PSO Algorithm Established Mobility Aware Optimal MANET Routing

Mohammad Jabirullah Research Scholar, Sri Satya Sai University of Technology and Medical Sciences, Sehore, Madhya Pradesh, India

Dr. Anil Kumar Professor, Dept. of ECE Sri Satya Sai University of Technology and Medical Sciences, Sehore, Madhya Pradesh, India

Abstract

Mobile Ad Hoc Networks (MANETs) have established their applications in various streams, particularly in military, Disaster Management, Medical as well other applications. However, insufficient bandwidth, communication faults, energetic topography, energy restraints, as well as stability of connection variations guide to node movement. However, the major problem is link failures between mobile nodes. As s result, make the rerouting process create an additional delay. To solve this problem, Particle Swarm Optimization (PSO) Algorithm Established Mobility Aware Optimal (PSOMA) MANET Routing is introduced. Here, the CH nodes are selected based on PSO fitness Function. This fitness Function is computed by Node reliability, Link Lifespan, and degree of node. The Link Life Time determined as the probability of the link exists among two nodes in the network. Simulation results illustrate that improve the network performance compare to the baseline protocol.

Keywords: Mobile Ad Hoc Networks, Particle Swarm Optimization, Mobility Aware Optimal Routing, fitness Function, Simulation results.

I. Introduction

For forming wireless networks in large scale topography, it is apposite to build also preserve disseminated nodes in decided structures for example dominating sets, spanning graphs, also clusters with the objective to build system well-organized, consistent as well as robust from transmission viewpoint. This moreover guides to wanted practice between nodes in a forever exchanging surroundings [1]. In networks on the dynamic topography, clustering spatially neighboring nodes are sorted mutually through division of the network. These clusters of nodes are distinguished through CHs. the entire nodes inside a cluster are associated to each other straight otherwise through a neighbor nodes.For alleviating proficient transaction between nodes Clustering is the significant procedure. This is since nodes present a restricted power that cannot be substituted on will dispatched thus node becomes out of activity [2]. This impact decreases the performance of network. There is necessitates to save the energy at the entire times. As a result, requires optimization of communication range as well as reduction of energy utilization. The restricted bandwidth builds it is a vital to make a virtual network as well as there from distinguishing the route for transmitting packets. Nodes going to neighboring clusters transmit through margin nodes. Since this grouping, the nodes into typical clusters for structure suitable clusters are the main disputes in MANET [3]. Forecast Weighted clustering approach (FWCA) preserves the cluster connections details also cluster rank. This approach minimizes the overhead of routing. Flexible Weight Based Clustering introduced a 2-hop clustering that is a relatively stable also provides stability against updating topography. However, it increases the network delay and enhances the routing overhead. Thus, optimal clustering resolutions can significantly require for MANET execution [4].

II. Relate Work

Mobility prediction-based clustering algorithm evaluates regarding mobility information [5]. This approach contains two stages such as clustering as well as maintenance. It improves the lifespan and minimized the time of re-association. Link-Prediction approach is used to forecast the failure of link. This approach is used to enhance the network function but it is increase the energy utilization [6]. Vicinity based Dynamic

Connectivity approach is capable to energetically search the status of the network through connectivity metric [7]. Dynamic random geometric graph framework is used for highly dynamic networks [8]. Mobility, energy as well as traffic congestion are the major causes for a reducing route function [9]. Mobility, Energy and Congestion Aware Routing approach that increase the route function. It also discovers the stable as well as congestion-free route [9]. Link availability evaluation based consistent routing protocol that conceives the unheralded network topology update difficulty to enhance the network function. The link accessibility represents the possibility of a link will be incessantly presented for a given period of time [10]. A terrain-awareness based mobility model is used to emulate the influence that terrain factors have on the dynamic distinctiveness of mobile nodes A linear time invariant method is used for creates a colored noise with first-order Markov property. A terrain-awareness based bypass strategy to facilitate the nodes to distinguish as well as bypass the area. This approach simulates the response of nodes while the nodes countenance large-scale terrain factors [11]. An Innovative Node Encounter Rate Metric is used for enhance the quality of service through minimizing the packet loss as well as average delay. In this approach, the Node Encounter Rate is introduced throughout network function [12].

III. PSO Algorithm established Mobility Aware optimal (PSOMA) MANET routing

In this approach, the Particle Swarm Optimization (PSO) algorithm is used to discover the mobility aware routing in MANET. Here, the CH nodes are selected based on PSO fitness Function. This fitness Function is computed by Node reliability (N_R), Link Lifespan (L_L), and degree of node (D_N). The Link Life Time (L_{LT}) determined as the probability of the link exists among two nodes in the network. Node reliability represents the reliability of the response during route discovery. The node degree denotes the number of nodes present in the communication range. The node personal best P*best* and global best G*best* value of fitness and position of every node are evaluated and then the node fitness is checked whether the fitness value is greater than the personal best (Fn> P*best*) and node fitness value is greater than the global best (Fn> G*best*). Finally highest fitness value node is selected as a CH node. Finally, the Data is transmitted to the destination via the forwarder CH nodes. After discovering the two best values, the node modifies its fitness value with following formula (a) as well as (b).

$$v[] = v[] + L1 * rand() * (pbest[] - present[]) + L2 * rand() * (gbest[] - present[]) \quad (1)$$

$$current\ [] = current[] + v[] \quad (2)$$

where,

v[] → node fitness value,

current []→ current node (solution).

Rand () → arbitrary number among (0,1).

L1, L2 → factors of learning, .Here L1 = L2 = mobility Threshold.

Algorithm:

For every particle

Launch particle

end

do

For every particle

Compute fitness value

If the value of fitness is greater than the best fitness value (pBest) in the past

put current value as the recent pBest

End

Decide the particle by the greatest fitness value of the entire particles as the gBest

For every particle

Compute particle velocity allowing formula (1)

Revise particle location allowing formula (2)

End

IV. EXPERIMENTS SETUP

The simulation of the proposed Obstacle Aware Model is validated using the network simulator (NS2). Here, we arbitrarily situated 50 mobile nodes within a field of 500m×600m. Constant Bit Rate is employed for managing the traffic model. User Datagram Protocol is applied for transaction among mobile nodes. The propagation model two ray ground is used for propagating the radio waves. The parameters used for the simulation of the proposed approaches are depicted in Table 1.

Parameter for Performance Evaluation:

Packet Delivery Ratio: Packet Delivery Ratio (PDR) is the ratio of the number of total packets received at all destinations to the total number of data packets transmit through all the sources.

$$PDR\% = \frac{\sum_{1}^{n} \text{Packets Received.}}{\sum_{1}^{m} \text{Packets Sent}} * 100 \tag{3}$$

Where 'n' is the number of destinations and 'm' is the number of sources engaged in data transmission.

Table 1 Simulation Parameters of FWCA and PSOMA

Parameter	**Value**
Channel	Wireless Channel
Simulation span	50sec
Number of mobile nodes	50
Pause Time(s)	0,5,10,15,20,25
MAC protocol	802.11
Traffic type	CBR
Packet Size(Bytes)	100
Topography Area	500×600
Communication range	250m
Network interface	Wireless Phy
Mobility Model	Random Way Point

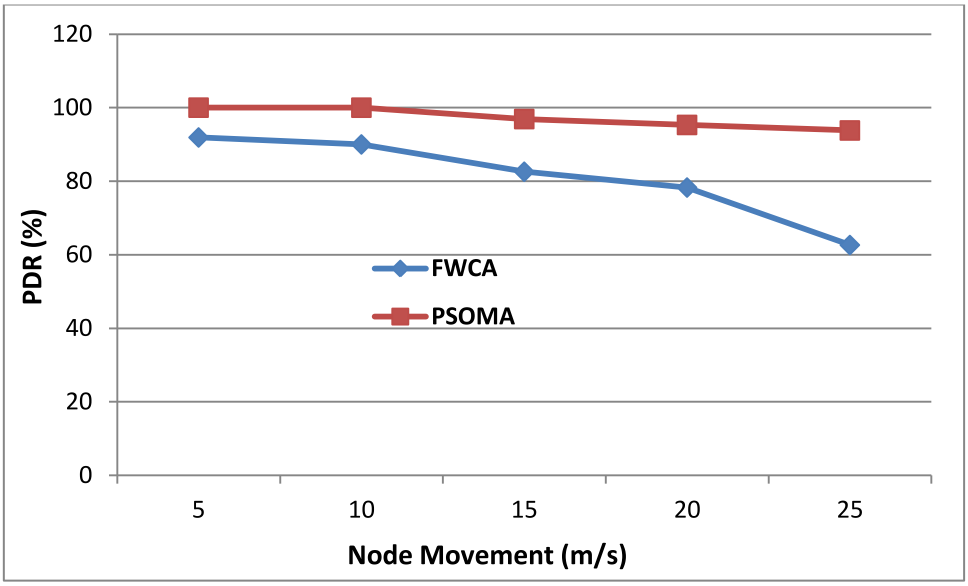

Figure.1 PDR of FWCA and PSOMA

Figure 1 explains that the PSOMA approach better packet received compare to the FWCA approach. Here, the node mobility increases in FWCA approach highly minimized than the PSOMA mechanism.

*Average End to End Delay***:** Average delay is defined as the ratio of the time difference between sending and receiving to the total number of nodes.

$$\text{Avg\_Delay}=\frac{\sum_{0}^{n}(\text{Packet Received Time-Packet Sent Time})}{n} \qquad (4)$$

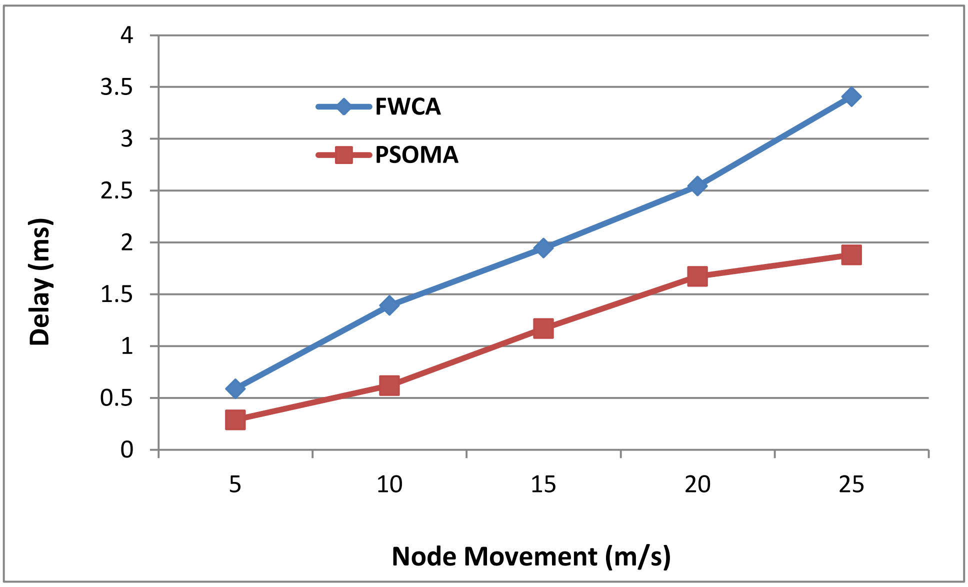

Figure.2 Delay of FWCA and PSOMA

Figure 2 shows the delay of FWCA and PSOMA mechanisms. It reveals PSOMA has the lesser delay for a node while equated to the FWCA mechanism.

*Throughput***:** Throughput is defined as the product of the number of packets received to packet size. It is normally expressed in Kbps.

$$\text{Throughput}=\frac{\sum_{1}^{n}\text{Packets Received(n)*Packet size}}{1000} \tag{5}$$

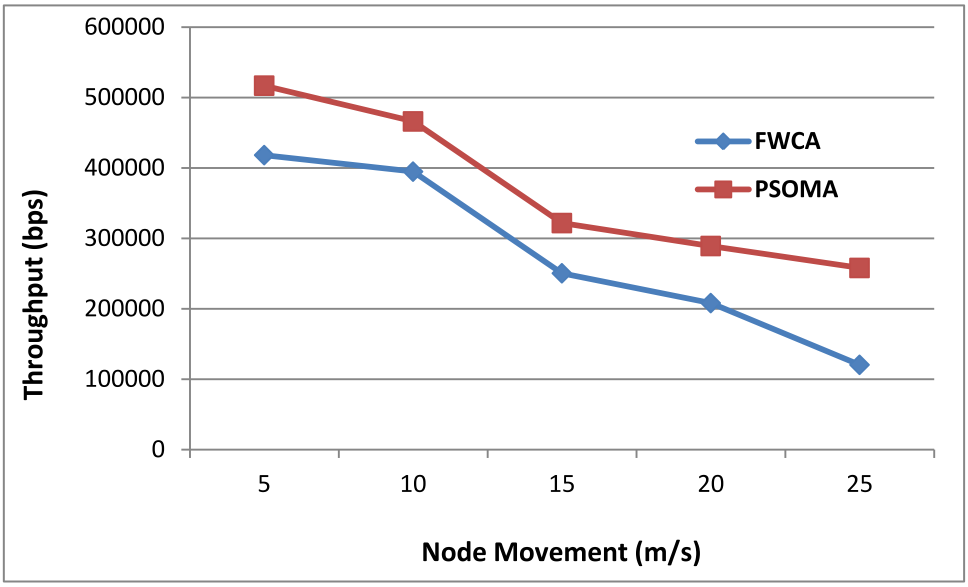

Figure. 3 Throughput of FWCA and PSOMA

Figure 3 indicates the throughput analysis for FWCA and PSOMA mechanisms. Figure 3 explains that the PSOMA approach better throughput compare to the FWCA.

V. Conclusion

In this paper, Particle Swarm Optimization Algorithm Established Mobility Aware Optimal MANET Routing is introduced. In this strategy, the CH nodes are selected based on PSO fitness Function. This fitness Function is computed by Node reliability, Link Lifespan, and degree of node. The Link Life Time determined as the probability of the link exists among two nodes in the network. This fitness function is used to choose the best CH forwarder node in MANET. Simulation results illustrate that improve the network throughput and reduces the network delay in MANET.

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