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Research Article

Optimization of Hello Message Broadcasting Prediction Model for Stability Analysis

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In mobile ad hoc networks, nodes are connected and disconnected regularly; since every mobile node travels autonomously, those nodes are dispersed not uniformly. Connection damage has straight consequences on the network characteristics. For that motivation, various techniques are quick and efficient damage of connection identification using alert packet is difficult for that time to identify next connection in a mobile network. It increases end to end delay and reduces the network lifetime. The present effective connection alteration rate- (ECAR-) based communication scheme depends on the details of neighbouring nodes to survey the connection between the connection alteration rate and the hello time gap in terms of entire transmission rate. Nevertheless, the hello time gap tracking algorithm is constructed to increase transmission rate displaying a stable choice of connection alteration rate, still although node velocity alters. It reduces end to end delay and increases the network lifetime. The hello time gap tracking algorithm is constructed in the network, and it obtains effective connection among unstable mobile nodes. Experimental output indicates that the connection alteration rate in general enhances the hello time gap. It provides the effective connection changing rate for analyzing different metrics which are network lifetime. throughput, and detection efficiency that are improved in the proposed ECAR scheme.

1. Introduction

Mobile networks are a kind of sequential and self-organized network environment that are appropriate for planned structure and failure recovery condition. Considering its distinguishing performance, there is no need of network environment. Mobile network has an attarct a delivery of notice. In this kind of networks, the mobile nodes can create a distributed network and share data packet with each other through wireless intermediate [1]. Every node has to collaborate with remaining nodes in sequence to send data packets from sender nodes to target nodes. The suppleness of mobile network make themselves appropriate for strategic structure and disaster recovery conditions, in which packet

transmission was performed but was not recognized without problems instantaneously [2]. Though mobile networks are initially devised under a contained statement which every nodes in the network are supportive and gentle. In the former adversary connection in mobile network, the main merits of mobile network may become observable vulnerabilities which can be attacked by intruder nodes in consideration to the open and dispersed scenery of mobile network. This contains various intruders which proceeded additional efficiency in mobile network than in stable structure [3].

In spoofing intruders, a node can pretence as an extra node; this frequently happens in mobile network in consideration to the required federal ability. An additional well-known intruder is the wormhole intruder, in which two nodes conspire to provide a channel among a sender node and a target node. The data packets lose by intruders are called as black hole intruders that do not broadcast data packets for remaining nodes [4]. Modification intruders frequently modify the fields of packet sequence to make overload confusion. These intruders can harm mobile network uses. In the sequence to diminish threat for mobile network, some survey had provided a diversity of protection scheme; this is called as hard defence, to preserve MANETs [5]. Hard defence can efficiently prevent intruders from outside of network environment. Though as intruders turn into additional intelligent and miscellaneous, tough protection does not avoid any intruders, particularly within intruders. Surveys stimulated by programme academic from protection of wired networks newly start to focal point on flexible defence for mobile networks [6].

Protection in mobile network is dissimilar from usual discipline from psychology to organization knowledge that have five different possessions: bias, dynamicity, intransitivity, context-awareness, and irregularity. Considering the uncertain character of protection, it is quite difficulty to measure the protection of a node in mobile network. With the progression of fake intelligence, Bayesian networks are introduced, which is a possible scheme to begin this improbability in protection [7]. In Bayesian networks, there are many primary aspects that are biased details which are reflected in the graphical network environment; assumption of faith is below the restricted possibility by Bayes's rule; fundamental analysis between the area variables is simulated in the graphical character. In this survey, Bayesian networks are used to merge various measurement protections [8].

To accentuate of causal analysis which are make possible protection calculation allowing for the reason of intruder. In addition, organization of causal connections in Bayesian networks should support us to make prediction in the availability of interference [9]. This method uses fundamental analysis on the Bayesian networks to estimate the protection of nodes. The correct confidence value allowing for intruder plan should be assumed. Communication process denotes that the present method has the best characteristics in protection estimation [10].

Residual of the paper is designed as follows. Part II provides related works. In part III, the proposed effective connection alteration rate- (ECAR-) based communication scheme depends on the details of neighbouring nodes to survey the connection between the connection alteration rate. The hello time gap tracking algorithm is constructed in the network, and it obtains effective connection. Part IV provides simulation performance results analysis obtained under various metrics. Part V concludes the paper with future process.

2. Related Works

Rao et al. [11] propose to obtain a reinforcement course foundation for quality of service for path finding convention. In this convention, the potential disappointments of system and node are recognized, and a reinforcement steering is started. For location of disappointments, a way assessment effort is resolved in light of the measurement vitality deplete rate and impedance, and block status is estimated. The essential way fulfilling the quality of service parameter hub's static asset limit, dynamic resource accessibility, neighborhood quality, and connection quality is set up. When disappointment is recognized, back up courses are built up and transmission is diverted on these back up courses. Reenactment results demonstrate that the proposed convention reduced the recovery delay and enhanced throughput.

Gnanasekaran and Vibeeth [12] proposed that a connection breakage expectation calculation is added to the ad hoc routing method. By utilizing signal qualities from the got packets, the connection breakage time is anticipated and sends a notice message to the source hub of dynamic course if the connection is destined to be broken. Additionally, the following ideal course to the goal hub will be chosen before the breakage of any genuine path connectivity.

Thomas et al. [13] propose an investigation of one such attack called as jellyfish intruder. Attacker can misuse the innate shortcoming of MANET. Watchful examination brings into the closer view the helpless attack detection that can be misused in the current multicast steering conventions; henceforth, a more powerful and secure calculation must be built. We have made and examined the effect of a jellyfish reorder attack and proposed a system to anticipate such an attack on routing convention for MANETs. We have utilized multicast steering convention as the directing convention with the assistance of standard system test system called EXata Cyber. The test system utilizes a blend of MANET and UAV organization that uses ODMRP gathering to complete a JF reorder attack and its counteractive action. Additionally proposed conduct to deal with relieve a reordering JF attack on a mobile network organize.

Metri and Agrawal [14] present mobile network which is a self-sufficient and self-arranging framework associated by remote connections. It is an accumulation of portable hubs and is generally utilized where organized foundation is testing. Remote specially appointed system makes accessible various ways for information transmission, yet it is important to pick most effective way and give better quality of service. Because of continuous development and arrangement of dynamic associations in mobile network, it is trying to keep up nature of administration. This quality of service is reviewed utilizing execution pattern, end to end delay, transmission capacity, transmission rate, likelihood of packet

misfortune, postpone difference, and more. Here, another convention QAMR is presented in view of subterranean insect settlement improvement calculation which gives conceivable way out of different ways for information transmission. This calculation is adaptable and effective. The execution is assessed utilizing resource.

Han and Lee [15] proposed intermittent hello packet informing which is a generally utilized plan to get nearby link accessibility information. This may be pointless because hello informing can deplete batteries while cell phones are not being used. This paper proposes a versatile hello informing plan to smother superfluous hello messages without decreased perceptibility of broken connections. Reenactment result shows that the proposed conspire lessens vitality utilization and system overhead with no indisputable contrast in transmission rate.

Kumar and Doohan [16] presented an each mobile hub which is competent for naturally arrange system and formation of connection with neighbor hub for foundation of correspondence. Directing conventions are utilized to find appropriate course from source to goal and offer help for foundation of correspondence. Ad hoc routing is a responsive convention used to identify course according to request. The total examination watch the ad hoc is great answer for correspondence in remote condition however powerless for different security dangers. Security dangers not just endeavor to trade off the protection of correspondence yet in addition debase the system execution. Dim gap is one of the extreme security dangers who in part drop packets and corrupt the system execution the entire work watch the need of security arrangement and built up a location and aversion method to keep away from dim gap assault and keep up organize execution.

Wei et al. [17] presented scheme focal point around moderating risk from attacker who purposely drop and alter packets to propose a plan of trust foundation in view of Bayesian systems, which can successfully perform causal thinking. In view of this model, different causes and unreliable remote associations, which additionally can result in packet dropping, will be recognized from malevolence, and therefore, a more precise trust can be computed. Reproduction results exhibit the execution and adequacy of the proposed conspire in malignant situations.

Hiremath and Rao [18] proposed a novel middleware configuration called as message exchange with resilient and adaptive middleware (MERAM) framework. It is planned by tending to the issues of message replications and offering a quicker message trading framework between two conveying hubs. The proposed framework is likewise found to offer quicker message trading time concerning existing framework.

Gadekar and Kadam [19] present the optimized link-state routing convention which is generally utilized today. Hub detachment assault is the significant DOS intruder which happens against optimized link-state routing scheme where aggressor just disconnects the casualty hub from the whole system. So it is critical to recognize and relieve hub separation assault and make the system secure for correspondence which will battle against cybercriminal exercises. To recognize and alleviate this node confinement assault, this method is altered by enhancing its MPR choice method.

In Sharma P. K. et al. [20], mobile nodes can show up, vanish, and reshow up in a course habitually which makes directing convention working more confounded in examination of a commonplace wired network. Moreover, because of high portability, the directing conventions that are composed by the design of wired or cell systems are not adequate for mobile ad hoc networks and perform ineffectively. Thus, a profoundly versatile directing plan is required to manage the dynamic condition of MANETs. To advance the connection network and QoS of MANETs, another viable on-request guiding strategy throughput efficient is presented. To demonstrate the criticalness of the proposed approach, it was reproduced with customary, and present-day calculation under simulator with same parameters and results obviously shows the strength of planned approach.

3. Overview of Proposed Scheme

In the MANET, nodes are linked or else cutoff with other nodes regularly, because every mobile nodes are move frequently; these nodes are diffused regularly. Connection failure has a straight result on the network performance. For that main aim, different methods are immediate, and efficient failure of link detection scheme is used for alert packet transmission which is not easy for that time instance, to identify the next link in the mobile network structure. This maximizes the end to end delay and minimizes the network lifespan.

Then proposed effective connection alteration rate-(ECAR-) based communication scheme depends on the details of neighbouring nodes to analyze the link. The link alteration rate with the alert time interval in terms of whole communication success rate. Nevertheless, the alert packet time interval tracking algorithm is designed to improve the transmission rate showing a steady option of link alteration rate and motionless although node speed alters. It minimizes the end to end delay and improves the network lifespan. The alert time interval tracking algorithm is placed in the network; this achieves the effective link through unstable mobile nodes. Simulation result denotes that the connection alteration rate in common improved as the hello time interval increases. TheNS2 tool is used to implement this effective connection alteration rate- (ECAR-) based communication method. This offers the effective connection changing rate for measuring various parameters which are network lifetime, throughput, and detection efficiency that are enhanced in the proposed ECAR scheme.

Figure 1 shows block diagram of effective connection alteration rate-based communication scheme. The link connection is established for neighbouring nodes. Search and find the next link for every nodes, single nodes have two links, also single node is linked with two nodes, and they are previous neighbor and next neighbor node. Effective connection alteration rate-based communication scheme depends on the details of neighbouring nodes to analyze the measurements of the link alteration rate with the alert time interval. Alert time interval tracking algorithm is

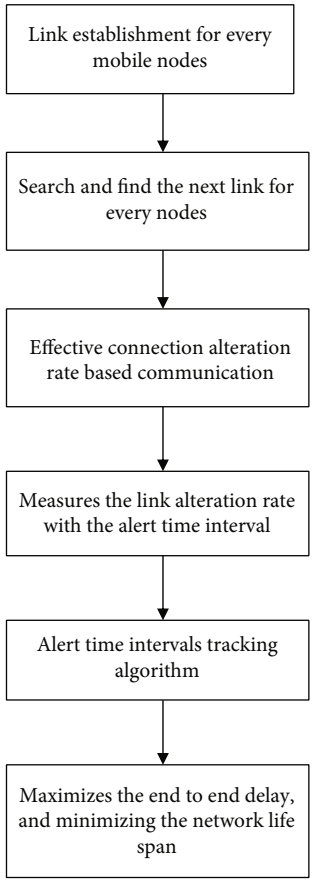

Figure 1: Block diagram of the proposed effective connection alteration rate-based communication scheme.

designed to provide alert packet when time exceeds. This maximizes the end to end delay and minimizes the network lifespan.

3.1. Link Establishment for Every Mobile Nodes. A sender node forwards a request packet, whether the relay node has an authenticated route to the target node; then moreover, it shares the path request else path reply packet. The sender ID and the broadcast ID are broken with all other to find out if the node has previously been accepted a preceding copy of the request packet. The sender node can accept the packet more than one reply packet; for this condition, it determines that one reply packet should be selected on the base of minimum hop count node. Every node, previous to forwarding data packet, provisions the broadcast ID and the earlier node count. From end to end, the request packet is accepted from the sender node. Whether no any reply packet is accepted for the request packet, one timer is used by the relay nodes to eliminate that access. And whether a reply packet is accepted, the broadcast ID and the earlier node from end to end in which the reply packet is accepted once more are maintained by the relay node.

Whether any connection failure occurs that is surveyed by finding the periodic hello packets else reply packet, after that sender node and the target node are learned. Then, the source reinitiates the correct path strength of the process to the target emphasizing maximum layers. When the amount of nodes improves, the characteristics of AODV minimize, although ad hoc routing protocol is efficient than a few other communication techniques. This is in consideration to its unfortunate route update method in a comparatively inactive topology structure. In AODV routing method, conversation is completed on maximum network latency except some metrics are infrequently used approximated count of link break, control packets, and rebroadcasting data packets, where BL is better link, At is alert time, Ec is effective connection, LE is link establishment, and C is communication.

$$\begin{aligned} \mathrm{BL} &= \mathrm{Ec} + \mathrm{At}, \\ \mathrm{Ec} &= \mathrm{LE} * C. \end{aligned} \tag{1}$$

Practical routing schemes are constructed and keep the routing detail of each and every nodes. This is self-governing of whether else the path is required. In sequence to obtain this, packets are regularly forwarded. The proactive routing protocols methods the trsamission rate not better . This is in consideration to the data packets which are forwarded still when there is negative data transmission. One of its major merits is the detail of that nodes can without difficulty get communication details and it is simple to create an assembly. While the demerits contain, there is as well a large amount of data kept by the nodes for path maintenance, and it is measured to redistribute while there is a breakdown in a specific connection. This searches the next link for specific path to arrange relay nodes in the network environment. Ptr is packet transmission, and Prep is packet receiving.

$$\begin{aligned} C &= \mathrm{Ptr} + \mathrm{Pre}, \\ \mathrm{Ptr} &= \mathrm{Preq} * t. \end{aligned} \tag{2}$$

In this method, the network residue silent awaiting a link is required. While node available from the network requires a link establishing, then it will share a request packet for link. The remaining nodes broadcasted this packet and confirmed the node that they hear it from, providing sudden increase of temporary path reverse to the sending node. While a node accepts data packet previously having path to the required node, it shares a packet towards the back among a provisional path to the sending node. The sending node then begins using the path which has the smallest amount number of nodes among remaining nodes. Unexploited entries in the routing tables are used after a time instance. While a connection breaks, a routing fault is approved reverse to a sending node and the procedure replicates.

3.2. Effective Connection Alteration Rate-Based Communication Scheme. The characteristics of ad hoc on-demand routing protocol have the preservation of time-based conditions in every node, and a routing entrance not recently used is terminated. When the condition of a path failed, the neighbors can be informed. Pathfinding depends on uncertainty and reply packet sequence, and path detail

Step1: Measures the link steadiness between nodes
Step 2: For each assign the link steady node in the path
Step 3: Proceed packet transmission among the node
Step 4: Establish link steadiness
Step 5: if {link==failure}
Step 6: altering the communication route
Step 7: else
Step 8: if { link==steady }
Step 9: Usethe same communication route
Step 10: Offering the steadylink
Step 11: Improve connectivity rate.
Step 12: end if
Step 13: end for

Algorithm 1: Algorithm for effective connection alteration rate-based communication scheme.

Step 1: Series of path allocation.
Step 2: for each nodes time gap measurement
Step 3: if {timegap==high}
Step 4: attacks are ocurred
Step 5: discover another efficient route
Step 6: alert packet is transmitted
Step 7: else
Step 8: if {timegap==low}
Step 9: Similar path is used.
Step 10: reduce delay.
Step 11: End If
Step 12: End For.

Algorithm 2: Algorithm for alert time interval tracking.

is maintained in all relaying nodes of the length of the path in the appearance of route table entry. The subsequent control packets are used, routing request packet which is transmitted by a node needs a path to the next neighbor node, routing reply packet is transmitted reverse to the sender node of request packet, and route error packet is sent to report the remaining nodes of the defeat of the connection.

$$\text{Prec} = \text{Prep} * t. \tag{3}$$

Request packets are used for identifying and observing connection to neighbouring nodes, because this packet contains the information about routing nodes. The ad hoc on-demand distance vector routing scheme is a routing technique designed for ad hoc mobile network structure. Ad hoc routing is proficient together with unicast and multicast communication. This is an on-demand communication algorithm, which indicates to construct paths among the nodes only as required by the sender nodes. It keeps these paths as long as they are required by the source nodes. AODV uses sequence counts to make certain the originality of paths. This is loop-free, self-starting, and balance to maximum count of mobile nodes. The link obtained failed to alter the connection to another one sequentially.

$$\text{LE} = l(S * D). \tag{4}$$

Ad hoc routing constructs a path using a route request and route reply uncertainty sequence. While a sender node needs a path to a target node for which it does not contain a path, it transmits a path request packet crossways of the network environment. Nodes accepting the packet inform its details for the sender node and fix the backward pointer to the sender node in the route table list. Additional to the sender node's IP address, current sequence count, and transmission ID, the request also has the most new series count for the objective of which the sender node is attentive. A node accepting a request packet may forward a path reply packet, whether it is moreover the target node, else whether it has a path to the destination node, with the equivalent sequence count greater than or similar to that restricted in the request packet. Whether this is the condition, it unicasts a reply packet reverse to the sender node. If not, it retransmits the request packet. Nodes maintain the track of the request packet, source IP address, and transmitter ID. Whether they accept a request packet, which they have previously processed, they reject the request packet and do not broadcast it.

$$\text{LE} = l(S * D). \tag{5}$$

Reply packets are propagated reverse to the sender node, and nodes fix to self-assured pointers to the target node. Formerly, the sender node accepts the reply packet, and it may start to share data packets to the target node. As long as the path residue is energetic, it will keep on to be maintained. A route is considered active as long as there is information at regular intervals travelling from the sender node to the target node along the route. Once the sender stops forwarding data packets, the connection will break and finally be removed from the relaying node information table. Whether a connection failure occurs when the path is energetic, the node upstream of the break propagates a path error packet to the sender node to notify it presenting accessible target node.

Table 1: Proposed ECAR packet format.

Source ID	Destination ID	Link establishment for every mobile nodes	Search and find the next link for every nodes	Effective connection alteration rate-based communication	Alert time interval tracking algorithm
2	2	2	4	3	4

Table 2: Simulation setup.

No. of nodes	100
Area size	1068 × 1052
Mac	802.11 g
Radio range	250 m
Simulation time	25 ms
Traffic source	CBR
Packet size	512 bytes
Mobility model	Random way point
Protocol	DSDV

$$C = (\text{Preq} + \text{Prep}) * t,$$
$$\text{Ec} = l(S * D) * (\text{Preq} + \text{Prep}) * t. \quad (6)$$

This ad hoc on-demand distance vector routing technique is an addition to the ad hoc routing scheme used for evaluating many loop-free and connection disjoint routes. The routing entry for every target node has a list of the next neighbouring nodes of the length with the equivalent hop count. Every neighbouring node contains the similar series quantity. This supports in maintaining to observe a path. For every target node, a node keeps the advertised hop calculation that is defined as the highest hop count for every route that is applied for transmitting path advertisement of the target node. Every reproduction path advertisement accepted by a node defines an exchange route to the target node. Routine freedom is guaranteed for a node by accepting other routes to target node, whether it has a minimum hop count than the advertise hop count for that target node. Since the more hop count is applied, the advertised hop count consequently does not alter for the similar series quantity.

3.3. Alert Time Interval Tracking Algorithm. This tracking algorithm can be planned to discover node-disjoint else link-disjoint paths. To find node-disjoint paths, every node does not straight away refuse reproduction request packets. Every request packet received through a various intermediate nodes of the sender node can define a node-disjoint route. This is since node does not transmit the original request, so any two request packets are receiving a relay node through various neighbor nodes of the sender node which cannot be forwarded by the similar node. In an effort to obtain the many link-disjoint paths, the target node provides reply packet to copy the request packet, and the target node only provides acknowledgement to request packet received through unique neighbor nodes. tg ∗ nt is time gap and node tracking.

$$\text{At} = \text{tg} * \text{nt},$$
$$\text{BL} = l(S * D) * (\text{Preq} + \text{Prep}) * t + \text{tg} * \text{nt}. \quad (7)$$

Subsequent to the initial node, the reply packet follows the invalidate routes that are node displaced and thus connection displaced. The trajectory of every reply packet may interconnect at relay node, except each takes various reverse routes to the sender to make assured connection displace. The merits of using ad hoc routing method accept relay nodes to answer to request packet, whereas motionless chooses the disjoint routes. Except, ad hoc routing has maximum packet outflow when the pathfinding considers to maximize the packet drop, and because there are many path communication methods, the target node replies to the many request packet; those outputs are in more overload.

Alert time interval tracking algorithm is constructed, to obtain effective connection among unstable mobile nodes. The failure paths are find and altering the route link to another mobile nodes in the network structure. This reduces delay and packet loss rate.

3.4. Packet ID. Packet ID contains the every mobile node communication details. The node location, node connectivity, and transmission rate of nodes are maintained in specific routing table.

In Table 1, the proposed effective connection alteration rate- (ECAR-) based communication method packet format is shown. Here, the source and destination node ID field each takes two bytes. Third one is link establishment for every mobile nodes takes two bytes to establish the connection between every mobile nodes. In fourth, field takes four bytes. Search and find the next link for every nodes. One link failed to alter the link from one node to another node. In fifth, it occupies three bytes. Effective connection alteration rate-based communication method observes the whole routing path from single source node to many relay node; this relay node sometimes breaks so link is altered. So it provides effective link alteration for packet forwarding through the specific path alert time interval tracking algorithm; it takes four bytes. This algorithm requires to monitor every packet transmission time gap, and also it decreases delay and packet loss rate.

4. Performance Evaluation

4.1. Simulation Model and Parameters. The proposed effective connection alteration rate- (ECAR-) based communication method is simulated with Network Simulator tool (NS 2.34). In our simulation, 100 mobile nodes are placed in a 1068 meter × 1022 meter square region for 25-millisecond simulation time. Each mobile node goes random manner

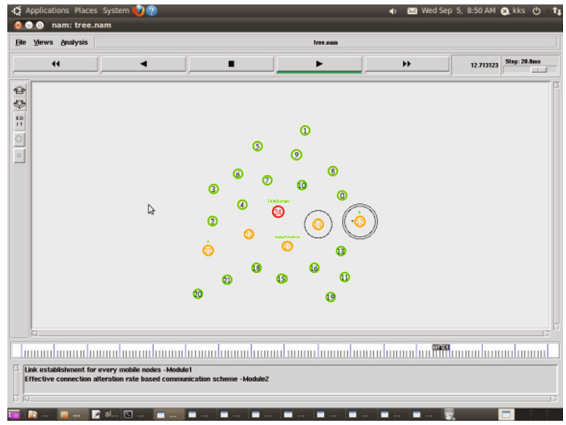

Figure 2: Proposed ECAR result.

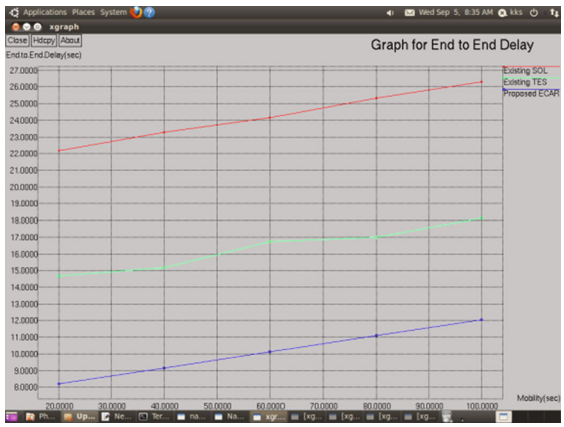

Figure 3: Graph for mobility vs. end to end delay.

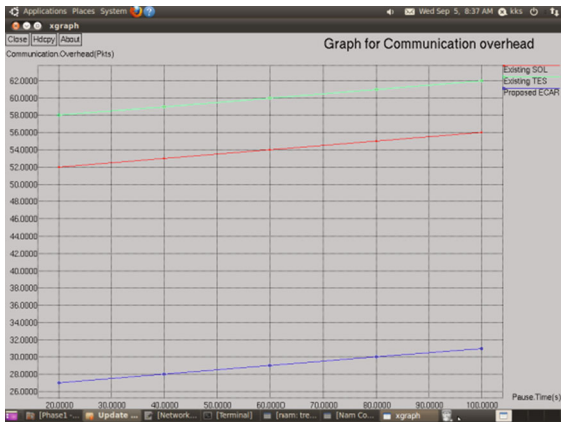

Figure 4: Graph for pause time vs. communication overhead.

among the network in different speed. All nodes have the same transmission range of 250 meters. CBR (constant bit rate) provides a constant speed of packet transmission in network to limit the traffic rate. DSDV (destination sequence distance vector) routing protocol is applied to obtain effective connection among unstable mobile nodes. Table 2 shows the simulation setup estimation.

4.2. Simulation Result. Figure 2 shows that the proposed effective connection alteration rate- (ECAR-) based communication scheme offers efficient connection between nodes and provides efficient connection compared with existing SOL [19] and TES [20]. The hello time gap tracking algorithm is constructed in the network, and it obtains effective connection among unstable mobile nodes. It reduces end to end delay and increases the network lifetime.

4.3. Performance Analysis. In the simulation, the following performance metrics were analyzed using X graph in NS 2.34.

4.4. End to End Delay. Figure 3 shows that end to end delay is estimated by the amount of time used for packet transmission from source node to destination node, and hello time gap tracking algorithm used to offer alert packet time interval exceeds. In the proposed ECAR method, end to end delay is reduced compared to existing scheme SOL and TES.

$$\text{End to End Delay} = \text{End Time} - \text{Start Time}. \quad (8)$$

4.5. Communication Overhead. Figure 4 shows that communication overhead is minimized in which sender transmits packet to receiver node. The hello time gap tracking algorithm is used to identify and ignore the maximum over load during communication period. In the proposed ECAR method, communication overhead is reduced compared to existing scheme SOL and TES.

$$\text{Communication overhead} = \left(\frac{\text{Number of Packet Losses}}{\text{Received}}\right) * 100. \quad (9)$$

4.6. Throughput. Figure 5 shows that throughput is measured by no. of received from no. of packet sent in particular speed. Node velocity is not a constant, and simulation mobility is fixed at 100 (bps). In the proposed ECAR method, packet delivery ratio is improved compared to existing scheme SOL and TES.

$$\text{Throughput} = \left(\frac{\text{Number of packet received}}{\text{Sent}}\right) * \text{speed}. \quad (10)$$

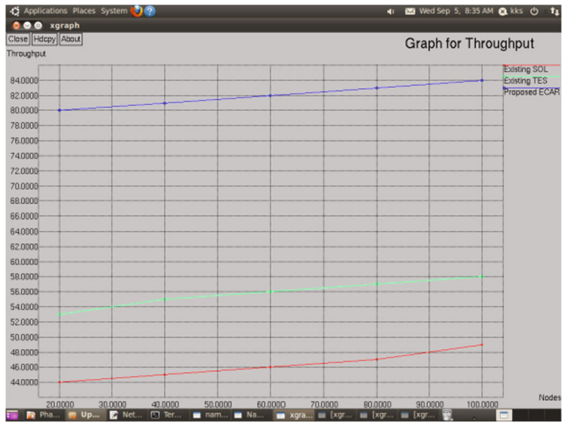

Figure 5: Graph for nodes vs. throughput.

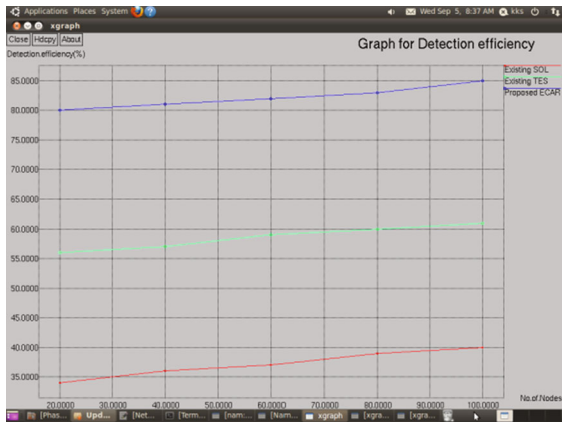

Figure 6: Graph for nodes vs. detection efficiency.

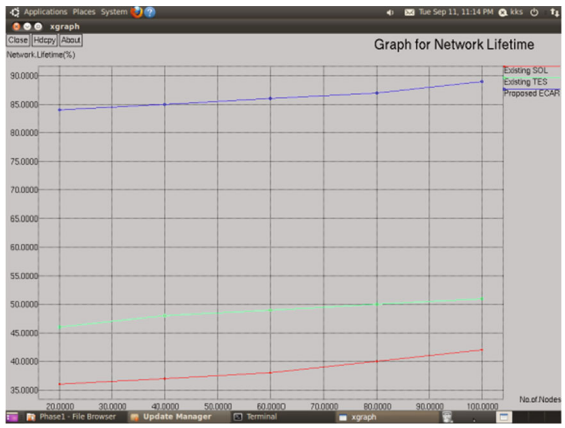

Figure 7: Graph for nodes vs. network lifetime.

4.7. Detection Efficiency. Figure 6 shows detection efficiency; attacks occurred and packet transmission is repeated from source node to destination node. Effective connection alteration rate- (ECAR-) based communication scheme obtains the efficient connection between nodes. In the proposed ECAR method, detection efficiency is improved compared to existing scheme SOL and TES.

$$\text{Detection efficiency} = \frac{\text{attack detection rate}}{\text{overall time}}. \quad (11)$$

4.8. Network Lifetime. Figure 7 shows that lifetime of the network is measured by node process, the time taken to utilize network from the overall network ability. The designed hello time gap tracking algorithm is applied to observe the characteristics of routing. In the proposed ECAR method, network lifetime is increased compared to existing scheme SOL and TES.

$$\text{Network Lifetime} = \frac{\text{time taken to utilize network}}{\text{overall ability}}. \quad (12)$$

4.9. Packet Drop Rate. Figure 8 shows that packet loss of particular communication in network is calculated by node loss packet with inefficient connection removed by using effective connection alteration rate- (ECAR-) based communication method. In the proposed ECAR method, packet drop rate is reduced compared to existing scheme SOL and TES.

$$\text{Packet drop rate} = \left(\text{Number of packet}\frac{\text{dropped}}{\text{Sent}}\right) * 100. \quad (13)$$

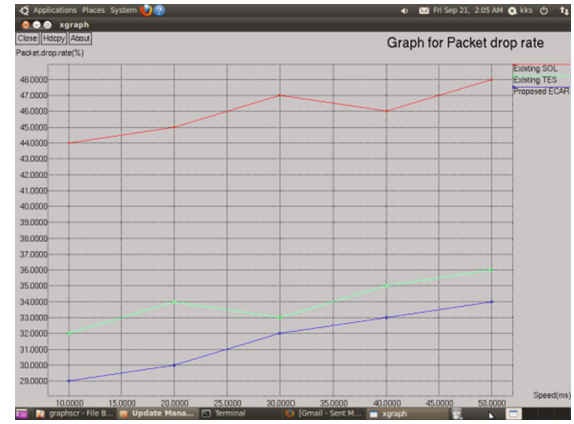

Figure 8: Graph for speed vs. packet drop rate.

5. Conclusion

In mobile networks, nodes are connected and disconnected regularly, because every mobile nodes are moved autonomously and are dispersed regularly. Connection injure has a straight significance on the network performance. The main aim is that different schemes are quick to break the connection identification using alert packet which is not easy for that time to discover the next link in mobile network. It improves the end to end delay and minimizes the network lifespan. The present effective connection alteration rate- (ECAR-) based communication method based on the information of neighbouring nodes investigates the link between nodes. The connection alteration rate and the hello time gap

in terms of entire transmission rate are good. However, the hello time gap tracking algorithm is designed to increase transmission rate indicating a stable choice of connection alteration rate, immobile even though node velocity alters. It minimizes the end to end delay and increases the network lifetime. The hello time gap tracking algorithm is constructed in the network offering effective connection among unbalanced mobile nodes. It offers the effective connection altering rate for analyzing different metrics which are network lifetime, throughput, and detection efficiency that are improved in the proposed ECAR scheme. In future work, focus the cross-layer optimization with stable link establishment to measure different parameters.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

There is no conflict of interest.

References

[1] "Energyaware clustering algorithm for the OLSR protocol," *IJCSNS International Journal of Computer Science and Network Security*, vol. 15, no. 7, pp. 85–91, 2015.

[2] P. K. Saini, Y. M. Sharma, and S. Mukherjee, "Analysis AODV, DSR&DSDV protocols with uniform pause & speed type over CBR&TCP connections in VANET," *International Journal of Advanced Research in Computer Science and Software Engineering*, vol. 3, no. 6, pp. 1512–1520, 2013.

[3] K. Bhagchandani and Y. M. Sharma, "Exploration of VANET Mobility Models with New Cluster Based Routing Protocol," *International Journal of Soft Computing and Engineering (IJSCE)*, vol. 2, no. 6, pp. 224–227, 2013.

[4] C. Perkins and E. Royer, "Ad hoc on-demand distance vector routing," *Proc. IEEE WMCSA*, pp. 90–100, 1999.

[5] A. Al-Maashri and M. Ould-Khaoua, "Performance analysis of MANET routing protocols in presence of self-similar traffic," in *Dept. of Electrical and Computer Engineering – SultanQaboos University, Sultanate of Oman*, pp. 801–807, IEEE, 2006.

[6] S. K. Dhurandher, S. Misra, M. S. Obaidat, V. Bansal, P. Singh, and V. Punia, "An energy-efficient on-demand routing algorithm for mobile ad-hoc networks," in *15th IEEE International Conference on Computer and Communication Engineering*, pp. 961–995, Saint Julian's, Malta, Aug. 31 2008-Sept. 3 2008.

[7] H. Y. Zhang, M. E. Bialkowski, and J. Hamer, "An extended AODV protocol for VoIP application in mobile ad hoc network," *ECTI Transactions on Electrical Eng., Electronics, and Communications, IEEE*, vol. 7, no. 2, pp. 836–841, 2009.

[8] R. Ghanbarzadeh and M. R. Meybodi, "Reducing message overhead of AODV routing protocol in urban area by using link availability prediction," in *Second International Conference on Computer Research and Development*, pp. 274–279, IEEE, 2010.

[9] A. Tripathi and R. Kumar, "MECB-AODV: a modified energy constrained based protocol for mobile ad hoc networks," *International Journal of Distributed and Parallel Systems (IJDPS)*, vol. 3, no. 6, pp. 15–30, 2012.

[10] L. I. Xut, L. I. U. Tianjiaot, L. I. U. Yingt, and T. A. N. G. Van, "Optimized multicast routing algorithm based on tree structure in MANETs," *Network Technology and Applications, IEEE, China Communications*, pp. 90–99, 2014.

[11] A. R. Rao, V. V. Kumari, and C. S. Reddy, "Backup route establishment for QoS routing protocol in MANET," in *Signal Processing, Communication, Power and Embedded System (SCOPES), 2016 International Conference on*, pp. 856–862, IEEE, 2016.

[12] P. Gnanasekaran and B. Vibeeth, "Link breakage time based QoS improvement in mobile ad hoc network," in *Circuit, power and computing technologies (ICCPCT), 2015 international conference on*, pp. 1–4, IEEE, 2015.

[13] A. Thomas, V. K. Sharma, and G. Singhal, "Secure link establishment method to prevent jelly fish attack in MANET," in *Computational Intelligence and Communication Networks (CICN), 2015 International Conference on*, pp. 1153–1158, IEEE, 2015.

[14] R. Metri and S. Agrawal, "Ant colony optimization algorithm based an intelligent protocol to improve QoS of MANETs," in *Circuits, Systems, Communication and Information Technology Applications (CSCITA), 2014 International Conference on*, pp. 121–125, IEEE, 2014.

[15] S. Y. Han and D. Lee, "An adaptive hello messaging scheme for neighbor discovery in on-demand MANET routing protocols," *IEEE Communications Letters*, vol. 17, no. 5, pp. 1040–1043, 2013.

[16] S. Kumar and N. V. Doohan, "A modified approach for recognition and eradication of extenuation of gray-hole attack in MANET using AODV routing protocol," in *Colossal Data Analysis and Networking (CDAN), Symposium on*, pp. 1–5, IEEE, 2016.

[17] Z. Wei, H. Tang, F. R. Yu, and P. Mason, "Trust establishment based on Bayesian networks for threat mitigation in mobile ad hoc networks," in *Military Communications Conference (MILCOM), 2014 IEEE*, pp. 171–177, IEEE, 2014.

[18] P. S. Hiremath and C. G. Rao, "MERAM: message exchange with resilient and adaptive middleware system in MANET," in *Computational Intelligence and Computing Research (ICCIC), 2015 IEEE International Conference on*, pp. 1–6, IEEE, 2015.

[19] S. Gadekar and S. Kadam, "Secure optimized link state routing (OLSR) protocol against node isolation attack," in *2017 IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI)*, pp. 684–687, IEEE, 2017.

[20] P. K. Sharma, U. Tiwari, and Y. M. Sharma, "A throughput efficient on-demand steering procedure for mobile ad hoc networks," in *2017 International Conference on Intelligent Sustainable Systems (ICISS)*, pp. 1010–1015, IEEE, 2017.