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Extended Congruity Path Optimization Using Rehearse Node Connection Scheme In Wireless Ad Hoc Network

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Abstract: Wireless nodes have dissimilar characteristics; ad hoc network should maintain direct communication but long distance between nodes because of the packet drop, when relay nodes behavior is not analyzed. Various routing paths are used to manage the irregularity of network performance. The data packet forwarding is abnormal by intermediate nodes and it sometimes transmits number of packets. Otherwise, it transmits only fewer packets. Then it consumes more energy. It reduces detection efficiency, and increases end-to-end packet latency. The proposed extended congruity path optimization (ECPO) is to optimize the routing path from the entire network, it checks the node steadiness, which transmits data packet from its high steadiness range nodes, otherwise, poor steadiness nodes are rejected from the network environment. Rehearse node connection scheme is used in wireless Ad Hoc nodes to allocate link with the neighbor node whose behavior is better. It reduces energy usage, and enhances the network lifespan, and the connectivity ratio.

Keywords: Extended congruity path optimization, Rehearse node connection scheme, Verify each routing node steadiness.

1 Introduction

Wireless ad hoc network is a promising scheme that facilitates the result of numerous limitations of computerization scheme, protection issues, and virtual protection issues. This is actually a handy result for well-organized and dependable data transmission [1]. Wireless network contains many sensor nodes that occupy minimum energy range in stipulations of range. The node is able to execute as a self-sufficient nodes and is also fixed various network infrastructure. Each node has the capability of analyzing, calculating, exposing the exact information and gathering among the wireless sender to the sink node [2]. Ad hoc nodes are fixed in this analyzed environment. The main problem in lifetime improvement of the fixed ad hoc nodes are obtained with a quantity calculation of identifying, managing, preparing and broadcasting with sink nodes. Wireless sensor networks are significantly guarded by recollection, imperfect power contribution, dispensation, presentation and packet transmission rate. Therefore, they are affected in all conditions by Ad Hoc nodes based power.

Allowing for these energy sources in WSN, it kept energetic for a particular occasion or as far as the force is sufficient [5]. Frequent operation in a wireless sensor network environment manages the energy efficiency. For exceeding energy, the process of the sensor network is group-depending and it communicates the technique by measuring the best scheme [6]. It contains particular merits linked to an efficient packet transmission and scalability.

Currently, the frequent group-based routing scheme is proposed with a vision to improve, the lifespan of the network. Organizing data packets from all sensing nodes and broadcasting information to the sink node is normally an important apprehension. By monitoring the information from sensor node, we can obtain the quantity rate of improved sensor nodes [7]. The quantity can be obtained by organizing sensed information. It is the main motive of minimizing the lifetime of the network. The low energy adaptive clustering hierarchy is a group-depending technique, which uses a disseminated grouping generation scheme. Monitoring the data packets from all nodes occupies energy in a good way [8]. The option of cluster head is designed on a predefined opportunity. The remaining node selects the group to connect by similar to the neighboring distance to the chosen cluster head. It uses the federal grouping technique of LEACH should increase the clustering system and dissemination the nodes of cluster head each

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among the network environment. Together LEACH and LEACH-C do not determine the best option of the group depending on any object process [9].

Cluster member node is a resident that depends on the optimization method, which obtains an improved reply in terms of energy usage and packet broadcasting between LEACH and LEACH-C scheme. Broadcasting data packet to the sink node among the network in direct possible time is attractive [10]. A cluster head organizes the data packets from all members of nodes and transmits those data to the sink node, which is done by time division multiple accesses. Modifying the data and monitoring the nodes' information is important for packet broadcasting. The data packet broadcasting is an important characteristic in the wireless sensor network [11]. This proposed research work summarizes as follows. Section 2 describes the literature survey of related work. Section 3 presents the proposed extent congruity path optimization (ECPO) technique. In section 4 the simulated outputs are discussed with various obtained parameters. Finally, section 5 concludes the overall system and provides the future.

2 Literature Survey

Massioni et al., [13] proposed scheme depends on the MP-matching pursuit algorithm that establishes to obtain a solution to these issues in the normal continuous processing conditions. Furthermore, it is a congested round description of the organizer that can be achieved as well by turning the scheme into a MPC-model analytical management method, recognition to the detail that the computational cost of the scheme is the minimum range. The uses of the end-to-end transmission scheme are stimulated by the work that is presently under improvement.

Dey Anamika et al., [14]] has proposed the set of importance of constructing a group-based technique inspired by producing racking movement of a node to minimize the energy consumption of the sensor nodes by using minimum distance route probable for packet broadcasting and to improve the network lifespan. The entire network is separated into various sectors by using the fruit-fly mechanism. Initially, energy effectiveness is important to execute the fruit fly scheme. Lifespan of the network is investigated using cluster-head choosing scheme and packet broadcasting effectiveness, which are experienced using fruit-fly method depending on grouping in the sensor network. A qualified investigation has made to distinguish previous and normally practiced scheme like that low-energy adaptive cluster hierarchy. It also depends on various techniques over the present method.

Sharma, Akshay, et al., [15] proposed broadcasting method of collecting efficient data packets. A major issue in WSN is energy, which is recognized by the remarkable receptiveness of various analyzers. The grouping method also protects the restricted energy possessions of the sensor nodes. This design uses a standing-group based method for energy efficiency. Here the snooze-wakeful scheme is used in the sensor network for getting a longer lifespan with high steadiness time instance. The experimental output indicates that present method is more efficient than the existing scheme for the successful broadcasting of data packets.

Singh, Smita, et al., [16] has presented the distance metrics that are applied to choose an efficient node so that packet latency is removed. The network monitoring needs to continuously monitor and transmit the data packets to the destination node lacking the latency and also allowing for the node lifetime to be minimum. It needs a particular well-organized energy technique. An experiment is performed, to obtain an output with higher a lifespan of the network and to increase the lifespan time instance of nodes. It obtains higher stability, and the maximum network lifetime is compared with the existing scheme.

Iwata, Masanari, et al., [17] present an energy-efficient data gathering method, which is used for wireless target node, anywhere target depending central communication development is realized by using asymmetric packet broadcasting and node active sate ratio. Particularly, nodes don't need to inform communication details. As an alternative, the target node determines the communication command. All the nodes are able to activate the state in WSN. For that time instance, the packet broadcasting method is to plan the target node to activate the state and it provides the more energy of communication. The direct activation of the node also provides the energy-efficient network path. Wide-ranging experimental calculation verifying the present scheme is a well-organized energy technique. This technique is additionally improved to contract with packet drop made by multipath disappearing, enhancing packet receiving rate for the meantime and suppressing energy usage and packet aggregation period.

Centenaro, Marco, et al., [18] has presented has to choose the rate buckle processing point for the loss density method at all sender node. By equally assessing a communication route for packed-in data, below deformation and capability constraint. This needs to optimize the issues by solute and converse for two convinced network conditions. By emphasizing the nontrivial inter associations scheme, the energy efficient network is measured for the entire communication path. Here the frequency rebuilding is excellent at the target node.

Zheng, et al., [19] proposed the CMFOA-combined multi-objective fruit-fly management technique. Initially, the hustle pair-depending output demonstration is obtainable, then a successful interpret technique is constructed. The heuristic population is presented in the initial stage and it calculates to manage the various issues in the smell-based investigation. The profession succession and handing out mobility choosing issue is rectified by choosing the method of CMFOA in sequence manner. Furthermore, a crucial route depending on reducing issues in additional enhancement process. It also discovers the fruit-fly management scheme. The consequence of the metric situation is limited in this paper. Mathematical test and association rules are accepted for obtaining an efficient result as compared to this method.

Li jun-Qing, et al. [20] has proposed the valuable HFOA with the best-organized stink and visualization searching method. Accumulation, an IG-iterated greedy local investigate is rooted in the present scheme to additionally improve its utilization capability. The present method is experienced in a group of cases created from developed information. During arithmetical analysis, the presentation of the present HFOA scheme is positively distinguished over various schemes in terms of each result's superiority and effectiveness.

3 Overview of Proposed Scheme

Ad hoc sensor nodes are very fast to organize data packets from different routing paths. It enables the multiple routing for achieving the communication efficiency. However, it consumes more energy for every single transmission. The multiple-path nodes have different characteristics, which are exact matches to the destination node. The sensor network nodes are stable in nature to manage and control packet broadcasting from the sender node to the target node in the network environment. Since it clearly monitors the starting time of packet, if any time instance is missing, they recheck the routing path.

Present Extended Congruity Path Optimization (ECPO) technique optimizes the transmission path from sender to sink node, in ad hoc network, then it verifies the node reliability. Nodes are of high reliability that is very efficient to broadcast data packets. Constructing the rehearse node connection scheme is applied to each and every routing node to assign a connection to all nodes which operate as best. It minimizes the energy consumption, and improves the lifespan of network, with a higher connectivity ratio.

Figure 1 shows the proposed extended congruity path optimization technique. Wireless nodes perform multipath ad hoc routing, source node monitors the different routers to the target location. Packet transmission is initiated to consider time instance to organize data packets from a real-time environment. It enhances detection efficiency and minimizes the delay. In ECPO, the higher steadiness node to perform broadcasting and the designs rehearse node connection scheme to reduce energy usage.

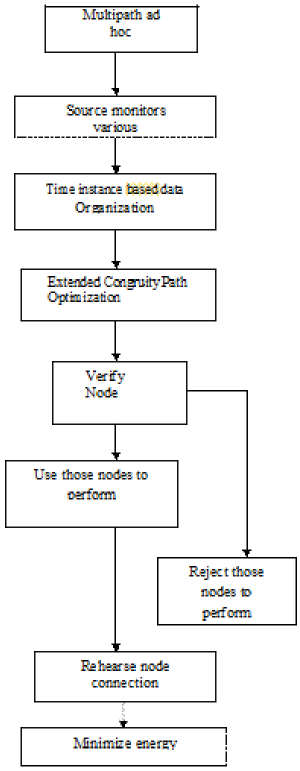

Fig. 1: Block Diagram of Proposed Extended Congruity Path Optimization technique

3.1 Time Instance-Based Data Organization

The packet is broadcast by a sender node and it should be accepted by each node for its coverage limit. Normally two kinds of limits for link establishment in sensor nodes, they are coverage area and intrusion limits. The sequences are accepted the packets for effective interpretations. In this state, the receiver node should be cover the area for communication. While a sender node is outer the coverage area except the intrusion choice of the sender node, the broadcast plan does not exist. The intrusion model in a wireless network is applied to monitor the coverage area in a process of the sender-accepter detachment. According to the protocol model, while a sender node broadcasts to a neighbor node, then this broadcast is effectively accepted by the target node.

V_p is a various path routing, D (Aggregation) is a data collection by destination node.

$$Vp = T\,(ins) \int\int D\,(Aggregation) \tag{1}$$

Management among sensor nodes at two intermediate ranges is needed as while a previous neighbor node forwards, the equivalent sender node has to be in the receiving method. Packet broadcasting scheme, on the other hand, instance is split into a permanent quantity of information. The length of a time instance is just sufficient for the broadcasting of data packet from the sender to next neighbor node. This sequence is to avoid the packet intrusion on many path communications. It is applied to all the nodes, which are having regularity path, and it is varied from each intermediate node. Each node should then tag on the plan resolute in the time instance allocation part to execute performance in all-time instances in a border, with the packet guide that should continue or be continued many times awaiting this task to be completed and it also initiates the next task. The information of the slot allocation and packet broadcasting is important in the wireless network. $Req(T)$ is the request time and $Rep(T)$ is the reply time.

$$T\left(ins\right) = Req\left(T\right) + Rep\left(T\right) \tag{2}$$

$$Req\left(T\right) = \sqrt[2]{Req * T} \tag{3}$$

Sender node should contain many intermediate nodes. While two or more intermediate nodes are able to broadcast a data packet to the similar previous nodes at the similar time instance, subsequently an intrusion is made. Consequently, a plan for all intermediate nodes to broadcast data packets to their previous nodes is wanted. Nevertheless, it is not confident for a previous node to provide a permanent timetable to its entire neighbor nodes since it does not intermediate with other nodes. A similar quantity of information is to broadcast in most of the time instance. This scheme must allow each node to contain adaptive packet broadcasting time instance depending on the over-load needed

$$Req\left(T\right) = \sqrt[2]{Rep * T} \tag{4}$$

The time-instance allocation scheme is available for various parts, which analyzes the behavior of previous nodes available in routing path also changed to execute time instance. Important to organize data packet through the matching node, grouping for sender and the destination through various relay nodes in exact time instance. Because a node should operate a previous sender in a particular time instance, except as a next neighbor node in an extra time instance, it is consequently essential to contain two time-instance tasks for all nodes. The information of iterative matching neighbor nodes that follow various procedures are request packet, process packet, and receiving packet. The process of all points is explained as follows: they are requested packet broadcasting; receiver node should transmit request packets to each of its previous relay nodes. Those requested packets contain the amount of time instance required. Whether the next neighbor node has many packets to broadcast, then it can demand for many time instances.

3.2 Extended Congruity Path Optimization

Time instance allocation rejects the intrusion occurrence with the support of the next neighbor nodes broadcasting data packet to the similar previous sender node concurrently. Though, intrusion is motionlessly occurring while a sender node broadcasts data to the destination node, each of its intermediate nodes should essentially accept it. It is also known as overload. Further, the concealed node issues make intrusion at the destination node side. While node broadcasts a packet to the next neighbour node then next node should drop the data packet. Whether another node is trying to broadcast data packet at this time instance, then intrusion is made at the relay node output packet that is loosed. Therefore, a node is needed to rebroadcast the packet once more.

$$T\left(ins\right) = \sqrt[2]{Req} * T + \sqrt[2]{Rep} * T \tag{5}$$

$$T\left(ins\right) = \left(\sqrt[2]{Req} + \sqrt[2]{Rep}\right) * T^2 \tag{6}$$

Consequently, many paths routing scheme are processed to allocate other neighbor nodes sequence to reject from intrusion and packet overload. Each of the nodes should contain its individual allocated routing path. For that path, it is not similar to the neighbor nodes path with also the path of the previous of sender nodes. Each the next neighbor nodes are capable to make out the path of its previous node. While the next neighbor node needs to broadcast a packet to their previous nodes, then it hands over the path to the previous sender node path. Subsequent to the previous node, it should initiate to broadcast data to the next neighbor node, also the next neighbor should accept the information. The multi-path procedure broadcast the wireless ad hoc network. All nodes should hand over the path to its previous path. The source node broadcasts the packet, it returns to its individual path.

$$T^2 = \sum (T) \tag{7}$$

The grouping of various path generations and time instance assigning is capable to obtain intrusion free packet broadcasting. Many path division avoids intrusion from all remaining node and the time instance is assigned by checking the neighbor node. The path is without charge for the packet broadcasting. In back off to previous broadcasting data packet is not needed to process the system. Consequently, the time instance can be orderly to the extent of broadcasting a single packet with the time of coming up for a reply message.

$$T\left(ins\right) = \left(\sqrt[2]{Req} + \sqrt[2]{Rep}\right) * \sum (T) \tag{8}$$

$$T\left(ins\right) = \sum (T) \left(\sqrt[2]{Req} + \sqrt[2]{Rep}\right) \tag{9}$$

A recent network technique is mentioned where sensor nodes are deterministically fixed within the coverage range of notice. Destination node preserves locality link connection hierarchically through each previous sender nodes in the form depending on node organization request packet. Condition of pair is useful on the link connection of wireless nodes formed which indicates the adjacency link connection. The link through ad hoc nodes uses a ranking data organization. This constructs the extended congruity path in a network environment. It ensures the route creation in those conditions, the connection is free. The connection range is based on data intrusion. It optimizes the extended congruity path using link connection among wireless nodes. These ad hoc nodes are checked by using this method, and nodes have high steadiness and they are selected to obtain an optimized routing path otherwise, remaining nodes steadiness is poor so, those nodes are rejected from the routing path.

Algorithm for Extended Congruity Path Optimization

Step 1:Monitor the routing node characteristics
Step 2:For each, find the next neighbor node to obtain the effective routing path.
Step 3:Establish the routing path.
Step 4:If steadiness of node==high
Step 5:Those nodes are selected to connect with each other
Step 6:To perform packet transmission
Step 7:else if steadiness of node==low
Step 8:Those nodes are rejected to disconnect with each other
Step 9:Search alternate path for routing
Step 10:improve network lifetime
Step 11:communication end

3.3 Rehearse Node Connection Scheme

Wireless ad hoc network is a difficulty for such volume while its link connection details can be successfully operated by any single node, and the organization of link-based data does not overcome the network. A link identification path is continuously executing the result by an important node that keeps link-based routing information. In network leftovers, the entire link connections of each node in the network environment are instance-based packet organization links, which are associated with packet-modified links. While once becomes unfinished, this have minimum nodes than each node of the network environment, it identifies the link connection that is damaged in the network. A direct scheme for discovering the minimum detachment through each available point is to initial and estimate the distance among each group, it also takes the minimum distance path. The time instance allocation is noticeable by the quantity of points. The time slot issue provides the effective result for communication. The link re-establishes scheme is known frequently to a estimate position to organize new nodes for re-establishing the link. Because neighboring node is separated on behavior of individual nodes.

$$D(Aggregation) = D1 \leftrightarrow D2 \tag{10}$$

$$T(ins) = \sum(T)\left(\sqrt[2]{Req} + \sqrt[2]{Rep}\right) \iint D1 \leftrightarrow D2 \tag{11}$$

The Wireless ad hoc network nodes are linked with each other at minimum probability. This adopts a method that introduces a re-establishment process waiting to become disjointed for the initial instance. While the ad hoc network link is a failure, the nodes gets breakdown by dropping packet. The routing path reduces the time complexity of every packet transmission; it optimizes the effective routing path.

Rehearse Node Connection Algorithm

Step 1:Establish a link between ad hoc nodes
Step 2:for search next neighbor ad hoc nodes.
Step 3:if connectivity of node ==establish
Step 4:Optimized better routing path is selected
Step 5:Perform the effective communication from the source node to target the node.
Step 6:else if connectivity of node== re-establish
Step 7:Not use current routing path
Step 8:Search for the next efficient routing path for communication
Step 9:Process end.

The rehearse node connection scheme is applied to obtain better communication path, it chooses the routing path, and node characteristics are of higher steadiness to manage abnormal activities. It improves the lifespan of the network, and minimizes energy usage.

Packet ID: Packet ID having an each wireless ad hoc node details and this indicates individual node characteristics and information organized by the routing table.

In Figure 2: the proposed ECPO packet format is given. Here the source and destination node ID field takes 4 bytes, and the next one is time instance-based data organization taking 2 bytes. It collects the data packets frequently by the destination node. Extended Congruity Path Optimization (ECPO) takes 4 bytes. This analyzes each node's behavior and monitors the historical information of every node in a routing path. In fifth occupying 3 bytes, by verifying node steadiness, the scheme search and find nearest neighbor nodes are identified. The steadiness is very high they are selected to perform routing, otherwise the node steadiness is low, and they are rejected to perform communication. Rehearse

Source ID	Destination ID	Time instance based data organization	Extended Congruity Path Optimization	Verify Node steadiness	Rehearse node connection scheme
4	4	2	4	3	5

Fig. 2: Proposed ECPO Packet format

node connection scheme is the last field; it occupies 5bytes; it monitors every node connection, and obtains the steady connection.

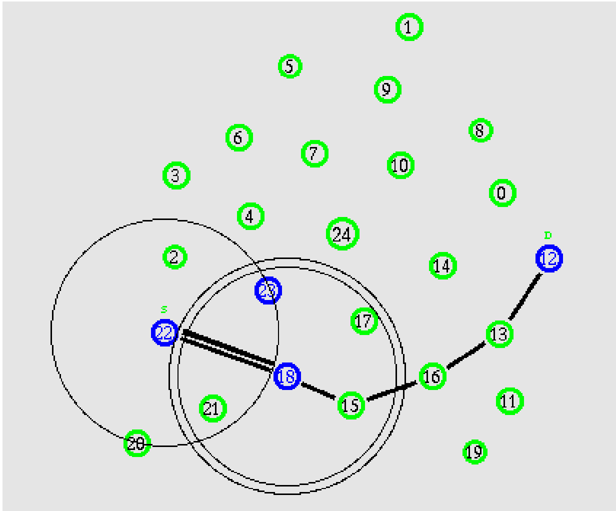

Fig. 3: Proposed ECPO Result

4 Performance Evaluation

4.1 Simulation model and parameters

The proposed ECPO is experimented with Network Simulator tool ($NS2.34$). In our simulation, 100 wireless ad hoc nodes are fixed in a 1040 meter $x960$ meter square region for 18 milliseconds simulation time and every mobile node goes in a random manner through the network with varied velocity. All the nodes have the similar transmission in the network to edge the traffic rate. Destination Sequence Distance Vector (DSDV) routing protocol is used to obtain the efficient communication route.

Simulation Result: Figure 3 shows the present Extended Congruity Path Optimization (ECPO) method, which obtains the optimized routing path in the wireless ad hoc nodes. In the ECPO scheme search, the neighbor nodes are routed with high steadiness otherwise, those nodes are rejected, because the nodes steadiness is very low in a wireless ad hoc environment. It improves the lifespan of the network, and minimizes the usage of energy.

End-to-End Delay: Figure 4 shows the end-to-end delay that is calculated by the quantity of time spent for communication process, Rehearse node connection algorithm is established to obtain the effective link between the wireless ad hoc nodes. The end-to-end delay of the proposed ECPO technique is reduced compared with previous CMF, HFF, AKS, IPTR, and SPLR techniques.

$$End-to-EndDelay = EndTime - StartTime$$

Communication overhead: Figure 5 shows that the communication overhead is minimized in which the sender transmits a packet to the receiver node, it selects only high steadiness node for communication process using Rehearse node connection algorithm, protected communication is performed. In the proposed ECPO method, Network overhead is minimized compared to existing method CMF, HFF, AKS, IPTR, and SPLR.

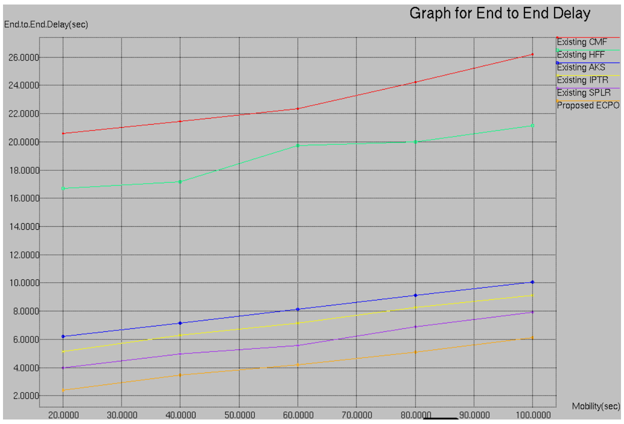

Fig. 4: Graph for mobility vs End-to-End Delay

$$Communicationoverhead = (NumberofPacketLosses/Received) * 100$$

Packet Delivery Ratio: Figure 6 shows packet delivery ratio that is calculated by the count of packet accepted from the amount of packet transmitted in specific velocity, which is unstable, also by setting the mobility at 100(bps) for every node. In the proposed ECPO technique packet delivery ratio increases compared with previous CMF, HFF, AKS, IPTR, and SPLR techniques.

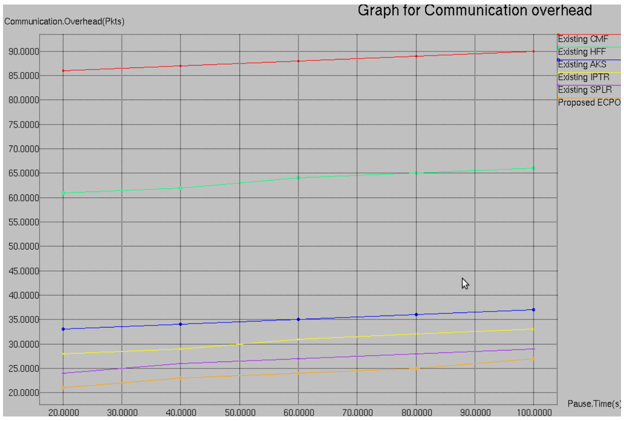

Fig. 5: Graph for Pause time vs Communication overhead

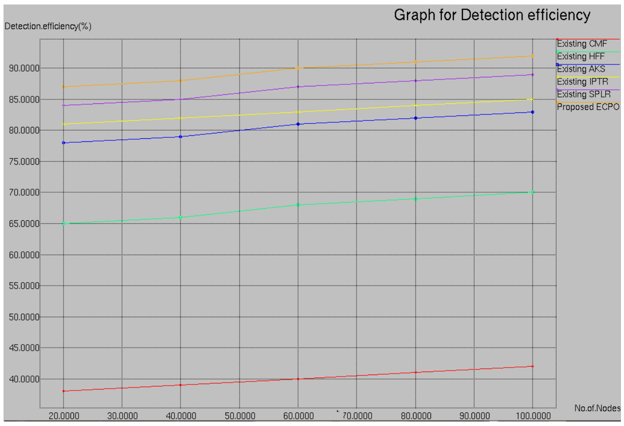

Fig. 7: Graph for nodes vs detection efficiency

$$PacketDeliveryRatio = (Numberofpacketreceived/Sent) * speed$$

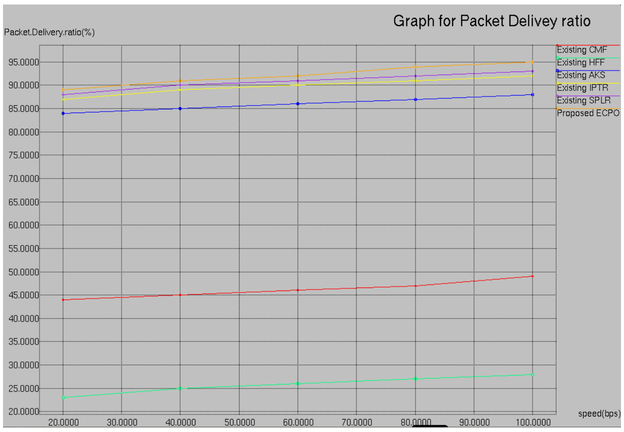

Fig. 6: Graph for nodes vs packet delivery ratio

Detection efficiency: Figure 7 shows the attack detection efficiency, network attacks occurred and packet transmission is frequent along with the network nodes. Rehearse node connection algorithm obtains the link among more stable nodes in the routing path, so it is easy to detect minimum stable node. In the proposed ECPO technique detection efficiency decreases compared with previous CMF, HFF, AKS, IPTR, and SPLR scheme.

$$Detectionefficiency = attackdetectionrate/overalltime$$

Network Lifetime: Figure 8 shows that the lifetime of the network is calculated by nodes process time taken to employ network for its whole ability of the network. Rehearse node connection algorithm obtains optimized stable node routing path for communication. In proposed ECPO method network lifetime is increased compared to existing method CMF, HFF, AKS, IPTR, and SPLR.

$$NetworkLifetime = timetakentoutilizenetwork/overallability$$

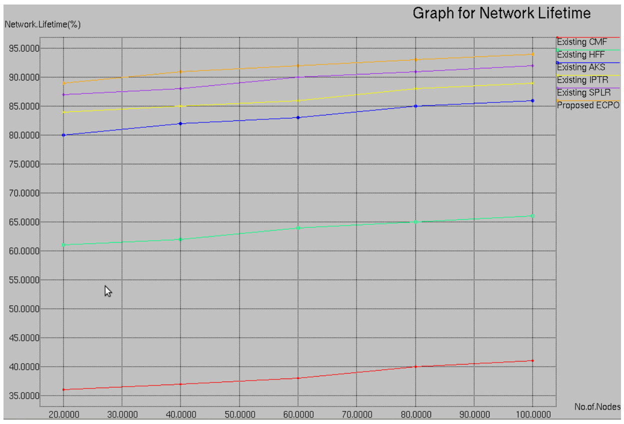

Fig. 8: Graph for nodes vs network lifetime

Connectivity ratio: Figure 9 shows that connectivity ratio between two nodes is estimated every time in the network, the time taken to complete particular communication with particular transmission speed using the rehearse node connection algorithm. In the proposed ECPO technique Packet integrity rate is better compared with previous CMF, HFF, AKS, IPTR, and SPLR schemes.

$$onnectivityratio = ((Packettransmissionrate)/timetaken) * 100$$

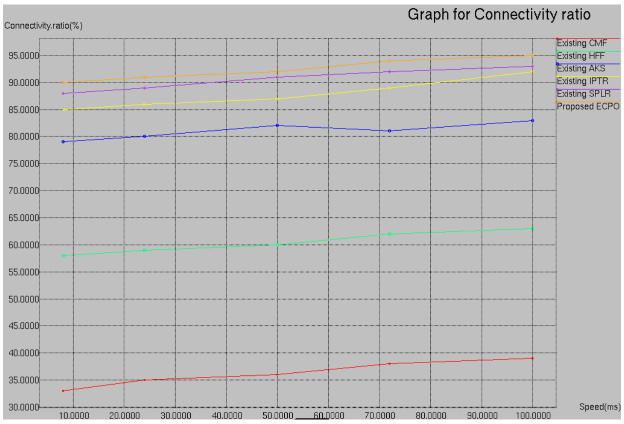

Fig. 9: Graph for speed vs connectivity ratio

5 Conclusion

Ad hoc network contains a huge amount of wireless nodes. Different communication paths are used to obtain different packet delivery rates in the destination side. Relaying nodes are needed to perform irregular packet transmission, since the time broadcast data packets are minimized. It consumes more energy and utilizes more resources for every communication. Therefore, Proposed Extended Congruity Path Optimization (ECPO) technique it obtains the optimized routing path, and only it chooses the higher steadiness node otherwise it rejects lower steadiness for ad hoc nodes. Rehearse node connection algorithm is designed and also applied to the wireless network, monitoring every node characteristics, those details filter out the unwanted low steadiness node. It chooses the higher steadiness node that is linked with the next neighbor node, which is also of higher steadiness, so an optimized efficient path, is achieved. It improves the lifetime of the network, and reduces energy consumption.

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