol that VANET provides
c) Routing decisions are based on the type of communication that exists

And for the exclusion criteria :

a) Only the communication protocols being compared are known
b) Duplication of research documents from the same study

There are several methods that can be used to create an vanet systems. Vehicle to Vehicle data transfer is one of the key challenges in VANET architecture since it is required to design complex routing protocols. Traditional MANET in-routing differs from VANET routing due to a very complex topology [13]. Routing into VANET can be divided into the following major categories (it show at Picture 2).

Position Based Routing Protocol

In a location-based protocol, routing decisions are based on the geographical position of the car [14]. This does not involve building or managing a road, but includes location resources to assess the direction of the point of interest. Any of the positions widely used by providers are Global Position System (GPS), DREAM Location Services (DLS), Reactive Location Services (RLS) and Simple Location Services (SLS) (SLS) [15]. With the advent of GPS-based location services, place based routing protocols are increasingly relevant.

Broadcast Based Routing Protocol

This is the most widely used routing protocol in VANETs, especially in safety-related applications. In broadcast mode, packets are transmitted to all nodes in the network and each node in turn re-broadcasts the message to other nodes on the network [16].

Flooding is the primary method used in routing protocol broadcasting. However, the product of the blind flood storm issue in the broadcast. Broadcast storms will overwhelm restricted channel bandwidth, creating channel congestion that decreases communication efficiency [17]. Broadcast routing is also used in VANET to share, traffic,

Table 1: Inclusion and Exclusion criteria.

Criteria	Inclusion	Exclusion
Timeline	2016-2021	-
Document Type	Article Journal, Conference Proceeding, Article Review	duplication
Language	English	-

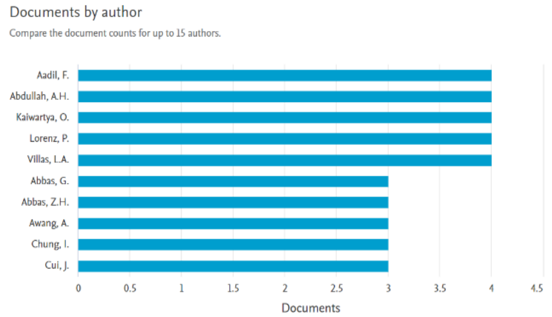

Figure 3: Document by author.

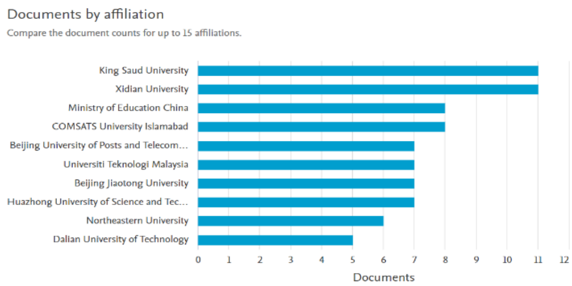

Figure 4: Documents by affiliation.

weather and accidents, road conditions between vehicles and transmitting advertising and announcements.

Cluster Based Routing Protocol

Grouping in an ad hoc vehicle network can be described as virtual partitions of hierarchical nodes into different classes. A number of nodes identify themselves to be part of the cluster [3][18]. Dedicated nodes, known as cluster-heads are responsible for routing, conveying between cluster traffic, arranging intra-cluster traffic and assigning channels to cluster members. Cluster-based routing is favoured within clusters. A number of nodes identify themselves as part of the cluster and the node is which is designated as the cluster head may broadcast packets to the cluster [19]. Good scalability can result in large-scale networks but delays and network overhead are faced when creating high-mobility VANET clusters.

Multicast/Geocast Routing Protocol

Multicast routing enables message delivery from central source to a set of starting points of interest. Geocast routing is essentially a location dependent on multicast routing, which attempts to deliver information from the source node to all other nodes within a given geographic region [3][20]. Geo cast is called a multicast facility in a single geographic region. Usually determines the forward zone where it redirects the flooding of packets to mitigate message overhead and network latency created by only flooded packets everywhere [21].

3 Result research

In this part, the SLR implementation approach succeeded in acquiring and locating 46 research journals that addressed in general about the vanet system based on locations. The research documents collected will be analyzed based on the publishing of the chosen journal index database and classified according to the publication year between 2016-2021 before the research report is compiled to address research questions.

Figure 3 show the distribution of review documents carried out by the researchers. From the picture, it can be seen that Aidil F, Abdullah A.H., Kaiwartya O., Lorenz P., and Villas L.A. became the most prolific writer by publishing a series of scientific works of 4 journals. Other researchers have provided fewer than 4 journals. The scientific work obtained is calibrated to the parameters provided in this paper.

Judging from the affiliation variables, King Saud University and Xidian University are the main contributors in this research area by publishing 11 research papers, as seen in Figure 4.

Study in this field continues to grow every year, and it appears that much of the findings of this research are published by IEEE Access each year. This reality can be seen in Figure 5.

Vosviewer is used to perform research and visualization of data from search results. Title and abstract subjects of each and every included publication examined

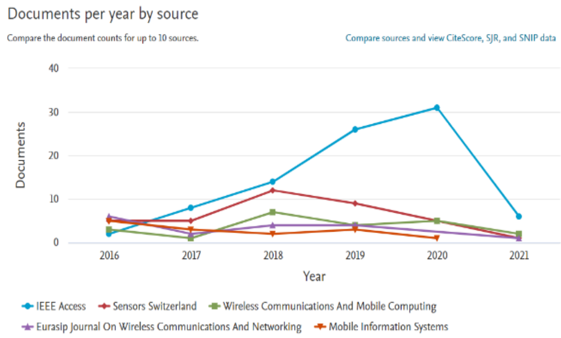

Figure 5: Documents per yer by source.

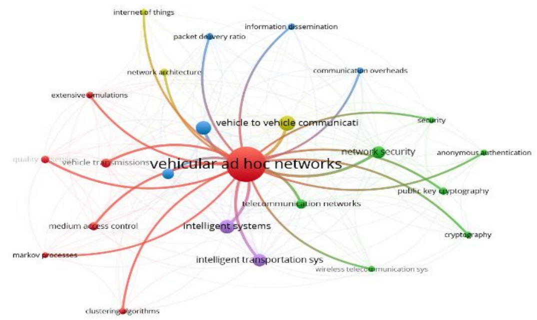

Figure 6: Keyword visualization of VANET.

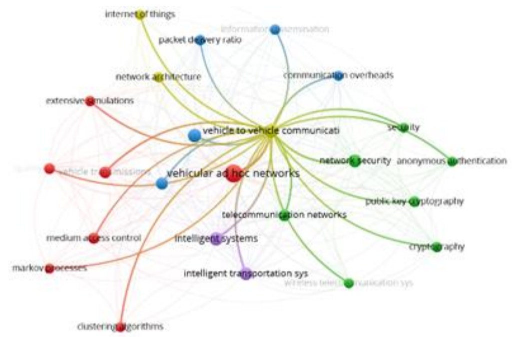

Figure 7: Visualization related v2v communication.

Position Based Routing Protocol	Broadcast Based Routing Protocol	Cluster Based Routing Protocol	Multicast/Geocast Routing Protocol
Good Performance in Highway	packet transmission is reliable, Since packet is delivered via many node	It has good scalability of large networks	Reduced network overhead and congestion
Global Route not Required	Minimize overhead by occurrence of broadcast storms	Delays in highly dynamic networks	Reliable packet delivery in highly dynamic topology
With high mobility in environment stability increases			

Table 2: Comparison of routing protocol on VANET.

Protocols	Position Based Protocols	Broadcast Based Protocols	Geocast Based Protocols	Cluster Based Protocols
Prior Forwarding Methid	Heuristic Method	Wireless Multihop	Wireless Multihop	Wireless Multihop
Digital Map Requirement	No	No	No	Yes
Virtual Infrastructure Requirement	No	No	No	Yes
Realistic Traffic Flow	Yes	Yes	Yes	Yes
Recovery Strategy	Carry & Forward	Carry & Forward	Flooding	Carry & Forward
Scenario	Urban	Highway	Highway	Urban

Table 3: Compar.

and were extracted using VOSviewer to classify recurrent words using comparative citation scores. Two length maps were developed for publications throughout the study period to exemplify the degree of co-occurrence, and terms effect was measured primarily based on their citation ratings.

As appeared in Figure 6, the topic of vehicular adhoc networks connects with other points or keywords such as vehical to vehical communications, network security, intelligent system, internet of things and several other keywords [22]. In some studies, such as, the topic of vehicular adhoc network is closely related to vehicle to vehicle communication.

If we see vehical to vehical communications as the core as seen in the Figure 7, we can see that v2v communication topics in the sense of vanet have close connections with other topics such as communications overheads, internet of things, network security, telecommunications networks, public key criptography, intelligent systems and several other topics [23][24].

4 Discussion

There are several studies related to position based in ad hoc network vehicles. This research looks at the advantages and disadvantages of the simulation results carried out, including the data transmission process, the use of the number of nodes and the efficiency of the communication process between nodes.

In [25] Location information plays an essential role in regional routing protocols for packet routing. Network based systems provide location based services with location information processed in a distributed manner. Regardless of their personal relationship, venue and routing facilities need to be viewed independently. Therefore, in calculating the overhead of regional routing, the overhead arising from location-based networks is not taken into consideration. Its purpose is to combine routing protocols and location-based services, to minimize routing overhead and latency in communications. Our primary contribution is the elimination of position overhead.

Table 2 show a comparison between the routing protocols that were run. This comparison shows the advantages possessed by each protocol. Table 3 show the comparison of various routing protocol based on different parameters [26].

A Geographical Routing Protocol is paired with Grid Location Services. Instead of putting an order for the exact location, the packet is sent to the position of its previous destination. If the packet reaches its original spot, its precise location is demanded. The study undertaken explored the feasibility of a hybrid of location-based systems and regional routing. It has been proven that this combination not only results in decreased position overhead but also improves the efficiency (50 %) of routing [25][27]. Previous comparisons with other location-based services reveal that the hierarchical mechanism is extremely dynamic with periodic topology changes due to high node mobility needing supervision to ensure good results [28]. This proposed solution takes into account the previous location for packet routing when sending packets and enables it to reach the destination node faster. The aim is to make the mechanism a significant reduction in the quantum of location requests prior to packet delivery.

From Figure 8, Statistics derived from the simulation related to location such as location access cache, and cache average and the quantum of requests and updates sent can be seen on request slots. The measurement of site performance is dependent on the Query Success Ratio (QSR) as shown in the Query success ratio. The parameter of the routing effectiveness is the PDR or packet delivery ratio as expressed in the packet delivery ratio. This can be expressed as the ratio of CBR packets received and delivered. The CBR Latency picture reflects the latency of the CBR packet. CBR package latency is determined based on the discrepancy between the delivery time of CBR packages at the source and the corresponding arrival times at the destination [29]. [30] Maintaining durable synchronization during data forwarding in the Vehicle Ad hoc Network. This has been a critical issue in recent decades with the goal of promoting most new implementations of smart transportation networks. Most of the strategies are dependent on selecting the next hop vehicle from a defined forwarding area by two or three criteria like speed, distance and direction, and ignoring

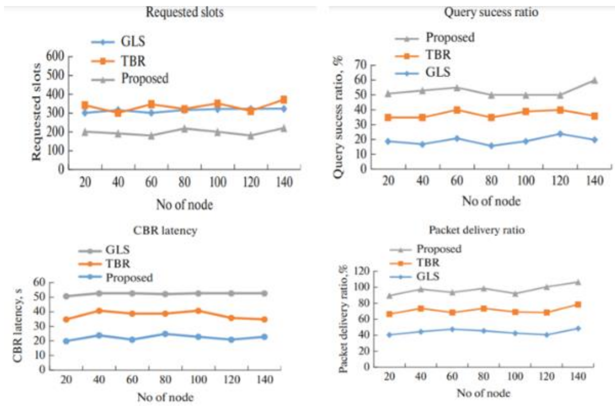

Figure 8: Process relation in packet transmission [25].

several other urban environmental parametersn. It show at Algorithm 1.

```
Process
  1.  Initialization
      M_D = D_is[0]; M_S = S_p[0]; Mi_a = A_n
      [0]; W_f[] = {60,30,10};
      S=0; i =0; j =0; k = 0;
  2.  for each Vi ∈ S_dn
  3.      if (D_is[i]> M_D ) then
              M_D =D_is[i]
          if (S_p[i]> M_S ) then
              M_S =S_p[i]
          if (A_n[i]> Mi_a ) then
              Mi_a =A_n[i]
              i + +
      end for
  4.  for each Vi ∈ S_dn
        if (M_D == D_is[i] ) then
            T_D[i,0]=1;
        else
            T_D[i,0]=0;
            if (M_S == S_p[i] ) then
                T_D[i,1]=1;
            else
                T_D[i,1]=0;
                if (Mi_a == A_n[i] ) then
                    T_D[i,2]=1;
                else
                    T_D[i,2]=0;
                    i + +
      end for
  5.      for each Vi ∈ S_dn
  6.          for j < 3
                  S = S + T_D[i, j]* W_f[j]
                  i + +; j + +;
          end for
              Wv[i] = S;
  7.              for each Vi ∈ S_dn
                      if (Wv[i] > Wv[k] ) then
                          k = i
                  end for
  8. NHV = k
  9. exit
  Output: A vehicle with the maximum summation of its weighting factors
```

Algorithm 1. Procedure next nope vehicle selection [28]

Safe areas and dangerous areas have been identified for optimum next hop vehicle selection. The risk of protection and hazardous vehicle outages is measured to prevent choosing an unreachable vehicle. Future locations have been expected for all dangerous cars to stop faulty vehicles. The use of weighting factors has allowed M-GEDIR to pick the optimal vehicle produced in higher throughput. It also cuts hop count without impacting connection efficiency resulting in lower end-to-end delays. The correct routing decisions of the proposed protocols minimize the risk of connection errors resulting in lower route break rates. M-efficiency GEDIR's with differing vehicle speeds and densities has been tested and contrasted with cutting-edge protocols on throughput criteria, connection faults and end-to-end delays. The review of the simulation findings explicitly reveals that the M-GEDIR routing decision is more accurate and efficient for urban vehicle scenarios as opposed to being considered a cutting-edge protocol. The findings of this analysis suggest the Multi-metric Geographic Routing (M-GEDIR) methodology for the discovery of the next hop. It selects the next hop vehicle from the diverse forwarding region, and considers the key parameters of the urban environment including, receiving signal frequency, future location of the vehicle, and critical area vehicles at the limit of the transmission range, in addition to speed, distance and direction. M-efficiency GEDIR's is measured. The Multi-metric Geographic Distance Routing Protocol (M-GEDIR) for networks is dependent on the selection of the next hop vehicle from the complex forwarding area taking into account multiple metrics. It show at Algorithm 2.

```
Process
  1.  Initialization
      C_F = ϕ; S^vi = ϕ; U^vi = ϕ; Θ = 180⁰;
  2.  S_dn = {Set of direct neighbor vehicles that located in Fr_c}
      C_F broadcast RREQ_i to S_dn
  3.  if (RREPi not received) then
              C_F carry the packet until Vi find
  4.  else if (V_D ∈ S_dn) then
              Forward the data packets to V_D using available direct link
              then V_D broadcasts the data packet within geocast region
          exit
  5.  else
      while (C_F ≠ V_D )
  6.      for all Vi ∈ S_dn find the S_max
              Calculate Δs using Equation (3)
                if (Δs > 0) then
                    Calculate approximate d^(US_area) using Equation (4)
                else
                    R' = R
                endif
          endfor
                a. U^vi = {Set of unsafety vehicles}
                b. Calculate US_area using Equation (2) & (4) to find U^vi
                c. S^vi = {Set of safety vehicles}
                d. Calculate S_area using Equation (5) to find S^vi

  7.   for each Vi ∈ S_dn
           Calculate D using Equation (7)
           e. If (D > R') then
           f.    If (P_r ≥ δ) then
           g.       If (S_max > S^(U^vi) ) && ( S^(C_F) > S^(U^vi) ) then
           h.          If (F^(U^vi) ≤ R) then
                           Select optimal unsafety vehicle from US_area using Procedure 1
  8.         else If (P_r > δ) then
                       Select optimal safety vehicle from S_area using Procedure 1
             endif
       endfor
  9.   Select NHV = A vehicle has highest weight factor
  10.  Transmit the data packet to NHV and NHV = C_F
       endwhile
       endif
  11.  exit
       Output: Optimal NHV from either S_area or US_area
```

Algorithm 2. Procedure m-gedir [28]

Other studies have also looked at diverse topologies [31], high node mobility, and complex channel conditions in urban cities, where current routing approaches are vulnerable to regular connection interruptions and channel congestion. To solve this problem, secure spatial routing dependent on Quality of Forwarding (QoF) in an vehicle adhoc network (VANET) is an alternative approach to connectivity problems between data and information transmission between nodes, where the best route is decided by ensuring QoF and meeting the requirements. link reliability. Two theoretical models for QoF and relation reliability analysis are first introduced. Taking into account transmission costs and parcel distribution ratios, QoF is then used to provide a quantitative assessment of the road segment by the road weight evaluation (RWE) scheme provided, which takes into account the effect of the relative location of the road. relation on network results. Furthermore, to match the size of the modern area network, the city map is split into smaller grid areas. Based on the destination location, various transmission methods are presented for packet forwarding.

Several studies have used a point geographical routing protocol as a data source for research in vanet systems. This is done including in determining the optimal route for communication between nodes. As has been [10], [30], [32], [33] and [34]. [32] presented an innovative technique to provide intelligent transport with improved traffic

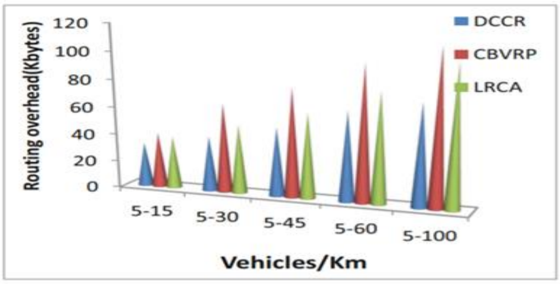

Figure 9: Vehicle velocity vs pafket delivery ratio [36].

```
//Vehicle Vi upon entering anchor area of J_i
Set timer T_a = t_ant
Upon Vi receives an ant do
if (the only junction recorded in the ant==J_i) then
    Reset timer T_a (timer T_a = t_ant)
end if
end do
Upon timer T_a = 0 do
    Launch ant
    Reset beacon timer
    Set timer T_a= t_ant
end do
Upon Vi left the anchor area do
    Cancel timer T_a
end do
```

Algorithm 3. Ant launching process [28].

regulation and safety, a new position-based routing protocol called Traffic Dynamism-Balanced Routing Protocol (TDBRP) for VANET. In the study, the results outperformed the existing work by minimizing the routing overhead and end-to-end delays by an average of 16% and 13%, respectively, and increasing the average PDR value by 25% over the others. [32] also states that the proposed protocol also proves that packet forwarding based on two-hop neighbor information provides better results and efficient.

Another thing that is no less important in the communication that occurs in vanet systems is the traffic aware routing protocol. Research [35] provides a traffic-aware position-based routing protocol for a vehicle ad hoc network (VANET) that is appropriate for a city setting. The protocol is an upgraded variant of the regional root routing protocol (GSR) (GSR). The suggested protocol, called effective GSR, uses an ant-based algorithm to identify routes that have optimum network connectivity. It is expected that each vehicle has an automated road map consisting of intersections and road segments. It show at Algorithm 3.

Using the information included in a tiny control packet called an ant, the vehicle measures the weight for each road segment relative to the network connectivity of that segment. The ant pack is launched by the vehicle in the crossing area [22] [36].

In order to find the best route between source and destination, the source vehicle file determines the routes on the road map with the least cumulative weight for the entire route. The correct functionality of the proposed protocol has been tested, and its consistency has been evaluated in a simulated environment.

The simulation results show that the packet distribution ratio is improved by more than 10 percent for speeds of up to 70 km / hr relative to the VANET routing protocol based on ant colony optimization (VACO) that also uses an ant-based algorithm. In addition, the management of routing overhead and end-to-end delays is also minimized, it demonstrates that what the EGSR offers provides reasonable performance and leads towards an operationally effective routing protocol in VANET [35].

Another analysis that can be taken is the clustering model [37]. Where the clustering paradigm is one of the most effective ways to obtain a compact topological structure. With the growth of the ad hoc vehicle network (VANET), smart transportation networks provide more and more services. However, the mobility characteristics of the VANET trigger frequent disconnection of the road, particularly during data transmission. Real-time systems require data transfer delay to be sufficiently reliable. In location dependent routing with adequate density in the atmosphere it can achieve the above objectives quickly. In this work, we propose a density-connected clustering-based routing protocol (DCCR), a position-based density adaptive clustering driven routing protocol. The comparative simulation was performed using NS2.34. Vehicle movement was simulated with SUMO (Simulation of Urban Mobility) (Simulation of Urban Mobility). SUMO considers several parameters including vehicle acceleration, deceleration, height, and maximum speed. The simulation parameters are presented in Table 4.

This method preserves connectivity between two successors in a row taking into account various matrices such as density and average relative velocity standard deviation. The suggested protocol indicates an improvement in packet distribution ratio, end-to-end latency relative to current approaches.

Figure 9 shows the comparison among DCCR, LRCA, and CBVRP in terms of contact overhead. It is found that as the mass of the vehicle grows, the cluster size also increases, owing to this, CH overhead also increases; in the case of LRCA and CBVRP, we will find that this only occurs due to unequal size of the clusters.

Another clustering paradigm that can be used is the cluster-based VANET guided evolving graph (CVoEG) [38]. This cluster is expected to extend the VoEG paradigm to increase the burden of conveyance communications. Here, relation accountability is used as the criteria for the choice of cluster member (CM) and cluster head (CH). The predicted CVoEG model divides the VANET (vehicle) nodes into the best variation of the cluster (ONC) by exploiting the Eigen distance heuristic. The simulation results reveal that the predicted themes far outperform the current schemes in terms of accountability,

Simulation parameters	Value
Simulator	Ns-2(v2.34)
Simulation time	400 s
Area range	Road segment length(4000 m)
Maximum velocity	5-35 m/s
Transmission range	250 m
Number of vehicles	5–100
Number of lane	4
Bandwidth	2 Mbps
Interface queue length	50
Traffic type	CBR
Packet size	512 bytes
Beacon interval	200 ms
δ	1 m/s
τ	0.1–0.3

Table 4: Simulation parameters [39].

efficient routing requests (RRR), packet distribution quantitative partnership (PDR), completion to completion latency (E2E).

In another research [39][40], ad-hoc vehicle networks (VANETs) have become increasingly relevant in intelligent transportation systems, intelligent vehicles can easily share critical or urgent traffic information and make driving decisions. Meanwhile, protected data exchange and vehicle identity privacy are used to overcome security problems by using the ElGamal encryption technique with a tweaked Schnorr signature technique. In addition, incorporating physical layer network (PNC) coding in vehicle-to-all communications to handle time-critical properties will minimize short touch time issues created by high-speed vehicle travel [41]. General conceptualizations that can be extended to the communication domain of an Intelligent Transportation System (ITS) enable the exchanging of information between applications and services running on the equipment that makes up a VANET, particularly moving vehicles, fixed road infrastructure systems, and mobile personal devices [42]. In this particular setting interoperability is accomplished by the use of some wireless networking systems and protocols.

In [43] Network forming and deformation between vehicles are very frequent due to differences in speed. In addition, for security applications, messages do not face any delays or collisions. Therefore, establishing connectivity between vehicles is becoming more difficult. Position-based routing protocols operate productively in vehicle ad hoc networks. Efficient routing protocols need to pay careful attention to the effect of the media access control layer parameters. In the case of a collision [44][45], a significant number of nodes will retransmit instead of transmitting new packets (node backlog). Packet collisions may also occur due to disagreement when multiple vehicles using the same slot when approaching each other encounter collision vehicles, particularly in two-way highway traffic. Some plan to repair a two-way traffic interaction collision by splitting the frame into two sets: one for traffic in either direction. The modern so-called PTMAC based TDMA protocol in a new way predicts encounter collisions and essentially decreases the number of collisions. Whereas the first protocol developed for both two-way traffic and four-way intersections reveals that based on predictability, collision encounters can be significantly minimized by two-way traffic and four-way intersections independent of the traffic load on separate road segments [44]. From the Figure10 shows how the collision process of sending data and information can occur so that it can interfere with the process of sending information between nodes.

For alert message transmission, the direction-oriented Greedy protocol chooses the next hop based on the current position of the relay node to the destination node, which is an effective solution to uni-directional traffic [46]. However, the protocol suffers from performance loss regardless of the direction of travel of nodes in two-way traffic where topology variations occur dynamically. This research uses the direction of travel and relative locations of source and destination nodes to meet the complex design of a two-way highway environment for effective and robust alert message routing. Path Aware Best Forwarder Selection (DABFS) routing protocol takes into account the direction and relative location of the nodes. The first parameter involves the nodes the direction of travel is determined by the Hamming wavelength, while the second parameter is the relative locations of the source and destination nodes. This parameter is very critical for the selection of the next hop in traffic. Bi-directional use of parameters to maximize throughput and reduce packet loss and latency, and make it possible to meet topology changes during transmission.

Figure 11 presents the DABFS protocol run for V2V communication between nodes traveling on a real-time bidirectional highway scenario. The Picture 11 shows a full picture of the proposed protocol, swhich performs direction-based priority assignment among many path to a goal.

In [47] Effective management of transportation status poses a key problem for the implementation of the Intelligent Transportation System (ITS). A microscopic congestion detection protocol (MCDP) was proposed to allow vehicle-to-vehicle (V2V) connectivity capable of tracking vehicle congestion and detecting traffic jams. Through implementing the current transport control domain network protocol header, each vehicle can compute its neighbors and approximate the time interval between vehicles.

MCDP offers an infrastructure-less solution file for microscopic calculations of vehicle mass, flow, and average speed. In practice, safety speed limits are enforced to allow each driver measure the time it takes to cover the gap between cars, so that each vehicle is able to determine the congestion of traffic by measuring it with any predefined safety time threshold.

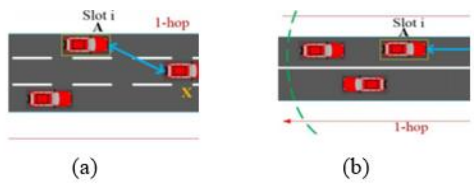

Figure 10: Potensial collision [43] (a) same direction and (b) opposite direction.

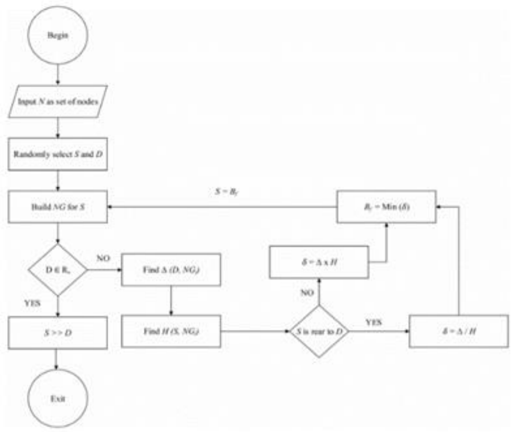

Figure 11: DBAFS protocol [45].

Table 5: Summary table for VANET related research.

Article	Protocol		Vanet Routing Protocol				Scenario Urban/Highway	Method
	Proactive	Reactive	Position Based	Broadcast Based	Cluster Based	Multicast		
[3]	√	-	√	-	-	-	Highway	Wireless Multihop Forwarding
[7]	-	√	-	√	√	-	Highway	-
[9]	√	-	√	-	-	√	Highway	Kalman Filter
[13]	-	√	-	√	-	-	Urban	-
[16]	√	-	√	-	-	-	Highway	Kalman Filter
[23]	-	√	√	-	-	√	Highway	Distance and Direction
[31]	√	-	-	-	-	√	Urban	Road Perception Geographical
[33]	-	√	-	-	-	√	Highway	Bidirectional and multilane roads
[36]	-	√	√	-	√	-	Highway	-

In MCDP, vehicles within contact range share macroscopic information locally, and each vehicle can thus approximate the surrounding vehicle\tendensity. Tendensity prediction is allowed by calculating distinct neighbors and time headway (spacing coverage time) to forecast upcoming congestion. Picture 12 show illustration workflow MCDP Process.

Spacing among vehicles is calculated under various vehicle densities and then headways are calculated under highway speed limit. Due to the microscopic feature, every individual vehicle calculates its own headway as an indicator of congestion.

Table 5 shows several research results related to the use of protocols in the vanet system. several scenarios and methods were used with different results and outputs. the effect of using the type of routing protocol also affects the quality of data and information delivery

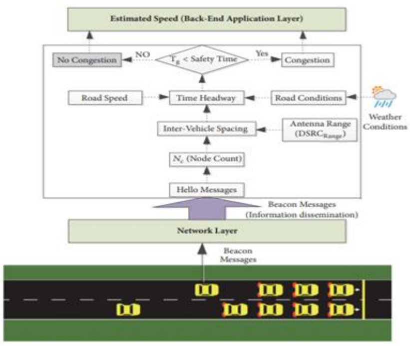

Figure 12: Ilustration workflow MCDP.

Table 6: Simulation parameters.

Parameter	Value
Safety time/Headway	t_s = 2 second
Transmission range	$DSRC_{range}$ = 1000 m
Vehicle's length	5m, 10m
Highway type	Chinese roads [28]
Number of lanes	City road=1,National highway=1,Express road=2,Expressway=3
Number of Vehicles	2 to 70 randomly generated
Probability of Cars	0.80
Probability of Buses	0.20
Speed limit	40, 80,120,130 km/h [32]
Lane 1 Speed	100 km/h
Lane 2 Speed	120 km/h
Lane 3 Speed	130 km/h
Simulation runs	50
Simulation time	200s
Propagation model	Two ray ground

Table 6 show the summarizes all the assumed criteria for scientific evaluation. The safety time headway is known as an efficiency measure.

5 Conclusion

There are several studies related to position based in ad hoc network vehicles. This research looks at the advantages and disadvantages of the simulation results carried out, including the data transmission process, the use of the number of nodes and the efficiency of the communication process between nodes. This paper has presented the SLR results regarding the communication model in vehicular adhoc network systems. The 4 categories in vanet system topology, namely position based routing protocols, broadcast based routing protocols, cluster based routing protocols and multicast / geocast routing protocols, have fundamental differences, especially in the concept of sending data and information between nodes. In addition, standardization and integration of data delivery between nodes is still an interesting thing to study. The ability to send data properly in busy and fast traffic conditions has its own challenges. For this, there are many variables that must be considered, so that communication between nodes will be better. This research is expected to be the basis for future research into the vanet system subsection. Looking at the comparison of the results of this study, the routing protocol indicates that there are many variables that affect the result of the data and information transmission smooth process. Node Moving, path topology, signal transmission behavior, and data/information transmission processes need to be better results. So it must develop protocols to form the direction of the data transmission process .

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