TITLE: "IMPROVING RELIABLE DATA TRANSFER RATE IN MANETS FOR AVOIDING CONGESTION USING ADVANCED FUZZY LOGICS"

Authors Name: Sumera Samreen
Department: Computer Science & Engineering,Jagdish Prasad Jabarmal Tibrewala University (JJTU),Rajasthan, India
sumerasamreen6@gmail.com
Guide Name: Dr. Vinod Vaze
Department: Computer Science & Engineering,Jagdish Prasad Jabarmal Tibrewala University (JJTU),Rajasthan, India
vinod.vaze@gmail.com

ABSTRACT
MANETs packet loss can be caused by either connection failure or node failure. Furthermore, the methods used to pick the bypass path and prevent congestion on the bypass route are seldom used. To address these, in this paper, we suggest an efficient, efficient and congestive routing management protocol that uses fuzzy logic to fix congestion and path errors by choosing bypass routes in MANETs. Many roads are being built. The shortest paths for effective data transfer are defined. Congestion is identified on the basis of consumption and connection capability and pathways. When a source node senses congestion on a connection along the route, it distributes traffic over alternate routes, taking into account the availability threshold and using a traffic splitting feature. Improving Stable Data Transfer Rate in MANETs to Prevent Congestion Using Advanced Fuzzy Logics If a node cannot address congestion, it signals its neighbours using a bit of traffic.

Keywords:
Mobile Ad hoc Network, fuzzy logic, congestion control mechanism, avoiding congestion.
Article Received: 18 October 2020, Revised: 3 November 2020, Accepted: 24 December 2020

INTRODUCTION

MANET (Mobile Ad-Hoc Network) follows a complex law that implies that the network topology is unpredictable. So any discreet time period node shift has formed a routing route from one to the other and raises the protocol of routing protocol drop the packet of data has been redirected. To figure out the cause for the data drop that follows, such as drop via collision, route malfunction, timeout, non-existing route, data packet and simulation etc. that all point has degraded the efficiency of the network and caused a retransmission state, giving rise to congestion
and optimising pause. So our attention is on the congestion management module process. The protocol aims to identify several routes that together fulfil the bandwidth specifications. In reality, the initial criterion for bandwidth is split into many sub-bandwidth specifications. Every sub-path shall be liable for one sub-bandwidth restriction. This protocol is accessible on demand and uses the local bandwidth knowledge available at each node to discover routes. A ticket-based approach is used to scan different routes. It is important to change the data rate used by and sender so as not to overwhelm the network where several senders fight for the bandwidth of the channel. Packets will be discarded as they arrive at the path of the router are not decided. Some packets are lost while an excessive number of packets arrive at the bottleneck of the network. The packets dropped must have travelled a long way and, in addition, the missing packets also cause retransmissions. And thus, network throughput is further compounded by network area. There is a risk of congestion failure when virtually no data is transmitted effectively unless effective congestion management is carried out. Shared news radio is used in mobile ad hoc networks. Medium power, which is quite insufficient, is shared among all the nodes in the collision domain.

Many existing protocols offer solutions for balance or congestion or fault-tolerance loading, on an individual basis. Thus, a combined protocol is required in order to have solutions to all of the above-mentioned problemsIn this analysis, the congestion-controlled multi-track routing protocol scheme is introduced to achieve load balancing and prevent network congestion. As the total load of the current connection increases above the threshold and the remaining battery capacity of the node reduces below the threshold, An algorithm for discovering multi-path routes computes several paths that fail-safe. Improving Efficient Data Transfer Rate In MANETs To Reduce Congestion Using Advanced Fuzzy Logics

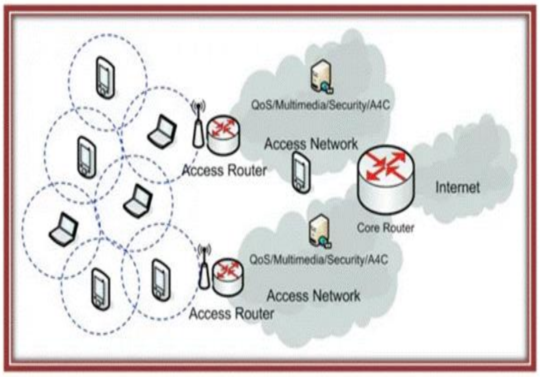

Figure 1: Ad-hoc Network Architecture [1]

This paper consists of six parts. Section II determines the standard of service (QoS) and some of its calculation metric. It also discusses the scheduling systems and some of the schemes currently applicable. The fuzzy scheduler is defined in Section III. Section IV discusses the success review, also describes the findings and discussions; the conclusion is eventually provided in Section V.

CONGESTION IN MANET

When need are higher than the full communication connection bandwidth, In fact, during several hosts trying to access shared media, network congestion occurs. Congestion can also be induced under the following circumstances.

In load balancing problem

If the broadcast packet special type

If the packet is timeout and field is blank

If the number of node increasing very rapid rate

If applying the standard deviation for computing the duration of the package. .

Congestion observed in the network can dramatically exacerbate the network throughput[3]. This leads in loss of packets, loss of bandwidth and energy expenditure[5]. Routing protocol are used, i.e. when an effective congestion control strategy is not carried out, the network fails. Therefore, the data would not be transmitted to the expected node in an appropriate manner[3]. The protocol of routing in MANET are not tolerant of congestion, the following problems emerge.

Long delay: this slows up the method to diagnose congestion. The routing prtocol is more stringent, it is easier to take an alternative new route. But the predominant on-demand routing protocol is slowing the method of path checking.

High overhead: further processing and coordination attempts are required for the exploration of new paths. If multi-path routing is used, it takes extra work to preserve multi-paths despite the presence of an alternative route.

Many packet losses: The goal of the congestion control plan is to reduce overload on The network by either reducing the transmission intensity on the sender side or by missing packets on the sender side.

RELATED WORK

the authors suggested a topological regulation that would extend the principle of dispersed and combined pathways. Once the congestion is observed, the route (in multipaths) will be broken by a specific node to detour the direct transmission to the congested SN. Eight, the multipaths are paired with the merged SN. However, there could also be congestion in the alternative route.

Ghazisaidi, N.et al.(2012) The proposed route selection algorithm is intended to enhance the efficiency of HWMP re-active

Zaimi, I., et al(2019) whereas the output of a single associated metric gives preference to the next-hop of the lower concern.

Sakthivel, T. et al(2018) The use of a conditional and fuzzy confidence model validates the consistency of the ambiguous data and the qualitative conditions of the trust. The usefulness of the system is understood by extending it to different routing protocols in wireless networks.

Rajawat A.S et al.(2021) The algorithm built is focused on a deep learning model, a consolidated approach used to predict ambiguity in mobile computing. this variability estimate is to learn both the performance of the aim and the related variance.

V. Romanyuk et al.(2016) In this method are based on description of mobile radio network control systems as a vertically linked hierarchical structure that describes the management tasks of subordination using a hierarchical control system and a fuzzy logic.

Das et.all (2015) Suggested ambiguous cost on the basis of Multi Restriction area of the path of routes on the basis of bandwidth, and amount of intermediate hops. The best transmission was found to be the route with a maximum life span and a low fuzzy cost. There was no continuity in the partnership at work.

Singh et.all (2015) set up a fuzzy-based intelligent routing agent to detect packet loss rate, optimum criteria, membership functions, and broken path repair. The use of durability in this work has been avoided.

Sju et.all (2014) has established multi-path connectivity and the positioning of mobile nodes has been modified by the kalman method. The performance of the future cluster was also calculated by fuzzy clustering. It is no estimation of the consistency of the cluster head node and the measurement of the efficiency of the cluster head voting.

PROPOSED METHODOLOGY

The fuzzy logic system in MANET used various researchers as a controller device to solve different problems. In addition, the fuzzy logic control system has recently been applied in many areas of pure science and engineering. Therefore, fuzzy control rules should be used to detect and identify the relationship between system parameters based on the Reliable Data Transfer Rate In MANETs For Avoiding Congestion Using Advanced Fuzzy Logics Initially, source and destination through five significant steps,

Compute the neighbour rate Effectively

Find the number of hop count

Applying muti object optimization technique

Find out the route continuity

Applying fuzzy logic for route stability

Finally, the forecasting of a reliable route for the Reliable Data Transmission Rate In MANETs For the Avoidance of Congestion is made on the basis of a study of viable alternate routes in routing. In general, reliability is calculated in terms of node mobility and energy consumption. In our job, reliability requires consistency and mobility of nodes as well as linkages. Link reliability is an important topic to remember before the process of route exploration starts. Connection durability assures that there is or is no stability of the link. Node efficiency is calculated on the basis of packet error rate, packet latency, throughput, packet delivery rate. In general, congestion is caused by the lack of reliability of the nodes. To prevent this, node stability is preserved during the path exploration and maintenance process of the route. If any stale routes are detected, they will be replaced automatically using the proposed routing protocol. Fuzzy logic control allows efficient routing to solve the complexity of the proposed protocol. Reliability is assured by a blurry control mechanism that continually enhances network life.

1. Source node and Destination node remain unchanged and consistent.
2. Nodes are passing within the context of transmission.
3. Each node holds the same and continuous transmission of data with each of its neighbour nodes.
4. All the links are binary which means the link exists or does not exist

We applying the algorithm for segment provides a, a router that is or is active for a specific destination will synchronize the updating of its routing-table entry with other routers. A router is active if at least one neighbor is waiting to submit an answer to a question already sent by the router, and otherwise is inactive. In addition, a passive-state router is configured for all known destinations with a 0 distance to itself and a finite distance to other destinations directly linked to an adjacent link. The topology table takes away passive destinations of limitless distances. When a router is inactive and needs to update its routing table for a certain destination j after a neighbor's upgrade request is read or a shift in the cost or availability of a connection is observed, it attempts to get a replacement. From the point of view of router I a successor to destination j is a neighbor router k which satisfies the following two equations:

where:
D_j^i= Compute the distance between i and j
D_jk^i= Define the neighbor k and router i distance j
c_k^i= Compute the cost of the link from neighbour k and router i
〖FD〗_j^i= Compute the distance feasibility form destination j.

Fuzzification

In this step, the key input is converted into I linguistici values. Each value is expressed by a fuzzy bundle. Each set of fuzzies has to do with the membership function used to explain how the crooked input is a feature of the set (Fig . 2). The source sends a data message to the destination after the validation has been received.

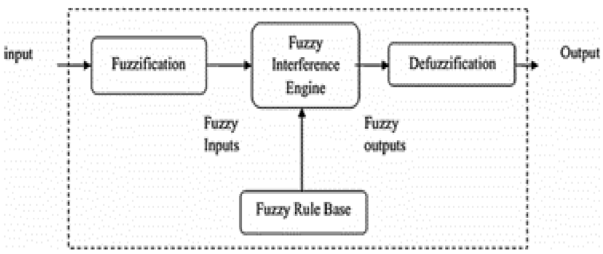

Fig 2. Architecture for fuzzy logic [2]

The time of retransmission via a new optimal route based on fluid logic. The triangulation functions are used in real time applications thanks to their computational efficiency and the uncomplicated formulas. For optimal route selection based on the detect and combined congestion status; input variables are considered network disconnections, channel errors and containments of link layers.

Proposed algorithm

Algorithm

Step 1: Broadcast the route request (from the sink node)

Step 2: Send the message from sink node

Step3: while (Sink node became the intermediate node) do

Step 4: Sink node receive the request from the route and creates

Step 5: replying the route node request again(broadcast the message)

Step 6: if(Check last node state then sends the message (route is terminate))

Step 7: Break

Step 8: end if

Step 9: end while

The cumulative congestion condition is determined and the optimum routes are chosen according to the performance of the fuzzy rules. 1. The key consideration in the selection of the best direction is Network disconnectionsi. If the likelihood of network interconnections rises on the path, the odds of an ideal route are smaller, i.e. network interconnections and ioptimal routei are inverselyi proportionali to ieach iother. Network breakups and the best path are complex laws:

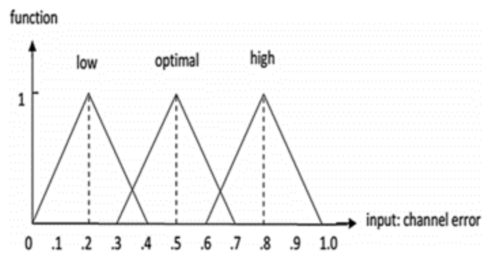

Figure 3: Channel Error

Anotheri importanti factor in deciding the best iroute to the destinationi is Channel Error. As the errors inside the ichannel become more likely to fail, the path is reversely proportionate to the channel error and optimum path capacity

Buffer overload is also an important factor in making choices on the best selection of routes. If the buffer overflows, the chance to keep track reduces optimally. Thus buffer leakage and optimal path choices are inversely proportional.

. The output adherence function, Input level based on this level are provided for optimal route:, channel error, overflow buffer and link layer connection.

iMembership functionsi for each input element: connection to inetwork, ichannel error, link layer dispute and output. Table 1 defines the optimal route. The rating is given as high (H), optimal (O) and small (L), in terms of linguistic values.

The ideal routes from the above table provide the data message reliability when transmitted from intial to final through the network path. The output function membership is shown in Fig. 3. The source node then begins to transmit data packets by these paths, once the perfect routes have been selected.

I. Simulation Setup

Table 1: Simulation parameters [3]

Number of nodes	110
Area size	1250 × 1250 m
MAC	802.11
Simulation time	50 s
Traffic source	CBR
Packet size	512
Speed	10 m/s
Rate	50, 100, 150, 200, and 250 Kb
CBR traffic flows	2–10
Propagation model	TwoRayGround
Antenna type	OmniAntenna

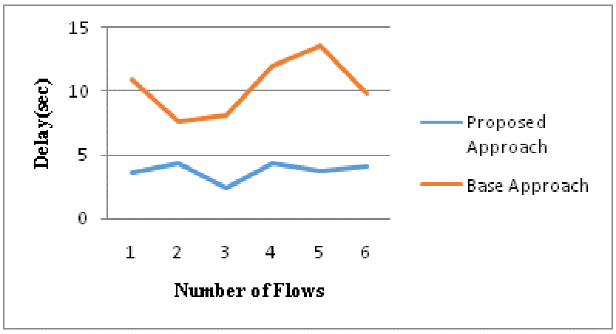

Fig. 4: Flows versus delay

If F priority = degree of decision-making, zi = fuzzy vector, g(zi) = membership function (Fig. 4) The output of the fuzzy priority function is modified to a crisp value based on the defuzzification process mentioned above.

The efficiency of the Congestion Detection and Routing Technique dependent cross-layer is evaluated. Flows versus delivery ratio

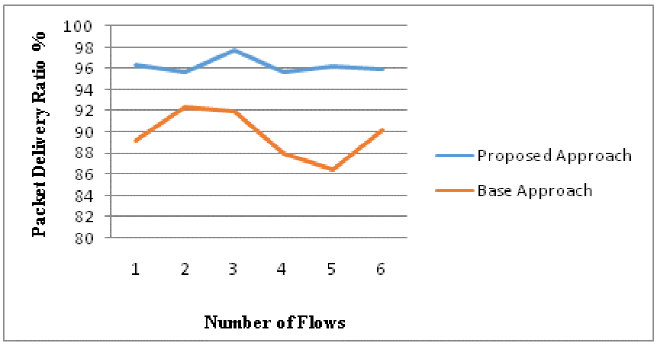

Fig.5 Flows versus throughput

For a total area of 1250 9 1250 m, a random network is considered. Shipment rates are 50, 100, 150, 200 and 250 Kb, respectively. Flow counts vary from 2, 4, 6, 8 and 10. UDP source and sink CBR is a virtual traffic (Fig. 5). The simulation parameters used are shown in Table 1.

Performance Metrics

Output is linked to the A-DSR[13] protocol. Output is measured primarily on the basis of the following metrics.

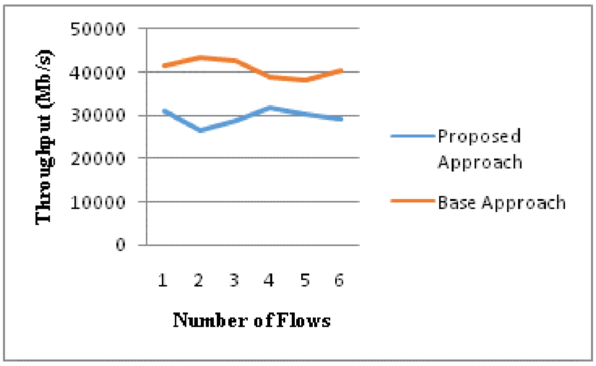

Fig. 6: Rate versus throughput

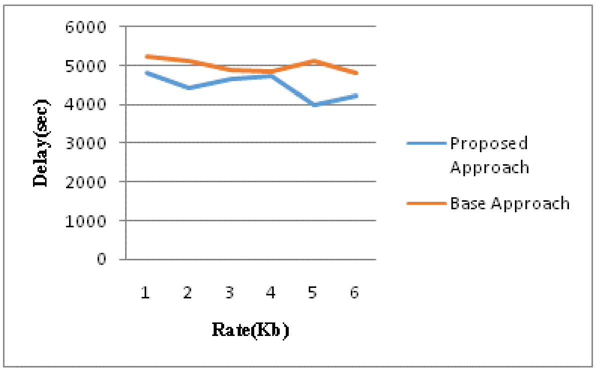

Fig.7: Rate versus delivery ratio

Average end-to-end delay

The end-to-end delay is summed over all remaining data packets from the source to the destination.

Normal distribution ratio of packets

Based on rate

The number of packet transmission speeds is 50 , 100, 150, 200 and 250 kb for a second experiment, with flows 10. Figures show the latency, transmission rate, drop and throughput performance, algorithm the number of packets being transmitted is 50, 100, 150, 200, and 250 kb. In the contrast of the results of the two protocols, we conclude that level by 59% in time-scale, 65% in transmission, 56% in efficiency and 8% in decline.

Conclusion and Future work

This research identifies and describes abnormal network events during data transmission as one of four potential mistakes including loss of the link, channel failure, buffer overload and conflict of link rates. The data is then transferred by alternative paths when the error type is formed. The additional fuzzy logic to the three parameters such as network access, channel loss, buffer overload, and bridge layer containment would pick the new alternative routes. Through choosing the optimum value path the optimum output path is selected and the three input parameters are taken into account in compliance with fuzzy legislation. Since there are no studies on an empirical protocol that preserve a consistency between cross-cutting or entirely re-designed protocols, it is difficult to understand how efficiency gains come at what cost. Studying this subject more closely than previously will help to create significant knowledge which field future research is to be centered. New protocol designs are still very much in progress, particularly in the field of non-TCP, network-enabled protocols. There can be completely different ideas to consider in contrast to conventional rate-based approaches. In comparison to wired networks, MANET routers — i.e. intermediate nodes — are considered to have greater device and efficiency compared with the network bandwidth.

CONCLUSION AND FUTURE WORK

This research identifies and describes abnormal network events during data transmission as one of four potential mistakes including loss of the link, channel failure, buffer overload and conflict of link rates. The data is then transferred by alternative paths when the error type is formed. The additional fuzzy logic to the three parameters such as network access, channel loss, buffer overload, and bridge layer containment would pick the new alternative routes. Through choosing the optimum value path the optimum output path is selected and the three input parameters are taken into account in compliance with fuzzy legislation. Since there are no studies on an empirical protocol that preserve a consistency between cross-cutting or entirely re-designed protocols, it is difficult to understand how efficiency gains come at what cost. Studying this subject more closely than previously will help to create significant knowledge which field future research is to be centered. New protocol designs are still very much in progress, particularly in the field of non-TCP, network-enabled protocols. There can be completely different ideas to consider in contrast to conventional rate-based approaches. In comparison to wired networks, MANET routers — i.e. intermediate nodes — are considered to have greater device and efficiency compared with the network bandwidth.

REFERENCES

[1]. Ghazisaidi, N., Assi, C.M. & Maier, M. Intelligent wireless mesh path selection algorithm using fuzzy decision making. Wireless Netw 18, 129–146 (2012). https://doi.org/10.1007/s11276-011-0391-2.

[2]. Zaimi, I., Boushaba, A., Squalli Houssaini, Z. *et al.* A fuzzy geographical routing approach to support real-time multimedia transmission for vehicular ad hoc networks. *Wireless Netw* **25,** 1289–1311 (2019). https://doi.org/10.1007/s11276-018-1729-9

[3]. Sakthivel, T., Chandrasekaran, R.M. A Dummy Packet-Based Hybrid Security Framework for Mitigating Routing Misbehavior in Multi-Hop Wireless Networks. *Wireless Pers Commun* **101,** 1581–1618 (2018). https://doi.org/10.1007/s11277-018-5778-2
[4]. Rajawat A.S., Upadhyay P., Upadhyay A. (2021) Novel Deep Learning Model for Uncertainty Prediction in Mobile Computing. In: Intelligent Systems and Applications. IntelliSys 2020. Advances in Intelligent Systems and Computing, vol 1250. Springer, Cham. https://doi.org/10.1007/978-3-030-55180-3_49.
[5]. V. Romanyuk, O. Sova, A. Romanyuk and S. Salnyk, "The MANET's hierarchical control system using fuzzy logic," 2016 13th International Conference on Modern Problems of Radio Engineering, Telecommunications and Computer Science (TCSET), Lviv, 2016, pp. 922-925, doi: 1 Ponraj Appandairaj, Kathiravan Kannan, "Software-Defined Multilayered Admission Control for Quality of Service Assurance in Mobile Ad-hoc Networks", Wireless Communications and Mobile Computing, vol. 2020, Article ID 2989751, 23 pages, 2020. https://doi.org/10.1155/2020/29897510.1109/TCSET.2016.7452226.
[6]. Calarany C., Manoharan R. Fuzzy Logic Based Path Stability Forecasting Scheme for Improving Data Dissemination in MANETs International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-9 Issue-3, February, 2020
[7]. Das S.K., S. Tripathi and A.P. Burnwal, 2015. Fuzzy based energy efficient multipath routing for ad-hoc network. In Computer, Communication, Control and Information Technology (C3IT), pp: 1-5.
[8]. Saju, I. and N. Krishnan, 2014. A Survey On FuzzyBased Adaptive Routing Protocol For Manets. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 3(3).
[9]. Singh P., V. Kukreja, P. Arora and P. Hooda, 2015. A Fuzzy Based Routing Strategy for Mobile Adhoc Networks (MANET). International Journal of Innovative Research In Electrical, Electronics, Instrumentation And Control Engineering, 3(7).
[10]. Geetha N. & Sankar A. (2017) A Multi Criterion Fuzzy based Energy Efficient Routing Protocol for Ad hoc Networks, Intelligent Automation & Soft Computing, DOI: 10.1080/10798587.2017.1309003
[11]. Alireza Shams Shafigh, Beatriz Lorenzo & Prof. Savo Glisic (2014) Fuzzy Logic Based Rate Control Scheme for ODMRP in Mobile Ad hoc Networks, Automatika, 55:2, 199-206, DOI: 10.7305/automatika.2014.06.356
[12]. Anuradha, M., Anandha Mala, G.S. Cross-layer based congestion detection and routing protocol using fuzzy logic for MANET. *Wireless Netw* **23,** 1373–1385 (2017). https://doi.org/10.1007/s11276-016-1211-5
[13]. A. S. Rajawat and A. R. Upadhyay, "Web Personalization Model Using Modified S3VM Algorithm For developing Recommendation Process," 2nd International Conference on Data, Engineering and Applications (IDEA), Bhopal, India, 2020, pp. 1-6, doi: 10.1109/IDEA49133.2020.9170701.
[14]. P. Muñoz, R. Barco, J. M. Ruiz-Avilés, I. de la Bandera and A. Aguilar, "Fuzzy Rule-Based Reinforcement Learning for Load Balancing Techniques in Enterprise LTE Femtocells," in IEEE Transactions on Vehicular Technology, vol. 62, no. 5, pp. 1962-1973, Jun 2013, doi: 10.1109/TVT.2012.2234156.
[15]. M. M. Jawad and N. M. Mahdi, "Prototype Design for Routing Load Balancing Algorithm based on Fuzzy Logic," 2019 4th Scientific International Conference Najaf (SICN), Al-Najef, Iraq, 2019, pp. 92-96, doi: 10.1109/SICN47020.2019.9019351.

[16]. S. J, H. Singh, J. Bhutani, S. Pandit, S. N. N and D. Kumar S M, "Congestion Aware Algorithm using Fuzzy Logic to Find an Optimal Routing Path for IoT Networks," 2019 International Conference on Computational Intelligence and Knowledge Economy (ICCIKE), Dubai, United Arab Emirates, 2019, pp. 141-145, doi: 10.1109/ICCIKE47802.2019.9004351.

[17]. M. Firdous, F. U. Din Iqbal, N. Ghafoor, N. K. Qureshi and N. Naseer, "Traffic Light Control System for Four-Way Intersection and T-Crossing Using Fuzzy Logic," 2019 IEEE International Conference on Artificial Intelligence and Computer Applications (ICAICA), Dalian, China, 2019, pp. 178-182, doi: 10.1109/ICAICA.2019.8873518.

[18]. H. V. Maddiboyina and V. A. Sankar Ponnapalli, "Fuzzy Logic Based VANETS: A Review on Smart Transportation System," 2019 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, Tamil Nadu, India, 2019, pp. 1-4, doi: 10.1109/ICCCI.2019.8822181.

[19]. D. H. Esawi, G. Attiya and M. El-Bardini, "Intelligent Controller based Host-to-Host Congestion Control: Fuzzy Logic Controller," 2019 7th International Japan-Africa Conference on Electronics, Communications, and Computations, (JAC-ECC), Alexandria, Egypt, 2019, pp. 67-71, doi: 10.1109/JAC-ECC48896.2019.9051220.