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# ENERGY EFFICIENT PROCESS USING CONGESTION CONTROL ALGORITHM IN MANET

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**ABSTRACT-** As of late, MANET is the mainstream and growing system utilized in different applications. Here the portable nodes are randomly moving without any passageway. Because of the versatility of nodes, the energy consumption of the system goes higher. More energy consumption happens because of retransmission of packets and the event of packet loss boundlessly. So the main objective of the system is to guarantee more energy efficiency. To give minimum energy consumption and avoiding more congestion, the energy consumption model and multipath routing plan are required in systems. In this paper proposed to Congestion Control algorithm using Energy-Efficient Process in MANET. The presentation of the Enhanced Random Range Based Wireless Streaming Algorithm plot is assessed using different measurements, for example, Reachability Ratio, Random Trip, Re-Transmission and Counter Time Ratio.

**Keywords: [**Congestion Control, Energy Efficient, Counter Time, Random trip, Reachability.]

## 1. INTRODUCTION

MANET is a versatile specially appointed system where different wireless nodes intercommunicate to one another. This system is a brief system. It is where source hub conveys to the destination hub. This system has constrained assets. These assets are in the terms of bandwidth. So there is high possibility of congestion. To evade the system congestion different methods are utilized in portable specially appointed system. Congestion is a circumstance in correspondence arranges in which an excessive number of packets are available in a piece of the subnet. Congestion may happen when the heap on the system (number of packets sent to the system) is more noteworthy than the limit of the system (number of packets a system can deal with). There are a number of issues and difficulties in a versatile specially appointed system. Congestion prompts packet losses and bandwidth debasement and sits around and energy on congestion recuperation. On the Internet when congestion happens it is typically focused on a single router, though, because the mutual mode of the MANET congestion won't over-burden the versatile nodes however affects the whole inclusion territory. In a system with shared assets, where different senders go after link bandwidth, it is important to modify the information rate utilized by every sender in request not to over-burden the system. Packets that land at a router and can't be sent are dropped, thusly an unreasonable measure of packets arriving at a system bottleneck prompts numerous packet drops. These dropped packets may as of now have voyage far in the system and in this manner expended critical assets. Also, the lost packets regularly trigger retransmissions, which imply that considerably more packets are sent into the system. Along these lines organize congestion can seriously fall apart system throughput. In the event that no fitting congestion control is played out, this can prompt a congestion breakdown of the system, where practically no information is effectively conveyed.

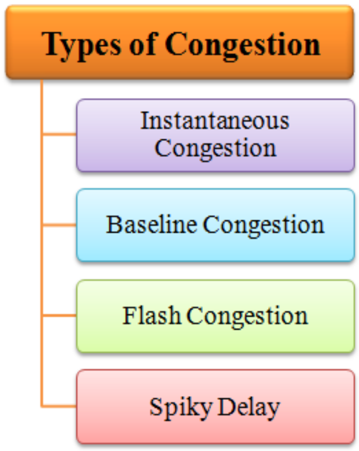


**Figure 1: Types of Congestion**

Exact and efficient congestion identification assumes a significant job in congestion control of sensor systems. There is a requirement for new congestion location methods that incur minimal effort regarding energy and calculation unpredictability. A few systems are conceivable. For run of the mill applications in sensor organizes, the sinks expect a certain sampling rate or reporting rate coming from the sources. This rate is profoundly application-explicit, and can be viewed as an indication of occasion devotion; that is, the reporting rate from the source regarding certain wonder ought to be sufficiently high to fulfill the applications' ideal exactness. At the point when a sink reliably gets a not exactly wanted reporting rate, it very well may be inferred that packets are being dropped along the way, most likely because of congestion. Line the executives are regularly utilized in conventional information systems for congestion identification. In any case, without link-layer affirmations (a few applications probably won't require this and thus would discard it to spare the overhead) cushion inhabitance or line length can't be utilized as an indication of congestion. It is hard to measure a degree of congestion or infer congestion exclusively dependent on support inhabitance. This bimodal impact isn't responsive enough and too coarse to even think about providing smooth and efficient congestion control. Channel loading gives precise information about how bustling the surrounding system is nevertheless it is inherently a neighborhood alleviation component. It has constrained impact, for instance, in detecting huge scope congestion brought about by information motivations from scantily found sources that produce high-rate traffic. Listening to the channel expends a huge part of energy in a hub.

## 2. LITERATURE SURVEY

**[1] Gururaj H L, and Ramesh, B. (2015)** proposed a Congestion Control for Optimizing Data Transfer rate in Mobile Ad-hoc Networks using HSTCP the retransmission time and to evade congestion in totally unique conditions where hub versatility is totally arbitrary is the fundamental concern. HSTCP outperforms when contrasted with TCP Reno for various network parameters. HSTCP outperforms when contrasted with TCP Reno for various network parameters.

**Merits:**

- Finding the closest/neighboring hubs in the network
- Energy constraints of the hubs
- Path disclosure among source and destination
- Congestion because of successive way breaks
- Node versatility

**Demerits:**

- In Ad hoc networks because of foundationless character, there is no guaranteed bandwidth and hub versatility.

**[2] Nousheen Akhtar, Muazzam A. Khan Khattak, Ata Ullah and Muhammad Younus Javed (2017)** propose an AODV based system to evade congestion before occurring. In the proposed scheme, the present bandwidth consumption is evaluated to adjust as indicated by accessible bandwidth. Input is given to the source hub about the current network state as per which source hub adjusts its information rate. The reproduced the situation by utilizing NS 2.35 utilizing TCL and C language.

**Merits:**

- Network monitoring to acquire congestion status.
- Congestion detection is dependent on line length, channel contention and watching the number of parcels drop.
- Avoid each one of those ways which have congestions and build up a congestion-free route from source to destination.

**Demerits:**

- Congestion evasion is a difficult issue because of versatility and subsequently powerful topology of MANETs.

**[3] Akhtar, N., Khan, M. A., Ullah, A., & Javed, M. Y. (2019)** proposed a bandwidth aware routing scheme (BARS) that can stay away from congestion by monitoring lingering bandwidth limit in-network ways and accessible space in lines to store the information. The measure of accessible and consumed bandwidth along with the remaining store must be turned out before transmitting messages. The BARS uses the criticism component to hint the traffic source for adjusting the information rate as indicated by the accessibility of bandwidth and line in a routing way. To performed broad simulations utilizing NS 2.35 on Ubuntu where TCL is utilized for hub configuration, organization, versatility and message initiation, and C language is utilized for adjusting the functionality of AODV. Efficient Bandwidth Aware Routing Strategy (BARS) for distinguishing way among sender and beneficiary. To break down accessible Bandwidth and lingering line size to choose about prescribing appropriate bandwidth esteem for information trade.

**Merits:**

- Ability to gauge the remaining bandwidth. All hubs along the way are skilled to realize their accessible resources regarding bandwidth
- Informs source hub about current network conditions as far as lingering bandwidth with the goal that source hub can adjust its transmission rate as needs.
- The route recuperation process promptly performs route recuperation at whatever point there is a wrecked route in network

**Demerits:**

- To incorporate quality of service factors like energy-aware route selection in combination with bandwidth estimation.

**[4] Mallapur, S. V., Patil, S. R., & Agarkhed, J. V. (2015)** proposed a efficient routing method known as the multipath load balancing technique for congestion control (MLBCC) for MANETs to proficiently adjust the load among various ways by decreasing congestion. MLBCC presents a congestion control system and a load balancing component during the information transmission process. The congestion control instrument identifies the congestion by utilizing an appearance rate and an active rate at a specific time interim T. The load balancing component is the selection of a portal hub by utilizing the link cost and the way cost to efficiently circulate the load by choosing the most alluring ways.

**Merits:**

- A congestion control system is proposed to distinguish the congestion through competitor hubs by utilizing the appearance rate and the active rate.

- A load balancing technique disseminates traffic over various ways by utilizing door hubs. Door hubs are chosen by utilizing way cost and link cost.
- Incorporate the congestion control instrument and load balancing systems into the previous stable backbone based multipath routing protocol (SBMRP).
- compared the consequences of proposed protocol with a current ad hoc on-demand multipath distance vector (AOMDV) and the Fibonacci sequence multipath load balancing protocol (FMLB)

**Demerits:**

- Congestion in routing leads to high overhead, parcel misfortune, and longer postponements, and it might diminish the network service quality

**[5] Shanti Rathore and M. R. Khan (2016)** proposed Enhance Congestion Control Multipath routing with ANT Optimization in Mobile Ad hoc Network. The ACO (Ant Colony Optimization) based multipath congestion control technique with shifting the line as per load in a powerful network. The AOMDV (Ad hoc On-demand Multipath Distance Vector) additionally balances the load by giving elective way however not proficient at each condition. The AOMDV gives the numerous way to information sending. In the proposed scheme, various ways section depends on the pheromone esteem not based on briefest and the conceivable line variation is dealt with the information bundles that cross the chose line limit. The line is increased and the putting away and forwarding capacity of hubs is likewise upgraded. The proposed load-balancing scheme is efficiently taken care of the load on the network. On the off chance that the hub being a piece of communication is moves out of range then the AOMDV is diminished the overhead restoration of connection in the middle of the sender and collector.

**Merits:**

- ACO scheme improves the load balancing by giving the necessary line size to every hub in the network.

**Demerits:**

- The security is additionally one of the significant issues in MANET.
- The decentralized network performance is effectively influenced by malignant conduct of assailant.

## 3. PROPOSED WORK

### 3.1 CONGESTION CONTROL ALGORITHM

Congestion is determined by postponement and loss of packets at the destination point. In TCP, congestion happens when the sender gets in excess of three duplicate affirmations or when a time period terminates, resulting in wastage of system assets. In TCP VEGAS for each affirmation Retransmission Time Out (RTO) was set and full circle delays are noted for each fragment in the transmitted window. What's more TCP Vegas produces exponential development in the congestion window.

Three phases of congestion control in TCP VEGAS:

#### 1. SLOW -START.

The slow-start stage starts when a packet loss is identified during which happens a huge increase in bandwidth which prompts congestion in the processing link. Henceforth maintaining the congestion window in three stages is extremely basic in this manner saving the necessary bandwidth. To forestalls, congestion starts up with slow-start stage. In the beginning, it figures the present rate to the normal worth and their distinction is over certain edge esteem it enters the congestion avoidance stage.

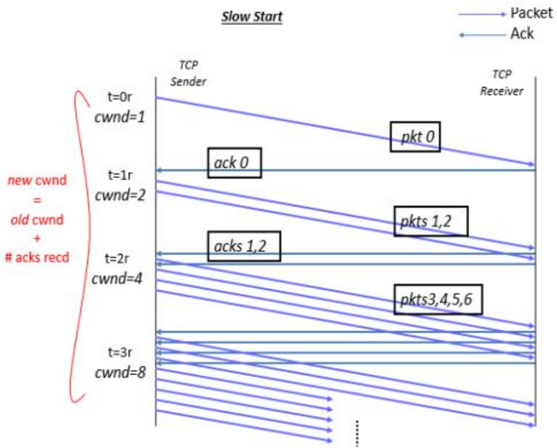


**Figure 2: Slow – Start phase**

1: Calculates the Current and Estimated values (once per RTT)
Where, Current value= actual data value /RTT
Predicted value= CWND Size/Minimum RTT
2: Measure the difference (Current value-Estimated value) on every RTT based on the static variable, α = 1 packet/RTT and measures throughput,
3: If (Diff<α)
Then, CWND=CWND+1
4: Else (Diff> α)
Then, Switch to algorithm 2.
5: Finally, set thresh =CWND
6: Rules to Algorithm 2

## 2. CONGESTION AVOIDANCE

TCP Vegas perceives congestion in the principal stage and avoids the congestion in the congestion avoidance organize. During this stage, the congestion window is diminished subject to the present worth, maintains a key good way from enormous packet drops. In perspective on the RTT, the congestion window is increased or diminished linearly with the past window size. In this way producing better throughput if there is a sufficient point of confinement.

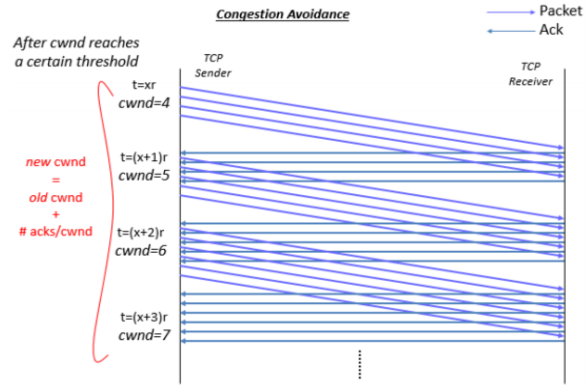


**Figure 3: Congestion Avoidance Phase**

1: Calculates the Current and Estimated values (once per RTT)
Where, Current value= actual data value /RTT
Predicted value= CWND Size/Minimum RTT
2: Check the difference (Current value-Estimated value) Here CWND size updated by checking the difference with the variables (α, β)
3: If (Diff < α), then CWND = CWND-1/CWND
4: If (Diff>β), then CWND = CWND +1/CWND
5: If (α<Diff< β), then CWND= current CWND.

## 3. FAST RETRANSMISSION

TCP VEGAS encounters a couple of changes in this retransmission organize. Initially, TCP Vegas encounters to assess RTT for every datum packet sent. By measuring distinctive RTT values, a timeout period for each part is viewed. Right when a duplicate message (dup ACK) is gotten, TCP Vegas checks whether RTT has terminated. If the time slips, by then the information is retransmitted. Something else, when more than one duplicate message is gotten, by then Vegas again checks for the timeout and transmits another packet. Finally, if various packet loss and more than one retransmission occur, by then, the congestion window is diminished distinctly for the essential retransmission.

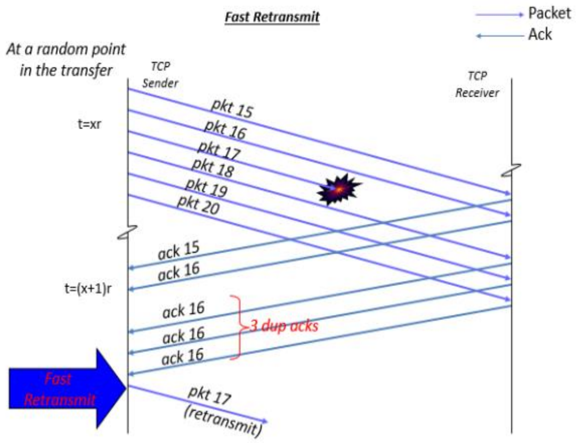


**Figure 4: Retransmission phase**

1: With a non- duplicate ACKS, When TCP receives more than one non -duplicate ACKS, it checks the current RTT.
2: If timeout expires, then retransmit the packet.
3: With a partial ACKS, For first two ACKS, checks whether timeout expires,
4: If time expires, retransmits immediately.

## 4. EXPERIMENTAL RESULTS

### COUNTER TIME RATIO

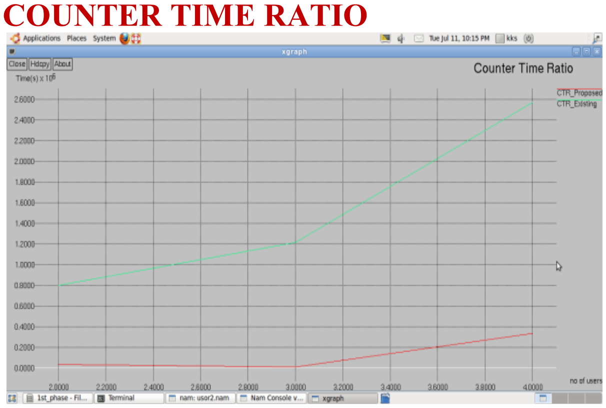


**Figure 5: Above graph compares the counter time ratio between existing work and proposed model, here graph shows existing work taken more counter time to compare our proposed model.**

Figure 5 exhibits the correlation of Counter Time Ratio. The Counter Time Ratio is defined as the contrast between values anticipated by a model and the qualities really saw from this present reality condition. Their existing counter time ratio esteems are commonly defined as between 0.8000 to 2.6000. Proposed counter time ratio esteems are defined as between 0.0500 to 0.0370. These results are reenacted using the NS2 simulator. This outcome shows a reliable outcome for the proposed novel procedure. Henceforth the proposed method created a superior improvement counter time ratio results. Subsequently, the proposed method created a critical improvement in results.

### REACHABILITY RATIO

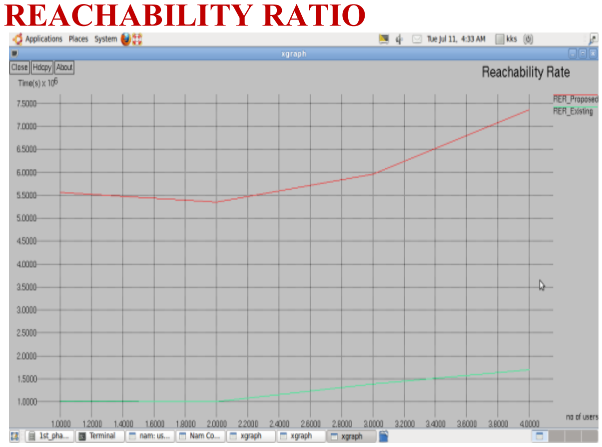


**Figure 6: This graph shows achieved our reachability ratio of data transmission in work proposed model and our work improves more ratio compared to existing process.**

Figure 6 shows the examination of the Reachability Ratio. The Reachability Ratio is defined as the normal most limited time for a progression of contacts to spread information between a reachable pair of vertices (a couple where a chain of contacts exists leading from one individual to the next) and the part of reachable vertex sets. Their existing reachability ratio esteems are commonly defined as between 1.0000 to 1.5370. Proposed reachability ratio esteems are defined as between 5.5100 to 7.4320. These results are recreated using the NS2 simulator. This outcome shows a reliable outcome for the proposed novel procedure. Henceforth the proposed method created a superior improvement reachability ratio results. Consequently, the proposed method delivered a noteworthy improvement in results.

## RANDOM TRIP TIME

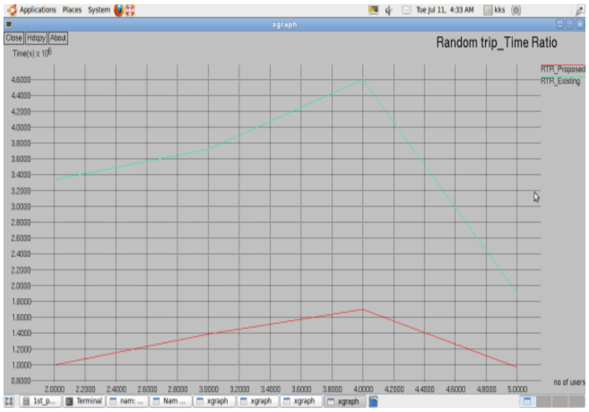


**Figure 7: Above graph mentions Random Trip time for whole process in our proposed work, it compared to existing system, this previous process having high ratio in trip time. Proposed process taken only low ratio compared to previous one.**

Figure 7 exhibits the examination of the Random Trip Time Ratio. Random Trip Time is defined as the period of time it takes for a signal to be sent in addition to the time span it takes for an affirmation of that signal to be received. This time delay includes the engendering times for the ways between the two correspondence endpoints. With regards to PC organizes, the signal is commonly an information packet, and the RTT is otherwise called the ping time. An internet client can determine the RTT by using the ping direction. Their existing random trip time ratio esteems are commonly defined as between 3.4000 to 1.9000. Proposed random trip time ratio esteems are defined as between 1.0000 to 0.9990. These results are recreated using the NS2 simulator. This outcome shows a predictable outcome for the proposed novel procedure. Henceforth the proposed method delivered a superior improvement random trip time ratio results. Subsequently, the proposed method created a critical improvement in results.

## RE-TRANSMISSION TIME

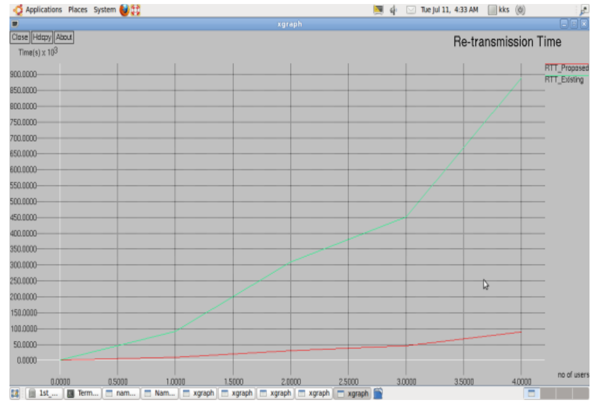


**Figure 8: Re-transmission time taken only less amount of ratio compared to existing model;**

Figure 8 shows the examination of the Re-Transmission Time Ratio. Re-Transmission Time is defined as the sender missing such a large number of affirmations and chooses to take a time out and quit sending by and large. Their existing Re-Transmission time ratio esteems are commonly defined as between 0.1000 to 900.0000. Proposed Re-Transmission time ratio esteems are defined as between 0.0000 to 49.0000. These results are reproduced using NS2 simulator. This outcome shows a steady outcome for proposed novel procedure. Subsequently, the proposed method delivered a superior improvement re-transmission time ratio results. Consequently, the proposed method created a noteworthy improvement in results.

## CONCLUSION

Our outcomes exhibit that it is possible to alter the passed on traffic to as far as possible, all together under stress conditions. Furthermore, the framework execution shows a smooth degradation when the traffic goes past an edge which is settled by the proposed self-sifted through control. Interestingly, without any control, the framework falls before this breaking point. The use of the proposed arrangement gives a feasible methodology to address a segment of the fundamental issues found in adaptable extemporaneous framework associations by providing an overhauled energy-efficient mindful routing. Likewise, the framework congestion is directed using adaptable traffic segments reliant on a satisfaction parameter studied by each packet which has an influence on the overall satisfaction of the traffic passed on by the MANET.

## REFERENCES

[1]. Gururaj H L, and Ramesh, B. "Congestion Control for Optimizing Data Transfer rate in Mobile Ad-hoc Networks using HSTCP" 978-1-4673-9563-2/15/$31.00 ©2015 IEEE.

[2]. Nousheen Akhtar, Muazzam A. Khan Khattak, Ata Ullah and Muhammad Younus Javed "Efficient Routing Strategy for Congestion Avoidance in MANETs" 0-7695-6347-3/17/$31.00 ©2017 IEEE.

[3]. Akhtar, N., Khan, M. A., Ullah, A., & Javed, M. Y. "Congestion Avoidance for Smart Devices by Caching Information in MANETS and IoT" 2169-3536 2019 IEEE.

[4]. Mallapur, S. V., Patil, S. R., & Agarkhed, J. V. "Load Balancing Technique for Congestion Control Multipath Routing in Mobile Ad Hoc Networks" 978-1-4799-8641-5/15/$31.00 c 2015 IEEE.

[5]. Shanti Rathore and M. R. Khan "Enhance Congestion Control Multipath routing with ANT Optimization in Mobile Ad hoc Network" 978-1-5090-5515-9/16/$31.00 ©2016 IEEE.

[6]. Istikmal, Adit Kurniawan and Hendrawan "Performance Analysis of Routing and Congestion Control Cooperation in Wireless Mobile Ad Hoc Networks" 978-1-4799-8975-1/15/$31.00 ©2015 IEEE.

[7]. A. Pratapa Reddy and Dr. N. Satyanarayana "Energy Efficient Stable Multi path Routing in MANET" 978-1-5090-4620-1/16/$31.00 ©2016 IEEE.

[8]. Senthilnathan Palaniappan and Kalaiarasan Chellan " Energy-efficient stable routing using QoS monitoring agents in MANET" DOI 10.1186/s13638-014-0234-9, © 2015; licensee Springer.

[9]. Hannan Bin Liaqat, Amjad Ali, Junaid Qadir, Ali Kashif Bashir, Muhammad Bilal and Fiaz Majeed "Socially-aware congestion control in ad-hoc networks: Current status and the way forward" https://doi.org/10.1016/j.future.2019.02.017. 0167-739X/© 2019 Elsevier.

[10]. Abedalmotaleb Zadin, Thomas Fevens "Neighborhood-based interference minimization for stable position-based routing in mobile ad hoc networks" 0167-739X/© 2016 Elsevier.

[11]. Mahendra Maiti, Srijit Mukherjee and Parag Kumar Guha Thakurta "An energy efficient teaching learning based optimization approach for common content distribution in mobile ad hoc networks" https://doi.org/10.1016/j.compeleceng.2018.09.020 0045-7906/© 2018 Elsevier Ltd.

[12]. Subramanian Balaji, Yesudhas Harold Robinson, Raghvendra Kumar, Eanoch Golden Julie, Pham Huy Thong, and Le Hoang Son "Design of a security-aware routing scheme in Mobile Ad-hoc Network using repeated game model" https://doi.org/10.1016/j.csi.2019.103358 0920-5489/ © 2019 Elsevier.

[13]. Shubhajeet Chatterjee and Swagatam Das" Ant colony optimization based enhanced dynamic source routing algorithm for mobile Ad-hoc network" http://dx.doi.org/10.1016/j.ins.2014.09.039 0020-0255/ 2014 Published by Elsevier Inc.

[14]. Rashmi Chaudhry and Shashikala Tapaswi "Optimized power control and efficient energy conservation for topology management of MANET with an adaptive Gabriel graph" https://doi.org/10.1016/j.compeleceng.2018.03.013 0045-7906/© 2018 Published by Elsevier Ltd.

[15]. Fadoua Yakine and Abdellah Idrissi "Energy-Aware Topology Control and Qos Routing in Ad-Hoc Networks" (http://creativecommons.org/licenses/by-nc-nd/4.0/) 1877-0509 © 2015 The Authors. Published by Elsevier.