Mathematical Statistician and Engineering Applications
ISSN: 2094-0343
2326-9865

Node Adjustment for Mobile Ad Hoc Networks

V. Rajesh Kannan
Research Scholar
Annamalai University, India.
Email: kannan.813@gmail.com

Dr. A. Charles
Assistant Professor
Annamalai University, India.
Email: charlesgceb@gmail.com

Article Info
Page Number: 2088 - 2097
Publication Issue:
Vol 71 No. 4 (2022)

Abstract

The continuous transmission of small packet is called beacon packet, that advertises the presence of a base station and the mobile units sense the beacons and attempt to establish a wireless connections. Basing their forwarding decisions only on the local topology, geographic routing protocols have drawn a lot of attentions in recent years. MANET nodes square measure distinguished by their restricted resources like multi-path communication, end-to-end delay, routing conjunction, remaining energy, bandwidth and storage. MANET routing is serious issue as a result of topology. In this emerging research article developed with my pervious published paper and proposed multipath work with three different topology size, three different set of nodes, three different set of malicious nodes with various parameters such as packet delivery ratio, throughput, routing overhead, packet loss, delay and remaining energy via Network Simulator 2 (NS2).

Article History
Article Received*: 25 March 2022*
Revised*: 30 April 2022*
Accepted*: 15 June 2022*
Publication*: 19 August 2022*

Keywords: MANET, Attack, Energy, Routing Protocols, Network Simulator.

I. INTRODUCTION

In MANET each node act as both host and route in autonomous behavior, any time a node can join or leave from the network due to making the network topology dynamic in nature. All nodes have

identical (same) features with similar responsibility and capabilities and hence it forms a completely symmetric environment due to mobile nodes are characterized with less memory, power and light weight features. Basically mobile ad hoc router model designed three different types (per established connection for proactive, on-demand connection established for reactive and both concept available in hybrid routing protocols) for sharing information between devices in non fixed network Multipath importance techniques using alternative multiple path in network which can elide provide such as tolerance increase bandwidth and improving security, the multiple path computing joint and disjoined between nodes in the network, extension of research is going recent years in multipath fading communication based on some criteria like minimum cost, minimum weight, maximum forwarding capability and maximum receiving capability etc.

II. PROBLEM IDENTIFICATION

The dynamic nature of MANETs requires the routing protocols to refresh the routing tables frequently while they suffer from transmission congestion which are the results of the broadcasting nature of radio transmission. Since a node in a MANET cannot directly communicate with the nodes outside its communication range, a packet may have to be routed through intermediate nodes to reach the destination. It also becomes essential to monitor the constraints in intermediate nodes (multi-hop routing). Consequently, an efficient routing approach may generate route failures. The simplest scheme of routing in MANET is the one to find a route without malicious nodes. In this research aims provide an unbreakable route to improved remaining energy for the way of secured transmission. Hence, a new routing algorithm named, Ad hoc on-demand Distance Vector with help of Fuzzy Controller (FC-AODV) is proposed.

Procedural Steps of FC-AODV Algorithm

- FC-AODV processing starts with fuzzy controller.
- Hello packet transmission from source to destination through intermediate nodes.
- Destination node sends ACK message to source node in same route through intermediate nodes.
- If source node receives this acknowledgement packet within a predefined time period, then data transmission will be start.
- If node A does not receive this acknowledgement packet within a predefined time period, then the intermediate nodes are marked as malicious nodes, otherwise data transmission is started.
- Transmit the data in the alternate path to the destination, and go to step1.

Simulation Parameter: Initially nodes are placed at certain specific locations, the simulation parameters are specified below.

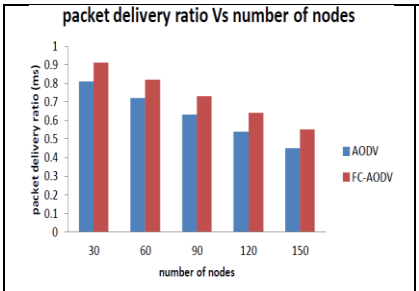
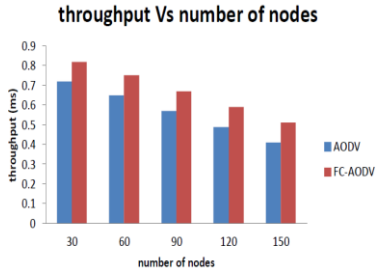
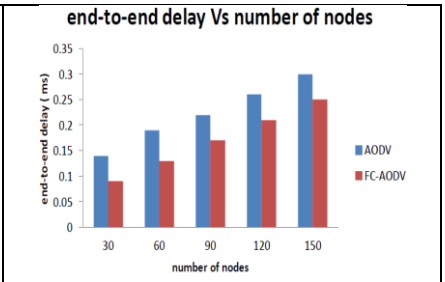
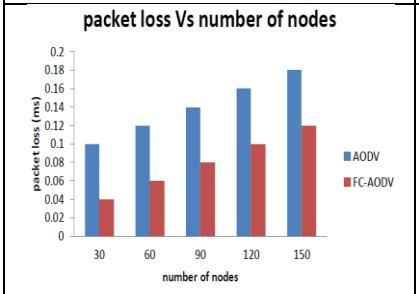
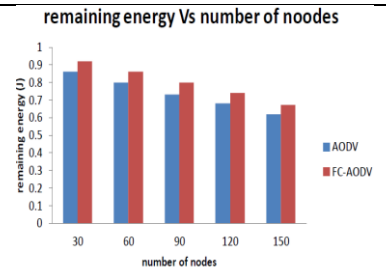
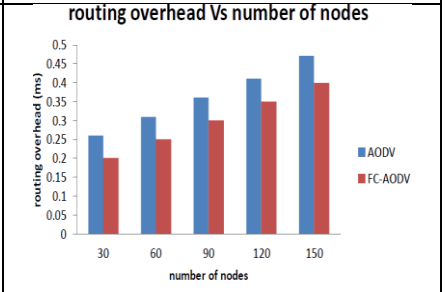
Table 1 Simulation parameters

Parameter	Values
Simulation area	780m*780m
Number of nodes	50, 100, 150
Number of packets sender	25
Constant bit rate	4 (packets/second)
Packet size	512 bytes
Initial energy/node	100 joules
Antenna model	Omni directional
Simulation time	500 sec
Malicious node	8

III. RESULT AND DISCUSSION

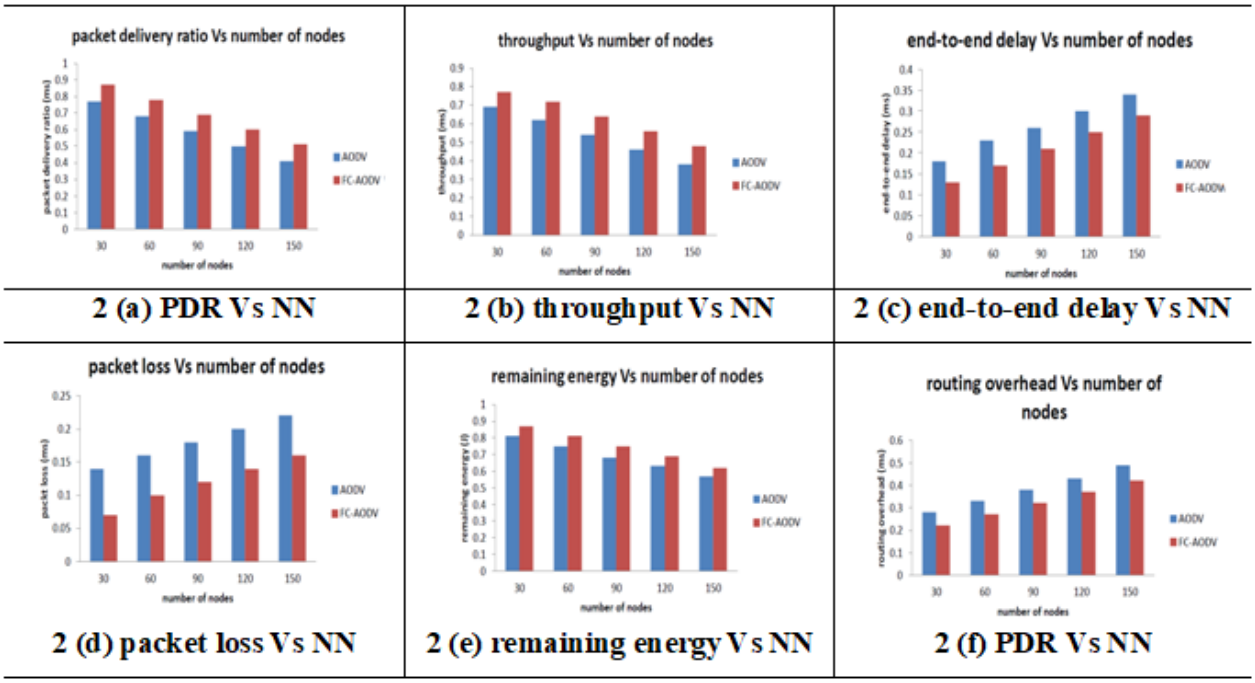
In this section we discussed results and discussion of existing and proposed methods classified three different models via NS 2.

Model 1: Results of Parameter Values (SA=780m, NN=50 & MN=8)

<table>
<tr>
<td> 
</td>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td>1 (a) PDR Vs NN</td>
<td>1 (b) throughput Vs NN</td>
<td>1 (c) end-to end delay Vs NN</td>
</tr>
<tr>
<td> 
</td>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td>1 (d) packet loss Vs NN</td>
<td>1 (e) remaining energy Vs NN</td>
<td>1 (f) routing overhead Vs NN</td>
</tr>
</table>

The result obtained is given in Table 2 and Fig. 1 is varied from 1 to 8 out of 50 and simulation is carried out to calculate the packet delivery ratio using proposed and existing methods. It is clear from the simulation results of Fig. 1 our proposed model archive the maximized average packet delivery ratio 10%, increase average throughput by 10%, decreases the average delay by 6.2%, reduced an average losses by 6%, increases the average remaining energy by 6% and reduce average routing overhead by 6.2% than AODV.

Model 2: Results of Parameter Values (SA=780m, NN=100 & MN=8)



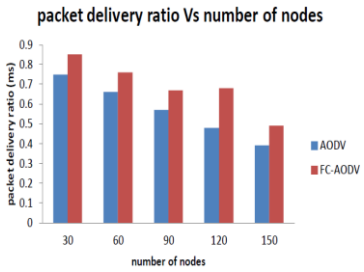
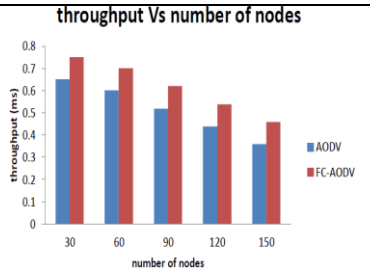
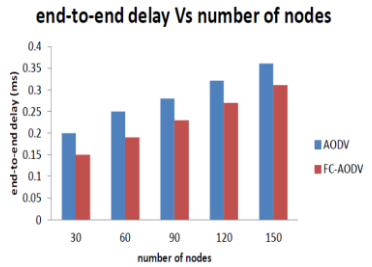
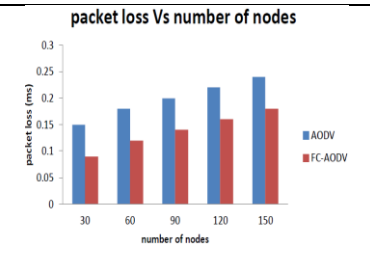
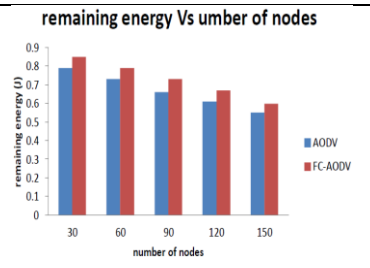
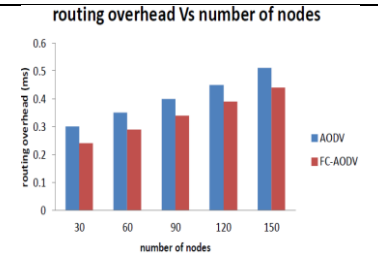
2 (a) PDR Vs NN | 2 (b) throughput Vs NN | 2 (c) end-to-end delay Vs NN

2 (d) packet loss Vs NN | 2 (e) remaining energy Vs NN | 2 (f) PDR Vs NN

Fig. 2(a) that the FC-AODV has the maximized average packet delivery ratio 10% than AODV, result of Fig. 2(b) shows that FC-AODV has increase average throughput by 10.4% compared to the existing method. It is observed from Fig. 2(c), the proposed model decreases the average delay by 5.2% than AODV protocol, simulation results are shown in Fig. 2(d). From the simulation results it is understood that the proposed algorithm reduced an average losses by 5.4% than existing design. Fig. 2(e) it is clear that the proposed design increases the average remaining energy by 6% with the increasing nodes 100 than AODV. Fig. 2(f) FC-AODV has reduced routing overhead with the

number of malicious nodes from 8 when compared to the existing method also suggested new method has the reduce average routing overhead by 5.2% than AODV.

Model 3: Results of Parameter Values (SA=780m, NN=150 & MN=8)

<table>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>3(a) PDR Vs NN</td><td>3(b) throughput Vs NN</td><td>3(c) end-to-end delay Vs NN</td></tr>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>3(d) packet loss Vs NN</td><td>3(e) remaining energy Vs NN</td><td>3(f) routing overhead Vs NN</td></tr>
</table>

The result obtained is given in Fig. 6 the malicious node is varied from 1 to 8 out of 150 and simulation is carried out to calculate the packet delivery ratio using proposed and existing methods. It is clear from the simulation results of Fig. 3(a) that the FC-AODV has the maximized average packet delivery ratio 10% than AODV with topology size 600m * 600m. Result of Fig. 3(b) shows that FC-AODV has increase average throughput by 10% compared to the existing method. Proposed algorithm to increases number of active nodes and to identify avoid malicious nodes, it is capable of finding the minimum link failed unbreakable short route between the sources to destination. It is observed from Fig. 3(c), the proposed model decreases the average delay by 5.2% than AODV protocol with the increase in the number of malicious nodes from 1 to 16 out of 150 nodes. Simulation results are shown in Fig. 3(d). From the simulation results it is understood that the proposed algorithm reduced an average losses by 6% than existing design. Fig. 3(e) it is clear that the proposed design increases the average remaining energy by 5.8% with the increasing nodes 30 to 150 than AODV. Fig. 3(f) Suggested new method has the reduce average routing overhead by 6.2% than AODV. From all the above figures and tables it is clear that the comparison of the proposed FC-

AODV with the conventional routing protocol and other existing acknowledgement based IDS schemes, shows the packet deliver ratio, throughput and remaining energy increased, end-to-end delay, packet loss and routing overhead decrease with the increase in the number of malicious nodes.

IV. CONCLUSION

In this manuscript, it is clear that misbehaver attacking for multi-path routing has always been a major threat to the security in MANETs during the transmission drop (or) attack the packet, if wireless communication is done without acknowledgement. In this research, a proposed routing protocol named FC-AODV is proposed with fuzzy controller. The simulation results propose FC-AODV algorithm as compared with the existing AODV algorithm in different scenarios through the network simulation 2. This developed model ability to detect misbehaviour nodes with improves average packet delivery ratio for all the three scenarios by 12.4%, improved average throughput for three scenarios by 10.27% than the existing routing protocol and reduced average end-to-end delay for all the three scenarios by 5.37%, reduced packet loss average packet loss for all the three scenarios by 5.57% also solve weakness of existing method, result of all the scenarios clearly shows propose system still increased average remaining energy by 6.4% than existing method and reduce average routing overhead by 6.37 compared to the existing routing protocol. We plan to investigate the following issues in our future research. 1) The same concept can be applied in satellite to reduce more congestion in the route and also to save more energy. 2) The possibilities of adopting the shortest path algorithm to eliminate the requirement of redistributed; can be examined. 3) The performance of FC-AODV can be tested in real time network environment Instead of software simulation.

References

1. K. Thamizhmaran, R. Santosh Kumar Mahto, and V. Sanjesh Kumar Tripathi “Performance Analysis of Secure Routing Protocols in MANET”, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 1, No. 9, pp. 651-654, 2012.
2. Akshayadevi Arivazhagan, K.Thamizhmaran and N.Thamilselvi “Performance Comparison of on Demand Routing Protocols under Back whole For MANET”, Advance Research in Computer science and software Engineering, Vol. 5, No. 3, pp. 407 – 411, 2015.
3. Thamizhmaran, K. et al. “Energy Efficient Routing Protocol with Ad hoc On-Demand Distance Vector for MANET”, IEEE Explore, Vol. 2, pp.158-163, 2015.

4. K.Thamizhmaran “Survey on Cluster Head with Cluster Head Selection Techniques and algorithm for MANET”, Journal of Applied Sciences Research, Vol. 11, No. 23, pp. 43-46, 2015.
5. K.Thamizhmaran “Performance Comparison of Proactive and Reactive Routing Protocol under Wormhole for MANET”, International Journal of Applied Engineering Research, Vol. 10, no. 46, 32193-32198, 2015.
6. K.Thamizhmaran and M.Anitha “A Survey of Routing Protocols in Mobile Ad-hoc Network”, International Journal of Applied Engineering Research, Vol. 10, No. 1, pp. 490-496, 2015.
7. K. Thamizhmaran, A. D. Arivazhagan and M. Anitha, "Co-operative analysis of proactive and reactive protocols using dijkstra’s algorithm", 2015 IEEE 9th International Conference on Intelligent Systems and Control (ISCO), pp. 1-6, Jan. 2015
8. K.Thamizhmaran, A.Akshyadevi and Dr.M.Anitha “Energy Efficient Routing Protocol with Ad hoc on-demand Distance Vector for MANET” WEAST, Vol. 2, No. 8, pp. 1-6, 2015.
9. K. Prabu and K. Thamizhmaran “Detecting misbehaving nodes in MANET using EA3ACK algorithm, Global Journal of Pure and Applied Mathematics, Vol. 12, No. 4, pp.1-6, 2016.
10. K.Prabu and K.Thamizhmaran “Cluster Head Selection Techniques and Algorithm for Mobile Ad-hoc Networks (MANETS)”, Advance Research in Computer science and software Engg, Vol.6, No. 7, pp. 169-173, 2016.
11. K. Thamizhmaran “Performance Evaluation of EA3ACK in different topology’s Using EAACK for MANET, I - Manager Journal of information technology , Vol. 5, No. 4, pp. 5-10, 2016.
12. R.Pushpavani, K.Thamizhmaran and T.Ravichandaran “Fast Handover Algorithm for Mobility Management in VANETs”, IJARCS, Vol. 8, No. 3, pp. 860-863, 2017.
13. K.Vennila and K.Thamizhmaran “Multilevel image segmentation based on firefly algorithm”, International Journal of Biometrics and Bioinformatics, CIIT, Vol.9, N0. 3, pp. 57-60, 2017.
14. K.Thamizhmaran, Dr. K. Prabu “Trust Based Dynamic Source Routing Protocol by Exclusion of Black-Hole Attack for MANETs”, International Journals of Computer Science Trends and Technology, Vol. 5, No. 2, pp. 486-490, 2017.
15. K.Thamizhmaran, Dr. K. Prabu “Trust Based DSR Routing Protocol by Exclusion of Black Hole Attack of Through for MANET”, Computational Methods, Communication Techniques and Informatics, 202, 2017.
16. K. Thamizhmaran “Comparison of Reactive Routing protocols in MANET using IDS system”, IJARCS, Vol. 8, No. 3, pp. 13-15, 2017.

17. K.Thamizhmaran., M. Anitha and Alamelunachippan "Performance Analysis of On-demand Routing Protocol for MANET Using EA3ACK Algorithm", International Journal of Mobile Network Design and Innovation, Vol. 7, No. 2, pp. 88-100, 2017.
18. K.Thamizhmaran., M. Anitha and Alamelunachippan "Performance Analysis of Energy-Efficient Enhanced Adaptive 3-Acknowledgement (EE-EA3ACK) Using ECC in MANET" ARPN Journal of Engineering and Applied Sciences, Vol. 12, No. 9, pp. 2901-2912, 2017.
19. K.Thamizhmaran, M. Anitha and Alamelunachippan "Comparison and Parameter Adjustment of Topology Based (S-EA3ACK) for MANETs", International Journal of Control Theory and Application, Vol. 10, No. 30, pp. 423-436, 2017.
20. Thamizhmaran K "Modified ABR (M-ABR) routing protocol with multi-cost parameters for effective communication in MANETs. IJARCS, Vol. 8, No. 1, pp. 288-291, 2017.
21. K. Thamizhmaran, M. Anitha and Alamelunachippan "Reduced End-To-End Delay for MANETS using SHSP-EA3ACK Algorithm", I-Manager Journal on Communication Engineering and Systems, Vol. 7, No. 3, pp. 9-15, 2018.
22. K.Vennila and K.Thamizhmaran "Implementation of Multilevel Thresholding on Image using Firefly Algorithm", IJARCS, Vol. 8, No. 3, pp. 373-378, 2017.
23. K. Prabu and K.Thamizhmaran "Cluster head Selection based energy Aware Routing Protocol for MANET", Journal of Network Security Computer Networks, Vol. 3, No. 1, pp. 9-14, 2017.
24. A.Kayalvizhi, K.Thamizhmaran and G.Ramprabu "Implement PAPR Reduction in OFDM System Using SAS DCT with Commanding", IJARCS, Vol. 8, No. 3, pp. 922-925, 2017.
25. K. Thamizhmaran "EEQRP-Energy Efficient Quality Routing Protocol for Wireless Sensor Networks, Journal of Signal Processing, Vol. 3, No. 1, pp. 1-6, 2017.
26. K.Thamizhmaran, "Performance Analysis of TS-AODV and MTS-AODV Routing Protocols in MANET", Journal of Computer Science Engineering and Software Testing, Vol. 3, No. 1, pp. 1-8, 2017.
27. K.Thamizhmaran "Performance Comparison of ABR using EPKCH in MANET", I - Manager Journal of Information Technology, Vol. 7, No. 2, pp. 23-28, 2018.
28. K.Thamizhmaran "Comparison of AODV and M-AODV IN MANET", IOSR Journal of Engineering, Vol. 8, No. 5, pp. 11-14, 2018.
29. K.Thamizhmaran "Markovian Implementation Methods using Mobile Ad hoc Networks", Journal of Wireless Communication, Network and Mobile, Vol. 4, No. 2, pp. 21-29, 2019.

30. K.Thamizhmaran and G.Girishkumar "ACO of Energy Efficient Clustering Routing Method", Journal of gujarat research society, Vol. 21, No. 7, pp. 66-71, 2019.
31. K.Thamizhmaran "IOT - Fundamentals and Applications" International Journal of Advance Research and Review, Vol. 4, No. 3, pp. 10-13, 2019.
32. K.Thamizhmaran "Developed QoS using S-EA3ACK Algorithm for MANETs", Journal of Advanced Research in Electronics Engineering and Technology, Vol. 7, No. 3 & 4, pp. 1-5, 2020. https://doi.org/10.24321/2456.1428.202002
33. K.Thamizhmaran "Analyses of Secure Hybrid Routing Protocol for MANET", Journal of Advancement Signal Processing and its Application (HSBR), Vol. 3, No. 2, pp. 1-9, 2020. https://doi.org/10.5281/zenodo.4010274
34. K.Thamizhmaran "Design Secure Routing Protocol for MANET", Journal of Research and Advancement in Electrical Engineering (HSBR), Vol. 3, No. 2, pp. 1-9, 2020. https://doi.org/10.5281/zenodo.4008889
35. K.Thamizhmaran "Efficient Dynamic Acknowledgement Scheme for MANET", Journal of Advanced Research in Embedded System, Vol. 7, No. 2, pp. 1-6, 2020. https://doi.org/10.24321/2395.3802.202005
36. K.Thamizhmaran "EE-ATPSP – Evaluation Node Life Time for WSNs", i-manager's Journal on Wireless Communication Network Vol. 8, No. 4, pp. 27-35, 2020.
37. K.Thamizhmaran, "Issues in Wearable Electronics Devices for Wireless Sensor Network", i-manager's Communication System and Engineering,, Vol. 9, No. 1, pp. 34-38, 2020.
38. K.Thamizhmaran "Security Attacks in Wireless Sensor Networks – A Study", i-manager's Journal on Information Technology, Vol. 9, No. 1, pp. 35-43, December 2019 - February 2020.
39. K.Thamizhmaran "IOT supported security considerations for network" WSEAS Transactions on Communications, Vol.19, pp. 113-123, 2020. https://doi.org/10.37394/23204.2020.19.14.
40. K.Thamizhmaran "Secure Three Acknowledgements Based Quality Routing Protocol for WSN", Journal of Optoelectronics and Communication (HSBR), Vol. 2, No. 3, pp. 1-5, 2020. https://doi.org/10.5281/zenodo.4042916
41. K.Thamizhmaran "A Review of Vehicular Ad hoc Network Broadcasting Techniques", Journal of Sensor Research and Technologies, Vol. 2, No. 3, pp. 1-10, 2020. https://doi.org/10.5281/zenodo.4222093

42. K.Thamizhmaran, “Enhanced Secure Technique for Detecting Attacks in Network”, Journal of Advancement in Electronics Design, Vol. 3, No. 3, pp. 1-6, 2020. https://doi.org/10.5281/zenodo.4223718
43. K.Thamizhmaran “Acknowledgement based Topology Control using Hybrid Cryptography for MANETs”, i-manager’s Journal on Information Technology, Vol. 9, No. 2, pp. 36-4, 2020.
44. K.Thamizhmaran “Cluster based Data Collection Scheme for VANET”, i-manager’s Journal on Software Engineering, Vol. 14, No. 4, pp. 37-40, 2020.
45. K.Thamizhmaran “Network Privacy Reflection using Internet of Thinks”, HBRP Publication on Recent Trend in Control and Converter, Vol. 3, No. 3, pp. 1-11, 2020. http://doi.org/10.5281/zenodo.4477853
46. K.Thamizhmaran “Face Recognition Through Simulation”, Journal of Advanced Research in Instrumentation and Control Engineering, Vol. 8, No. 1, pp. 12-17, 2021.
47. K.Thamizhmaran “Signature Verification Through Simulation”, Journal of Advanced Research in Electronics Engineering and Technology, Vol. 8, No. 1, pp. 19-22, 2021.
48. K.Thamizhmaran “RFID for Library Management System”, Journal of Advance in Communication System, Vol. 4, No. 1, pp. 1-18, 2021. http://doi.org/10.5281/zenodo.4787338
49. K.Thamizhmaran “Image Segmentation using Edge Detection Through Simulation” Journal of Sensor Research and Technology, Vol. 3, No. 1, pp. 1-10, 2021. http://doi.org/10.5281/zenodo.4738452
50. K.Thamizhmaran, “Comparative Study of Energy Efficient Routing Protocols in MANET”, WSEAS Transaction, Vol. 21, 2022.
51. K.Thamizhmaran “Comparison of On-Demand Routing Protocol for MANET using Simulation”, i-manager’s Journal on Communication Engineering and Systems, Vol. 11, No. 1, pp. 13-18, 2022.