Innovations

Performance analysis of Wireless based VANET using Dynamic Self-Configured Weights for high Quality of Services

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Abstract: *Ad hoc networks have become more popular in recent years and have garnered a lot of interest from researchers, potentially leading to significant technological advancements. Such networks are anticipated to play a significant role in the development of next-generation access networks, whereby end consumers would demand multimedia services offered throughout the world via their wireless gadgets. In the present study, we specifically concentrate our scientific end eavours in the field of Vehicular Ad hoc Networks (VANETs) and Mobile Ad-hoc Networks (MANETs), two distinct types of ad hoc networks that may be utilized to deliver engaging multimedia experiences. A QoS(Quality of Service) is offered over MANETs and VANETs which is an important concern for the researchers due to their distinctive features, which include accessibility, flexible network structure (especially in Vehicular Ad hoc Networks), energy limitations, infrastructure-less design, and variable link potentials. As a result, new techniques for routing must be developed specifically for use in MANETs and VANETs capable of offering services involving multimedia. The primary objective of this study is to improve decision-making regarding pathways or subsequent hops while sending video-reporting messages by contributing to the establishment of the communication architecture of MANETs and VANETs. This would make it feasible to quickly address citywide issues and support emergency response agencies (such as the police,ambulances, and medical facilities) in the event of a crisis (such as a traffic collision). In order to generate a realistic setting for VANETs, we also examined the existence of obstacles on real mappings. The data packet is also kept in a buffer for a specified amount of time while the transmitting neighbour node is discovered in the instance that there is a barrier preventing the prospective next forwarding node from passing through the current forwarding node; alternatively, a loss in the packet happens. We suggest an innovative method of routing that utilizes a game-theoretical strategy for N number of consumers specifically created to send video messages to enhance the MANETs' communication foundation. By obtaining a huge increase in packets that have a lesser average end-to-end latency, less jittery signals, and an increased Peak Signal-to-Noise Ratio, our technique increases network efficiency and customer satisfaction. Additionally, we suggest the Multimedia Multimetric Map-Aware Routing Protocol (3MRP), a spatial routing method for VANETs that considers various metrics [1]. A geographic approach that uses hop-by-hop forwarding is called 3MRP. The length of the route, the number of vehicles that exist in the range of the gearbox, the utilization capacity of the bandwidth, the potential paths of the nearby nodes, and the impairments in the MAC layer are the parameters taken into account by 3MRP. A Multimetric value is created by weighing each of these metrics. As a result, a node chooses one of its neighbours to serve as the most effective forwarding node in order to raise the number of successfully delivered packets, reduce the average packet latency, and provide a particular standard of service and performance. In addition, an innovative technique called DSW (Dynamic Self-Configured Weights) calculates the weight assigned to every measure in accordance with the state of the network. Nodes are subsequently more accurately categorized as a result. In conclusion, we provide Game Theoretical Multimedia Multimetric Map-aware Routing Protocol, also called the G-3MRP, an entirely novel routing algorithm for VANETs that is founded on a game theory approach for N number of consumers for transferring video communications for reporting in city areas. Three distinct kinds of video footage-I, P, and B-*

will be relayed across as many as three neighbour nodes in G-3MRP, which relies on 3MRP. A similar set of metrics that are used in 3MRP are employed. In comparison to 3MRP+DSW, G-3MRP delivers a greater level of customer satisfaction, thanks to users receiving a greater number of packets having a greater average PSNR. We additionally looked at the problem of VANETs in urban environments spotting impediments on real maps. Having created the REVsim [3] program specifically for such applications to ensure our suggested routing protocols could be readily building aware, preventing nodes beneath buildings from being selected for the subsequent forwarding nodes. Additionally, ourmodels remain more reliable.

Keywords: *DSW, VANET, Wireless communication, Vehicular ad hoc networks, Computer architecture, Analytical models, Delays, Queueing analysis*

1. Introduction

Reactive protocols were never meant to handle the high mobility throughout route finding. This varies frequently as a result of breakdowns in the VANET that result in increased broadcasting as well as flooding throughout the whole network so as to find alternative pathways. Additionally, the start of routing takes a while to complete, which means that it is possible that delay will fundamentally change things. Such things make ordinary responsive procedures, as they currently exist, insufficient in the case of applications that require quickness like Cooperative Collision Avoidance. A crucial group of safeguarding features for VANETs known as CCA uses vehicle-to-vehicle (V2V) communication to give drivers ahead-of-time alerts [13]. Reactive routing protocol Ad Hoc On-Demand Distance Vector (AODV) has the ability to support both unicast communication and multicast communication. As in the case of other reacting procedures, Ad Hoc On Demand Distance Vector permits topological data communication between nodes when there is a need for it. At an instance when there is an information that needs to be transmitted, an RREQ message is initially transmitted, that is transmitted by a connecting node till it hits its intended location. When the receiver either assumes the role of the node using the requested address or possesses a path to the destined location, a unicast communication is enabled that transmits the route reply message to the point of origin. Vehicle-to-Vehicle as well as Vehicle-to-Infrastructure interactions form the foundation of the Vehicular Ad hoc Network (VANET). Vehicle mobility presents a significant design difficulty for VANETs. This study gives you a foundational understanding of vehicular mobility and the way it affects the overall density of the VANET network as well as V2V/V2I connectivity. This study consists of two sections: To evaluate network capacities that can provide V2V connectivity across various road traffic levels, the first section includes modelling of a particular kind of vehicular mobility— freeway mobility. One will discover a simulation of a basic graphical tool that visualises and evaluates two different user-specified VANET situations in the subsequent section: (i) V2V interactions within a four-way intersection; and (ii) V2I interactions involving a vehicle and distributed RSUs. Video streaming via the Internet has grown into an established technology over the past ten years, with several effective applications including video conferences, video surveillance, information on demand, etc. Thanks to recent advancements in portable computers and wireless technology, the technological telecommunications framework to deliver these infrastructures for streaming video and other applications for multimedia to a wider range of wireless end consumers has recently become a fact to be accepted. However, there are nonetheless many more hurdles to overcome before offering end customers services for streaming videos of appropriate quality. Resource constraints (like the power capacity of the CPU, connectivity, capacity for storage, and battery backup), shifting circumstances (like resource allocation), and a greater frequency of errors (like errors in bits, path modifications, and inability to maintain a steady connection) are the root causes of these difficulties. Additionally, these difficulties are exacerbated in 802.11 connections operating in infrastructure-less mode, in which nodes are able to function as servers, clients, as well as routers. These kinds of networks might be operational despite any type of existing framework while also covering enormous geographic areas. MANETs and VANETs will be the main topics for discussion in this research. A MANET constitutes a collection of wireless mobile nodes that may interact among one another autonomously, without the use of fixed networks or centralised administrative services. Data communication while in crisis intervention in isolated regions or in situations when a calamity (such a natural disaster) has either completely or partially damaged the current infrastructures are applications for MANETs. Additional MANET applications might enhance people's standard of living and behaviours on an everyday basis. It is highly possible that a substantial amount of the communication data being transferred in the years to come will be video, given the high number of people who maintain a minimum of one modern communications device—capable of recording and delivering video content—in their hands. For instance, Cisco predicts that streaming media will account for eighty percent of mobile data usage by 2019 [4]. The use of streaming video via MANETs has several uses. For instance, during emergencies, a firefighter can put on a head-mounted camera to stream real-time footage from the scene to the distant command centre, improving the situational awareness. Yet another scenario might be amid athletic competitions when footage from cameras worn by athletes are shared. A further instance would be if a crash occurred and dynamic sensors (such as people with cell phones) captureda quick video of the incident to transmit across the MANET. This could facilitate speedy response by alerting various emergency agencies and the public, and perhaps as a result, it could potentially save people's lives. To enable video-streaming technologies in such settings, numerous research concerns have to be solved. Vehicles serve as the nodes in VANETs, which are a kind of MANETs [5]. Over the past ten years, there has been a lot of research on VANETs. A wide range of intriguing applications for Intelligent Transportation Systems (ITS) was a major driving force behind the invention of VANETs [6] [7].

2. Literature Survey

Vehicles with the capability of connecting to various other vehicles to establish vehicle-to- vehicle connections or that are able to connect with stationary devices besides the road, known as a roadside unit (RSU), to establish vehicle-to-infrastructure (V2I) communications, are considered nodes in these kinds of networks. Drivers and regulators can receive a variety of data through V2V and V2I transmissions. Through incorporating on-board technology like network interfaces, various kinds of sensors, and GPS receivers, VANET enabled smart vehicles to possess the capacity for gathering, analyzing, and distributing data pertaining to one another and the related circumstances to RSUs or to various neighbouring vehicles withinthe reach of the gearbox [8, 9]. The establishment of communication by means of ad hoc technology supporting services for multimedia like streaming of video files constitutes the primary driver behind this theory. This study focuses on ad hoc vehicular as well as mobile communications in urban settings. A whole new set of intriguing services are now possible, thanks to the presently existing state of smart cities. However, there are difficult problems that must be solved in the development of routing algorithms in order to deliver information encrypted as video files via ad hoc means. The creation of an infrastructure to quickly alert
officials when events happen on city roadways is the primary focus of the present study. This will be crucial for smart cities. Effective methods of routing specifically created for ad hoc networks need to exist to accomplish this goal. We have created an innovative routing algorithm that employs a game-theory-based technique for N number of consumers to enhance the efficiency of transmitting messages in the form of video content across MANETs to accomplish this broad achievement. The creation of this technology was built upon the Multimedia Multipath Dynamic Source Routing Protocol [10]. By playing a strategic routing game, people can ensure that the most significant data is transmitted by the best of the two most effective routes with a given probability p * rather than always using the most favourable path available. When it comes to VANETs, we have created methods to enhance routing that are specifically created for reporting applications that make use of video format in urban settings. Each of our suggestions for routing algorithms for VANETs was built on Greedy Perimeter Stateless Routing [11] as a point to begin. Considering the great capability of the nodes to move (i.e., vehicles), establishing a direct route is not appropriate in the caseof using VANET, hence it is therefore not advised to utilize topology-based routing protocolslike (Dynamic Source Routing protocol [12]. Additionally, by selecting the most suitable nextforwarding node and applying deterministic metrics, we made improvements to the hop-by-hop forwarding choice. Through the process of creation of a program called REVsim [3], we have also added a map-aware capability in order to ensure each vehicle stays apprised of nearby activity of structures. This will stop vehicles beneath barriers from being chosen as a subsequent forwarding node. Moreover, given that buildings might distort the signal and possibly prevent a packet from getting transmitted to a neighbouring car beyond a building, our simulations are enhanced by simulating what might take place in real-life situations. Additionally, we've added a buffer to hold packets providing a

technique to lessen the loss of packets in the instance that little neighbours were nearby or a barrier was found among this particular forwarding node and each prospective subsequent hop node. At last, we introduced a game theoretical forwarding plan apart from the newly suggested routing algorithm meant for VANETs to ensure the fact that people may engage in a strategic routing game in which the crucial data will ultimately be delivered by means of one of the two most effective readilyaccessible forwarding nodes with a given probability p*. Previously, the most effective forwarding node was constantly employed to transmit the data that is most significant. Our study led to the development of various approaches. To begin with, using a game-theory- based method for N number of consumers, we have developed an innovative distribution method for MANETs to transmit messages in the form of video files within an urban setting. The aforementioned structure might get implemented in smart cities within which one of the main objectives is to avoid disasters and rapidly alert emergency personnel if a problem occurs. In this proposed approach, users participate in a strategic routing game in which the I+P video frames are delivered using one of the two best possible routes with the given probability p * rather than using the most available path. The advantages of the method we use are demonstrated by simulation results in MANETs environments as contrasted with the situation of not employing our game-theoretical routing when contrasted with different conventional routing methods. Due to the novel method of choosing the forwarding path based on p *, results are significantly better with regard to losses in data packets, latency, and jitter. Additionally, our suggestion works better than the end user's perception of the video's level of quality. Additionally, gains with regard to the number of packet losses, the average packet delay, and the average delay jitter are together exhibited in the initial calculation findings of a VANET circumstance for N = 2 source vehicle. Secondly, in order for VANET simulations to produce reliable findings, it is crucial to take into consideration the prevalence of impediments (mostly constructions in cities) based on real map settings. The explanation suggests that if the subsequent forwarding node were to be located behind a construction, the

signal could get blocked, and therefore the data packets could get dropped. For the purpose of trying to determine whether a neighbour can be considered as the subsequent forwarding node, we as a team have constructed a program called REVSim [3] which specifies the current condition of each neighbouring mode, which is either in or out of the line of sight when looked at from the point of view of the present forwarding node. The candidate node gets removed from the list of actual neighbours if it is not visible because it is judged to be behind a structure. Thirdly, we have introduced the Multimedia Multimetric Map-Aware Routing Protocol [1] routing protocol, which allows Vehicular Ad hoc Networks to deliver reporting messages in video format in city settings. The proposed approach may be applied within urban settings in which managing as well as preventing disasters is a top priority. A reporting message in video format enables a more accurate assessment of the circumstance. Because of this, enabling quick notification to the concerned emergency personnel might safeguard people from casualties. Additionally, our method avoids selecting nodes that are within the transmission range that is situated behind buildings. As a result, our simulations remain more accurate because our routing simulator only transmits packets to nodes that are not obstructed by structures.

We employed our REVSim [3] program, which is described in Chapter 4, for this purpose. Additionally, a localized buffer is utilized to hold such for a short period of time, data packets whenever the routing algorithm has no way to locate a suitable subsequent forwarding node, and a period of time is set. The data packet is dropped if its duration expires above the limitof time because the video frame will show up at the intended location far too late to begin the decoding operation. The 3RMP considers five measurements: distance, path, density, available bandwidth, and losses in the MAC layer. Moreover, based on an appropriate relative current value as well as the past average value for the respective measurements across each of the neighbouring nodes, we designed a technique that can properly weigh every measure. As a result, the outcome is improved in contrast to the situation when each ofthe variables is given set weights. This aids the entire procedure in providing every statistic with its relevance at every point. In two separate situations with low as well as medium vehicle densities, we examined our idea against GPSR. Findings show that 3MRP+DSW enhances Multimedia Multimetric Map-Aware Routing Protocol and Greedy Perimeter Stateless Routing in regards to the amount of data that is lost or discarded and throughput because of the newly developed approach for choosing the subsequent forwarding node and the innovative method for assigning a dynamic weight for every measure. We also demonstrate the method by which the end user's perception of the video's quality has improved with respect to PSNR. Lastly, based on a game theory-based method for N numberof consumers, we have created an innovative routing system for VANETs to convey video reporting messages in the context of a smart city. Additionally, picking nodes in the range of transmission which are situated behind buildings is avoided using the program we developed REVSim [3]. In our system design, nodes engage in a routing game that uses strategic planning where I+P video frames are transmitted through one of the two most optimal reachable nodes with a specific probability p*, instead of being continuously delivered solely through the best-transmitting node. With simulation findings in the VANET setting, the advantages of our approach are demonstrated, and the outcomes outperform the situation when our game-theoretical routing is not used. Owing to the novel method of transmitting I+P video frames by means of the best-transmitting node using p*, significant improvements are made in relation to packet losses and delay. Undoubtedly, the consumer perceives the movie to have a higher PSNR quality.

3. Proposed Vanet for Better Quality of Service for Vehiclecommunications

Data transfer between source and destination nodes in VANET using efficient geographic junction routing protocol is simulated using the four modules explained below.

In the beginning, the network is populated with a total of 'N' nodes. The Node’s number and the position the node is in are given for all the nodes in the network. The module identifies the source node and the destination node. The source node acquires data regarding the location of the destination node and the neighbour nodes. The location information of the nodes is obtained via GPS and is stored in the database at all the nodes and can be retrieved every second using the timer. GJIBR scans for neighbour nodes within a radius of 400 meters. The source node obtains data regarding the location and chooses only one intermediate node within the radius of transmission of 400m with the help of GPS services. Once the neighbour node is found within the current radius of transmission, the source node broadcasts the RREQ. On receiving the RREQ, the neighbour node rebroadcast the RREQ byincreasing the transmission region terms by 400m till the path is completed. By choosing only one neighbour node at each level within the junction, the shortest path is discovered for broadcasting the RREQ as shown in Fig.1. On broadcasting the RREQ, the receiving node address is updated in the node information file. Therefore, RREQ is rebroadcasted using the same geographic technique, till it reaches the destination node. If receiving node is the destination of the RREQ, then the complete path is discovered from source to destination. The discovered route is stored on the discovered route file and RREP is generated. Once the destination node is ready for data transfer, the source node obtains the entire route to the destination from the discovered route file and forwards the data packet to the destination node in the discovered route. Geographic Junction Information Based Routing (GJIBR) protocol is created entirely for use in Vehicular Ad hoc Networks. GJIBR is a geographic junction routing protocol that uses the position information to provide efficient data transfer and a notable decrease in the production of control packets. The protocol has three phases.

- The source node acquires the positional data of the destination and itsneighbouring nodes;
- Determines the neighbor nodes at the junction from source to destination; and
- Discovers the route for forwarding the data packet to the destination.

Geographic Junction Information Based Routing is an algorithm where data is selectively forwarded to a single intermediate node at each junction along the path between the source and destination nodes, rather than being broadcast throughout the entire transmission area. This mechanism helps in reducing the over-flooding of the network.

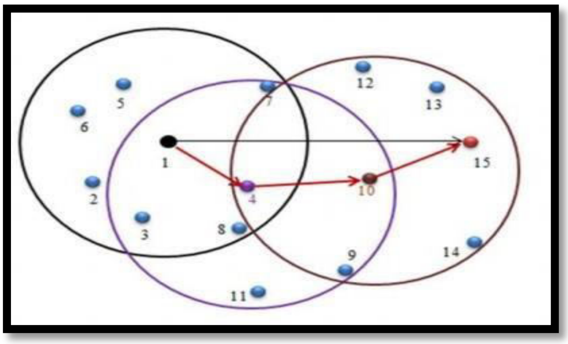
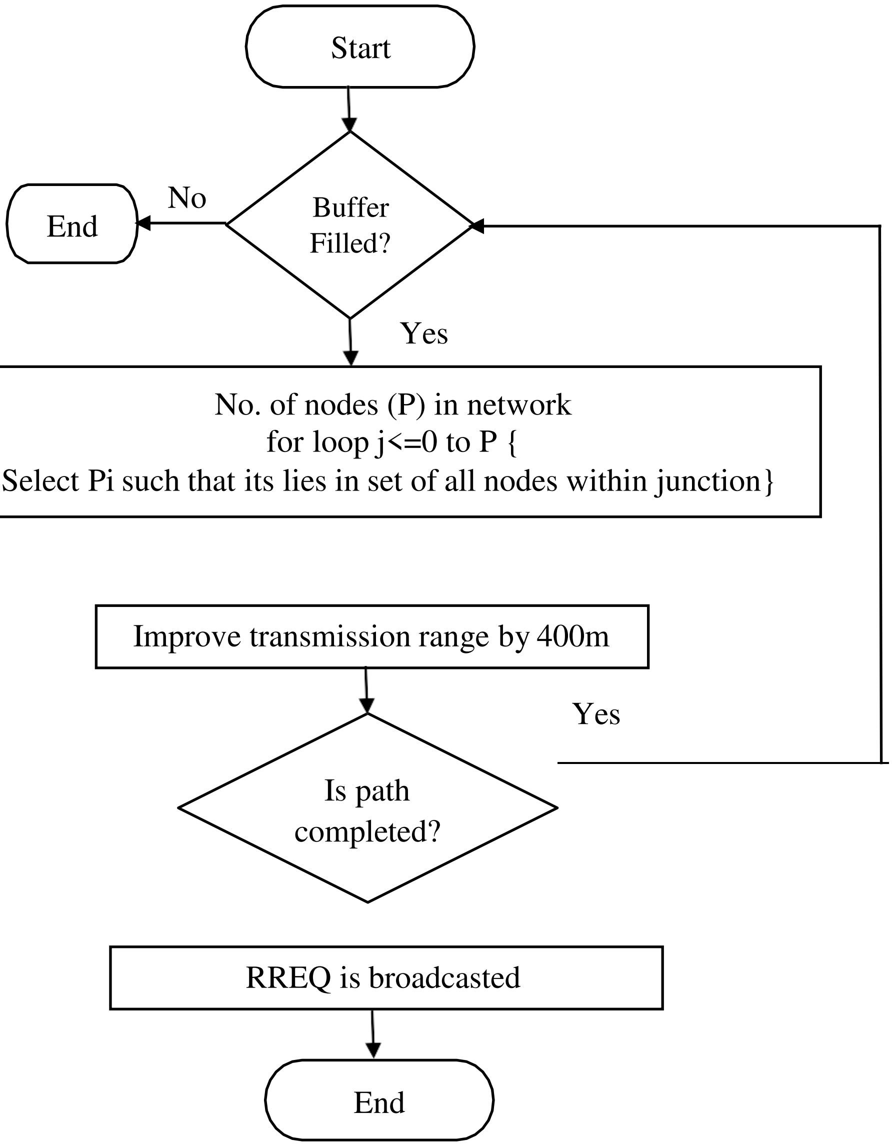


Fig. 1 Topology of GJIBR

If a route cache is available, the source host checks the cache, constructs a source route, and sends the packet. If no suitable node is discovered within the range to transmit the RREQ (Route REQuest), the transmission area is expanded, and the route discovery process is repeated. However, if the number of re-broadcasts exceeds the allowed limit, a route error (RERR) is triggered, and the route discovery procedure is restarted from the beginning. Else, if the time elapsed is greater than the flush interval, the message is removed from the buffer. If the node address is identical to the destination address in the packet, the message is transmitted and the route is added to the cache. Else, the route is saved in the cache and a RREP packet is forwarded. The flowchart in Fig.1 shows how in route discovery the RREQis broadcasted. If there is a message which needs to be transmitted, the route is discovered forit. Every node which lies closer to the destination within the junction is chosen to send the RREQ. Each time when the node crosses the junction, it increases the transmission region by 400m and repeats the above procedure till the path is completed, after which RREQ is broadcasted in the complete network. The flowchart in Fig.1 shows how the route reply is generated. When an RREQ packet is received and if the receiving node is the same as the destination, then the complete path to the destination has been discovered and, hence, an RREP packet, which holds the complete route address, is sent to the source node using the discovered route. Else, the receiving node is actually an intermediate node and forwards the RREQ. This work discusses the modules of GJIBR and the algorithm description. Route discovery of GJIBR is explained in detail with the help of topology and flowcharts. The routing includes RREQ, RREP, and RERR messages as shown in Fig.2.

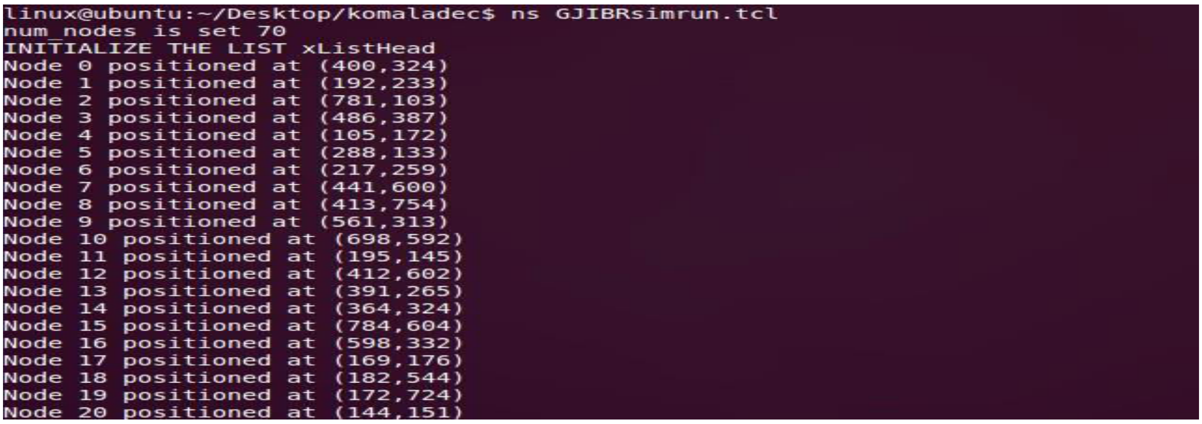
The vehicles transmit packets to another vehicle in a session. Multiple sessions are created in the network. Each session is last for 3 seconds. The simulation lasts for 60 seconds and trace file is generated. From the trace file, AWK scripts are written to calculate throughput, delay, packet success ratio and the network overhead. The simulation is conducted for varied number of nodes and the calculated parameters are written to text file and from this text file gnu plot scripts are written to plot the graph.

Fig.2. Proposed work flow of Route Discovery



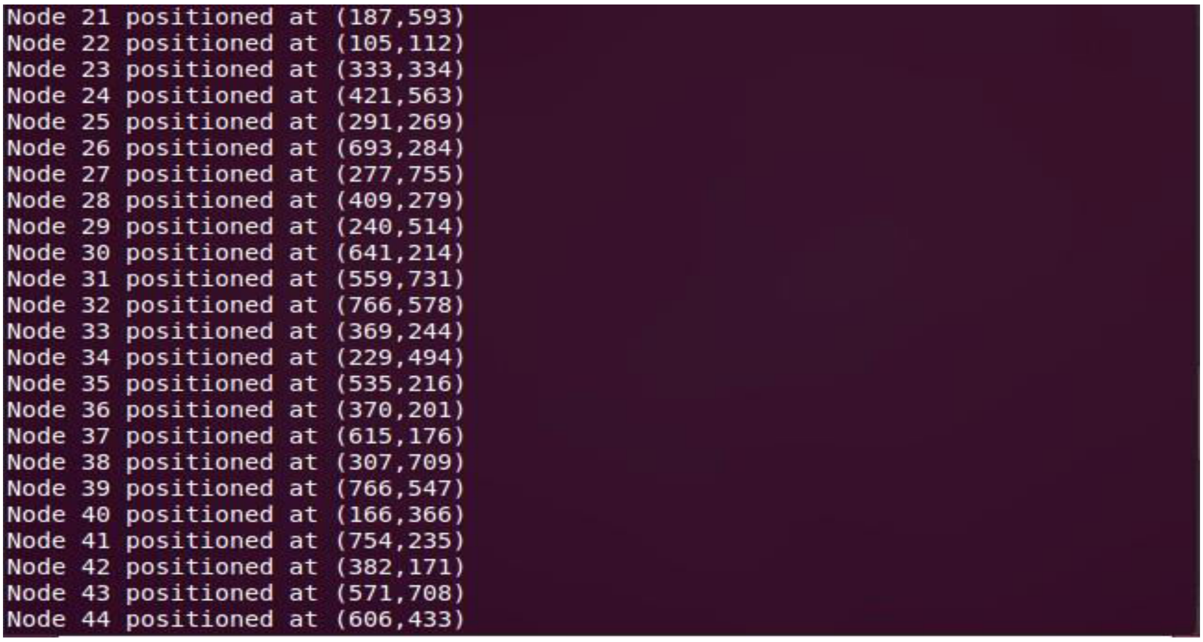
4. Results and Discussion

The simulation results of GJIBR are obtained over AODV using MATLAB 2017a. The performance behavior of GJIBR is good in terms of Throughput, Delay time, Packet Delivery Ratio (PDR), and Control Overhead than AODV as shown in Fig.3 to Fig.10.



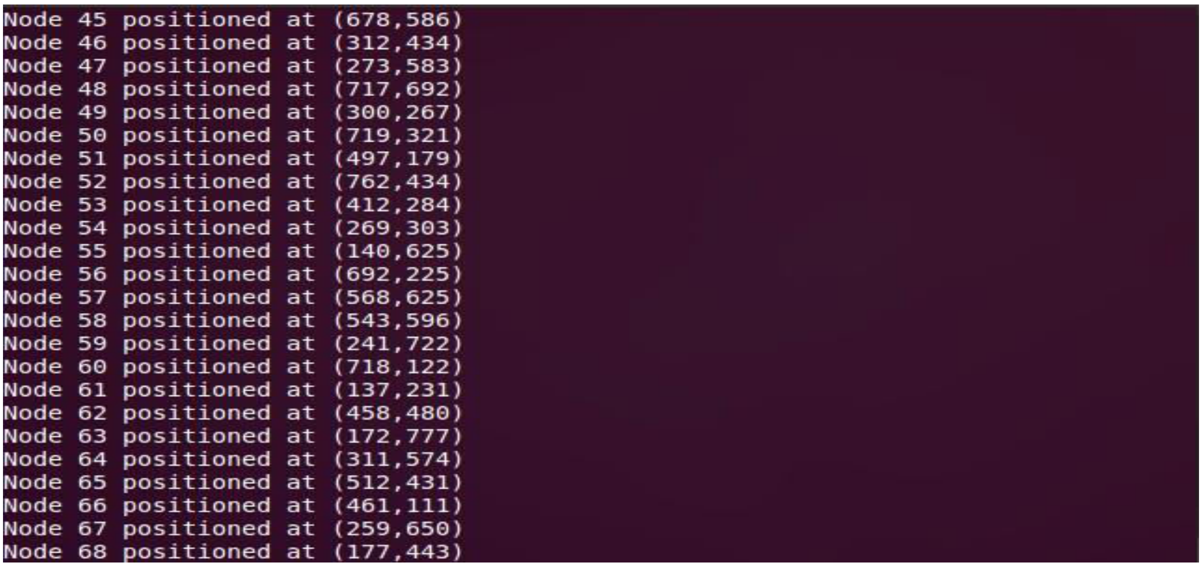
```
linux@ubuntu:~/Desktop/komaladec$ ns GJIBRsimrun.tcl
num_nodes is set 70
INITIALIZE THE LIST xListHead
Node 0 positioned at (400,324)
Node 1 positioned at (192,233)
Node 2 positioned at (781,103)
Node 3 positioned at (486,387)
Node 4 positioned at (105,172)
Node 5 positioned at (288,133)
Node 6 positioned at (217,259)
Node 7 positioned at (441,600)
Node 8 positioned at (413,754)
Node 9 positioned at (561,313)
Node 10 positioned at (698,592)
Node 11 positioned at (195,145)
Node 12 positioned at (412,602)
Node 13 positioned at (391,265)
Node 14 positioned at (364,324)
Node 15 positioned at (784,604)
Node 16 positioned at (598,332)
Node 17 positioned at (169,176)
Node 18 positioned at (182,544)
Node 19 positioned at (172,724)
Node 20 positioned at (144,151)
```

Fig.3 Simulation results of node between 0 to 20



```
Node 21 positioned at (187,593)
Node 22 positioned at (105,112)
Node 23 positioned at (333,334)
Node 24 positioned at (421,563)
Node 25 positioned at (291,269)
Node 26 positioned at (693,284)
Node 27 positioned at (277,755)
Node 28 positioned at (409,279)
Node 29 positioned at (240,514)
Node 30 positioned at (641,214)
Node 31 positioned at (559,731)
Node 32 positioned at (766,578)
Node 33 positioned at (369,244)
Node 34 positioned at (229,494)
Node 35 positioned at (535,216)
Node 36 positioned at (370,201)
Node 37 positioned at (615,176)
Node 38 positioned at (307,709)
Node 39 positioned at (766,547)
Node 40 positioned at (166,366)
Node 41 positioned at (754,235)
Node 42 positioned at (382,171)
Node 43 positioned at (571,708)
Node 44 positioned at (606,433)
```

Fig.4 Simulation results of node between 21 to 44

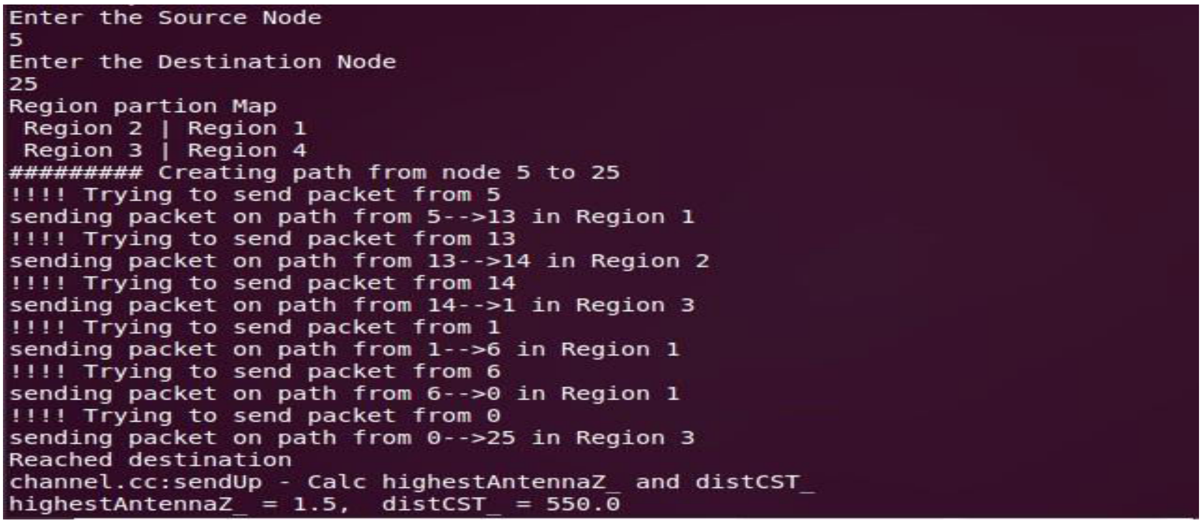


```
Node 45 positioned at (678,586)
Node 46 positioned at (312,434)
Node 47 positioned at (273,583)
Node 48 positioned at (717,692)
Node 49 positioned at (300,267)
Node 50 positioned at (719,321)
Node 51 positioned at (497,179)
Node 52 positioned at (762,434)
Node 53 positioned at (412,284)
Node 54 positioned at (269,303)
Node 55 positioned at (140,625)
Node 56 positioned at (692,225)
Node 57 positioned at (568,625)
Node 58 positioned at (543,596)
Node 59 positioned at (241,722)
Node 60 positioned at (718,122)
Node 61 positioned at (137,231)
Node 62 positioned at (458,480)
Node 63 positioned at (172,777)
Node 64 positioned at (311,574)
Node 65 positioned at (512,431)
Node 66 positioned at (461,111)
Node 67 positioned at (259,650)
Node 68 positioned at (177,443)
```

Fig.4 Simulation results of node between 45 to 68

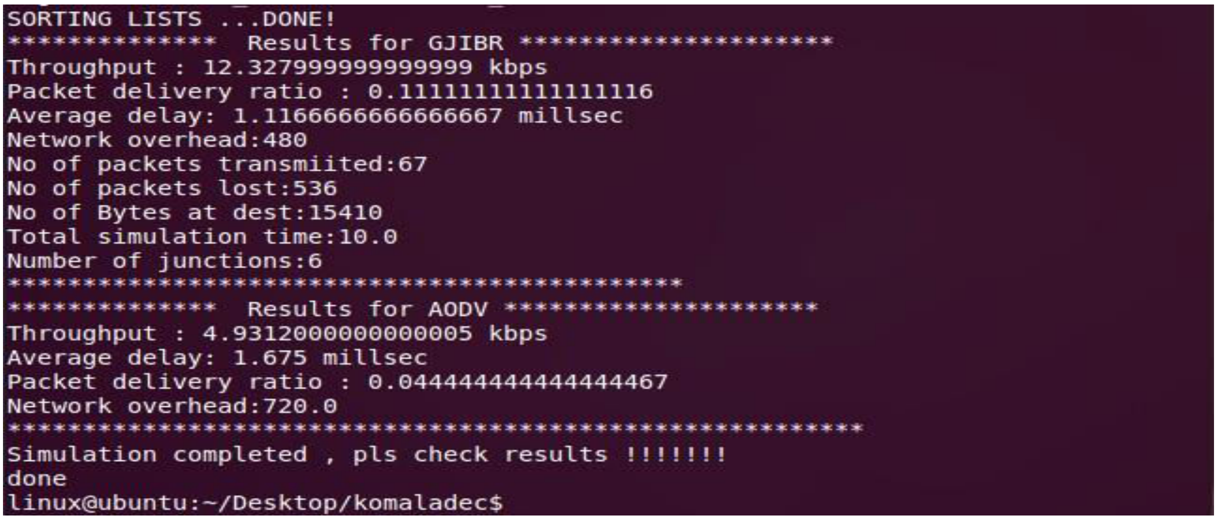
```
Node 69 positioned at (597,496)
Enter the Source Node
5
Enter the Destination Node
25
```

Fig. 5 Simulation results of node position 69, Source node 5 and Destination node 25



```
Enter the Source Node
5
Enter the Destination Node
25
Region partion Map
 Region 2 | Region 1
 Region 3 | Region 4
######### Creating path from node 5 to 25
!!!! Trying to send packet from 5
sending packet on path from 5-->13 in Region 1
!!!! Trying to send packet from 13
sending packet on path from 13-->14 in Region 2
!!!! Trying to send packet from 14
sending packet on path from 14-->1 in Region 3
!!!! Trying to send packet from 1
sending packet on path from 1-->6 in Region 1
!!!! Trying to send packet from 6
sending packet on path from 6-->0 in Region 1
!!!! Trying to send packet from 0
sending packet on path from 0-->25 in Region 3
Reached destination
channel.cc:sendUp - Calc highestAntennaZ_ and distCST_
highestAntennaZ_ = 1.5,  distCST_ = 550.0
```

Fig.6 Simulation results of node between node 5 to 25



```
SORTING LISTS ...DONE!
**************  Results for GJIBR *********************
Throughput : 12.327999999999999 kbps
Packet delivery ratio : 0.11111111111111116
Average delay: 1.1166666666666667 millsec
Network overhead:480
No of packets transmiited:67
No of packets lost:536
No of Bytes at dest:15410
Total simulation time:10.0
Number of junctions:6
********************************************
**************  Results for AODV *********************
Throughput : 4.9312000000000005 kbps
Average delay: 1.675 millsec
Packet delivery ratio : 0.0444444444444444467
Network overhead:720.0
*********************************************************
Simulation completed , pls check results !!!!!!!
done
linux@ubuntu:~/Desktop/komaladec$
```

Fig.7 Simulation results of GJIBR and AODV for the performance parameters Throughput,Packet Delivery Ratio, Average Delay and Network Overhead

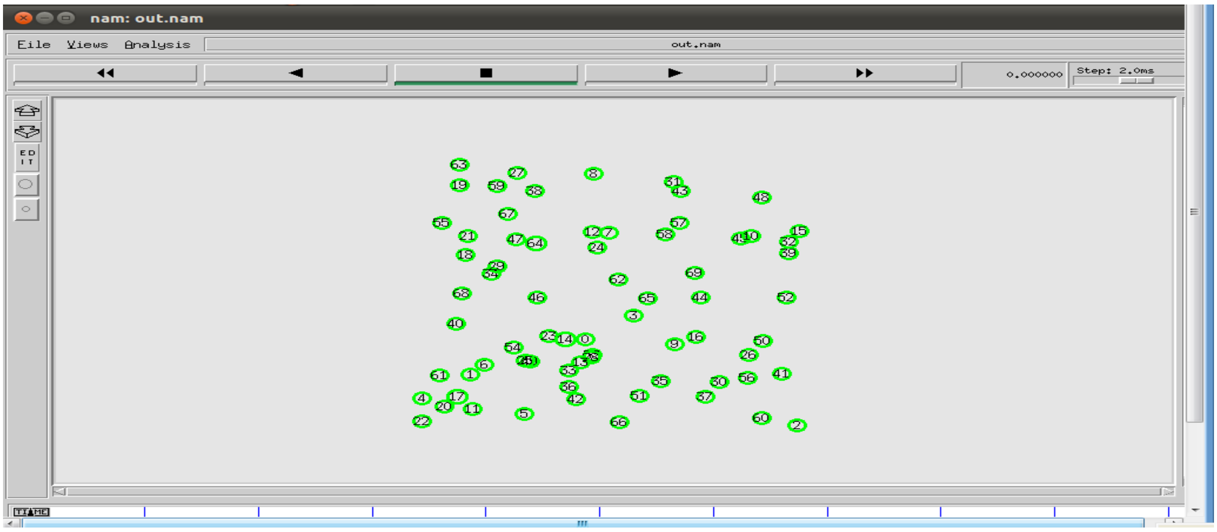
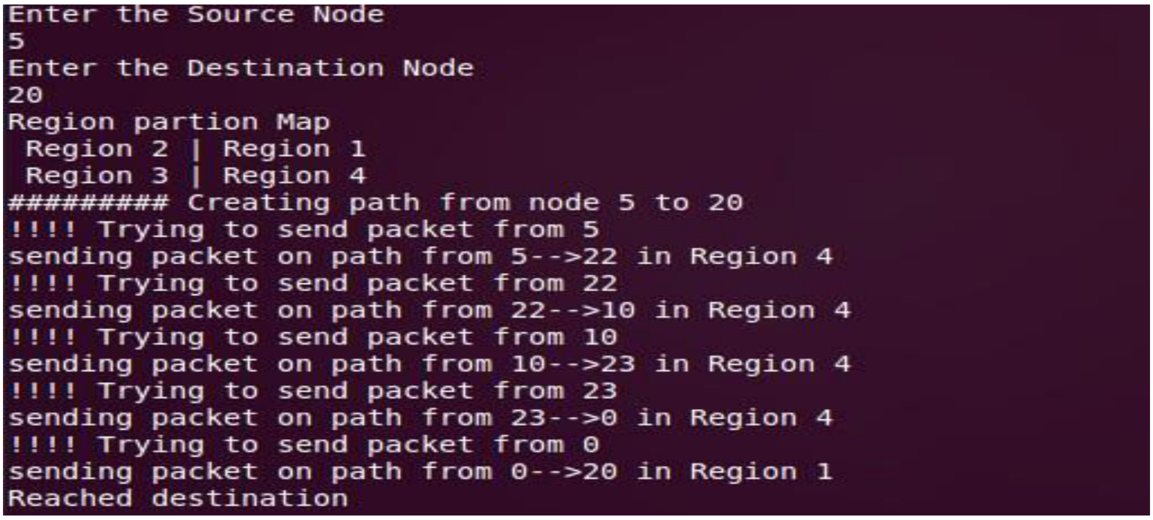


Fig.8 Simulation result for the Routing Topology



```
Enter the Source Node
5
Enter the Destination Node
20
Region partion Map
 Region 2 | Region 1
 Region 3 | Region 4
######### Creating path from node 5 to 20
!!!! Trying to send packet from 5
sending packet on path from 5-->22 in Region 4
!!!! Trying to send packet from 22
sending packet on path from 22-->10 in Region 4
!!!! Trying to send packet from 10
sending packet on path from 10-->23 in Region 4
!!!! Trying to send packet from 23
sending packet on path from 23-->0 in Region 4
!!!! Trying to send packet from 0
sending packet on path from 0-->20 in Region 1
Reached destination
```

Fig.9 Simulation result for the path from node 5 to 20

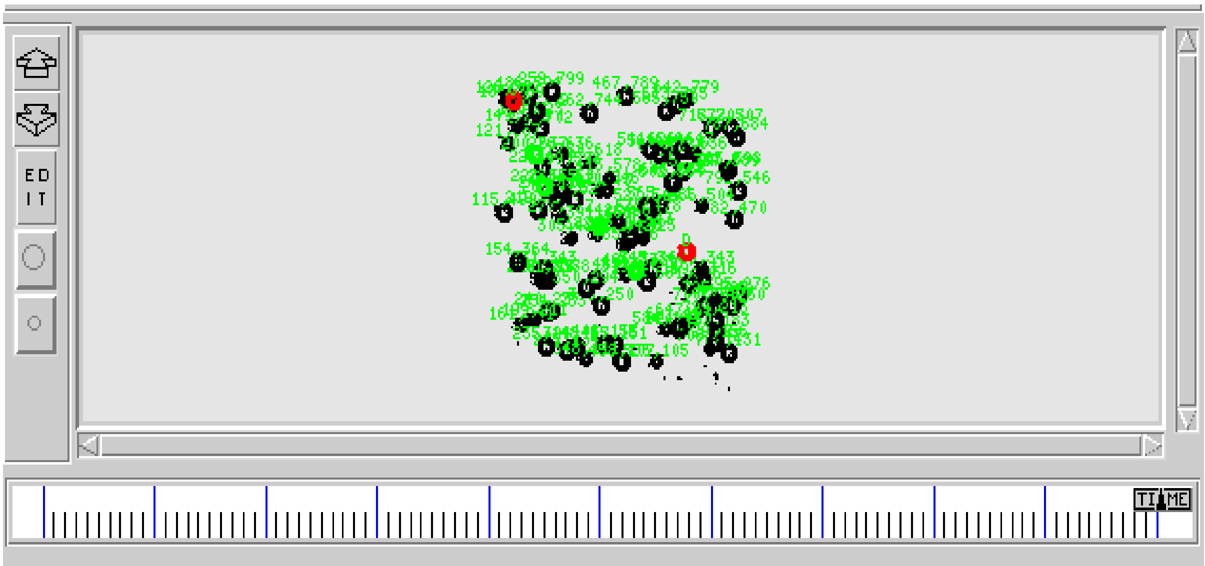


Fig.10 Simulation result for the path from node 5 to 20 in the Topology

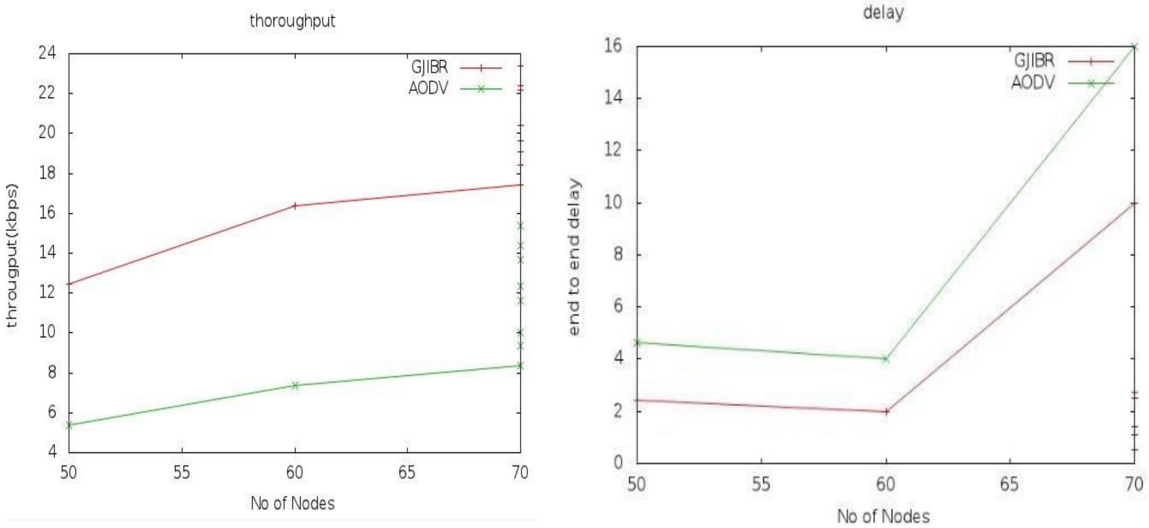


Fig. 11 (a) Simulation results for Throughput **(b) Simulation results for Delay Time**

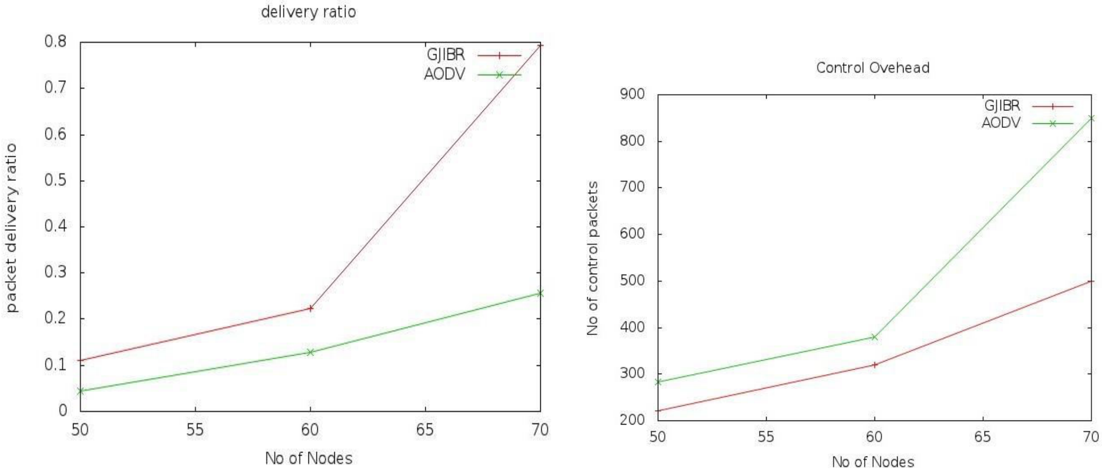


Fig 12(a) Simulation results for Packet Delivery Ratio 6(b) Simulation results for Control Overhead

The proposed modules of GJIBR simulation using MATLAB 2017a, the routing is adaptedfor unicast and multicast routing, and the performance is compared in the proposed solution against AODV. The proposed solution has better throughput, delivery ratio, and delay. The control overhead is also less in the proposed solution.

The suggested protocol, GJIBR, seeks to incorporate a higher packet delivery ratio and enhanced throughput during transmission in order to address the inadequacies of the current protocol AODV and enable its effective implementation as a VANET protocol. Compared to AODV, GJIBR includes sending fewer control packets, such as RREQ, RREP, and RRER messages, which lowers control overhead. The end-to-end latency is reduced by reducing the number of hops in the routing, which boosts throughput. By using the geographic approach with the aid of GPS services, this research concept has been utilized in GJIBR, and this transmission feature makes the protocol more appropriate for VANETs as opposed to AODV,as shown in Fig.11(a & b). The data is sent via junction-based routing. Only one intermediate node is selected at each level inside the junction, as opposed to broadcasting a ROUTE REQUEST (RREQ) throughout the whole network. As seen in Fig. 12(a & b), this method aids in the effective transmission of data via mobile nodes in the VANET. GJIBR is a method that restricts broadcasting from the source and destination to just one node at each junction rather than the whole transmission zone. As seen in Fig. 12, this approach prevents network flooding while simultaneously saving memory space. For usage on VANETs, the GJIBR protocol was developed and put into use. It employs a well-organized routing strategy that aids in data transmission to a greater extent than the AODV protocol. When it comes to throughput and packet delivery ratio, GJIBR offers a superior strategy. The average number of control packets in a transmission can be decreased by GJIBR. The performance of GJIBR in heavy traffic situations is likewise commendable. This procedure can yet be enhanced in a variety of ways in the future. GJIBR may have an idea for an algorithm that combines geographic and angular approaches. GJIBR and Efficient Angular Routing (EAR) are expected to perform worse than this combined approach. In comparison to AODV, the suggested protocol GJIBR has performed well and is more effective. As was already indicated, the rationale for utilising AODV as a standard protocol for measuring the performance of the GJIBR protocol was because it employs AODV as the foundation upon which the idea of geographic junction routing is based. Future research should examine how GJIBR stacks up against other VANET routing technologies. Last but not least, the GJIBR protocol has to be tested in real network circumstances with real traffic.

In order to evaluate our recommendations employing simulations whose results are as accurate to real-world situations as feasible, we decided to take on the challenge of designing a plausible scenario for VANETs. In order to achieve accurate outcomes from simulations, we created a program called REVSim [3] which assists us take into consideration the existence of buildings on real maps. In essence, REVsim forgoes transmitting the data packet to neighbours who are located behind a structure. The tool indicates whether a neighbour is in direct line of vision with the present forwarding node in order to determine whether that neighbour should be considered as a possibility for the position of the subsequent forwarding node. If not, this indicates that the neighbour is behind a structure, which means that as a result, it must be removed from the list of neighbours. Additionally, we offer an easy means to search up the pertinent data from our output file generated by REVsim with the real map, so calculation duration is essentially unaffected by our building-aware technique. This eliminates the need for an effort-consuming inspection throughout the simulation. Major developments in the area of VANETs are anticipated in the upcoming years as manufacturers begin integrating them into the design of new vehicles. We looked into the primary concerns with video-reporting messages on VANETs in city areas. As a result, a number of vehicle behavior traits have been put into account to improve communications, including the nodes' rapid speeds and their propensity to alter their neighbours frequently. Following this, we realized it would be practical to create a multi-metric routing algorithm for VANETs that would enable the transmission of video reporting messages in city settings. The proposed protocol would feature a number of modifications to lower packet losses and boost PSNR. These enhancements include choosing the optimum forwarding node to send packets based on five criteria (distance, path, vehicle density, bandwidth accessible, and MAC layer losses). Due to the brief duration of a communication link among two nodes in-vehicle networks, routing choices are selected hop-by-hop. In order to build our methods, we started with the geographic protocol GPSR (Greedy Perimeter Stateless Routing) [11]. To ensure that a large number of data packets are sent to their destinations, we have concentrated our attention on designing appropriate forwarding decisions. Our methodology could potentially be applied in smart cities wherein preventing disasters and responding quickly to them are top priorities We recognise that a video message would enable officials to assess the mishap's severity far more accurately, enabling them to alert the rescue teams quickly and possibly protect lives. Anything that can connect to the VANET and send a video-reporting message to the right authorities qualifies as a user of the system. The standard of living in smart cities would get better as vehicles may immediately be alerted of any problem in the city. The probability p of transmitting the most crucial video frames (i.e., I+P frames) by means of the best available forwarding node alters based on specific network variables. Within this method, users engage in a game of strategic routing in which the I+P video frames are delivered by means of one of the two possible best nodes with a given probability p* rather than constantly by means of the best forwarding node. The advantages of our approach are demonstrated by simulation findings in the VANET scenario, which surpass the outcomes as contrasted with the situation of not adopting our game-theoretical routing. Outcomes noticeably increase with regard to packet losses, latency, and PSNR, thanks to the novel approach of choosing the subsequent forwarding node based on p*. By allowing the network to receive more (I+P) frames having an average end-to-end delay that is less, our approach increases network performance and satisfaction with services. The end consumer's perception of the footage's quality will unquestionably increase as a result. The development and execution of an operational system for sending video-reporting messages through both MANETs and VANETs in city contexts constituted our primary emphasis during the study for our thesis. For the purpose of being able to quickly warn emergency personnel (such as 112 or 911) in the instance of a serious incident, this study intends to create a foundation for smart city services involving video streaming.

5. Conclusion

The demand for services involving multimedia is anticipated to grow further, necessitating the development of designs capable of delivering QoS via ad hoc networks, a problem that is nevertheless challenging to solve. Because of the lack of complexity and sufficient video quality for video-reporting messages concerning instances in the city, we opted to use MPEG-2 for our architecture. This section has provided an explanation of digital video coding methods and QoS assistance with video streaming. RTP/RTCP QoS support protocol stack has been defined. The most essential performance parameters for network measures have also been defined, along with how to calculate them. PSNR was strategically chosen to assess the quality of footage within our simulations based on its simple nature of use. Additionally, the standard QoS measurements (such as losses, delay, and jitter) used to assess the effectiveness of our suggestions were also discussed. For MANETs to convey video reporting messages in a smart city, we have created an entirely novel routing algorithm in the present section. A game-theoretical plan for N users serves as the foundation for the routing
algorithm. In smart cities in which preventing disasters is a top priority, our architecture may be put into operation. We recognize that a video message would enable those in charge to assess the event's severity far more accurately, enabling them to alert emergency personnel quickly and possibly safeguard from fatalities. A dynamic sensor, for instance, an individual using a tablet or mobile device to connect to the MANET and submit the video to the right officials, might be a user of the technology. Additionally, smart residents would ultimately readily receive warnings from their fellow city dwellers regarding any problem, which would enhance the standard of life in smart cities. The likelihood p of transferring the most crucial video frames (I+P frames) over the optimum route differs according to several network features within the architecture. In this approach, users engage themselves in a game of strategic routing wherein the I+P video frames are delivered by means of one of the two best routes with a given probability p* rather than constantly by means of the best available path. When contrasted with the possibility of not adopting our game-theoretical routing, simulation outcomes in the MANET scenario demonstrate the advantages associated with our solution. Because of the novel method of choosing the forwarding path based on p*, results for N = 2, 3, 4, and 5 users (players) significantly rise with regard to

packet losses, delay, and jitter. By obtaining significantly more (I+P) frames that have reduced average end-to-end delay and jitter, our approach increases network performance and increases satisfaction among users. The final user's perception of the video quality is certain to improve as a result. The simulation findings of a VANET scenario additionally demonstrate gains for N = 2 users in terms of packet loss percentage, average packet latency, and average delay jitter. In order to transport video-reporting signals in a smart city, we have created a novel routing algorithm for VANETs in this section. A game-theoretical plan for N users serves as the foundation for the geographical routing system.

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