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Implementation of an Improved Path Selection Algorithm Using Particle Swarm Optimization (PSO) Technique

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Abstract - *This paper presents optimizing the routing process in MANET. The proposed work is about the mobile networks and based on DSDV protocol. Malicious node is detected by PSO technique. PSO is used for shortest path problem inspired by behavior of swarm of fishes or flocks of birds to find a good food place. In this paper, we have compared three parameters distance, delay and energy of the existing work and proposed work based on PSO technique that is an improved safe routing approach to transfer data from congestion free and attack safe path. This technique provides effectiveness in terms of energy and the time as well as provides a reliable route over the network.*

Keywords *- PSO, Routing, Node, Shortest Path, Adhoc network, MANET (mobile ad-hoc network)*

I. INTRODUCTION

A wireless ad hoc network is a decentralized wireless network where the network does not depend on a infrastructure that is existing before, such as routers in wired networks or access points (AP) in managed (infrastructure less) wireless networks. Instead, each node forwarding data to the other nodes, and so it is determined dynamically, which nodes forward data i.e. the normal nodes is converted to a routers and gateways [8].

A MANET is an autonomous group of mobile users that communicate over reasonably slow wireless links. The network topology can change fast and non- predictable over time, because the nodes are mobile. The network is not centralized, where every network activities, including discovering the topology and delivering messages must be executed by the nodes themselves. So routing functionality will have to be incorporated into the mobile nodes.

II. PSO

The Particle Swarm Optimization algorithm is based on certain social behaviours observed in flocks of birds, schools of fish, etc., from which certain aspects of intelligence emerge. Later than its development by Kennedy and Eberhart [10] in 1995, this evolutionary paradigm has been seriously studied on and grown in the past decade. Each particle remembers its own best position so far in the vector p_{best} and the best position vector among the swarm is stored in a vector g_{best} the search for the optimal position (solution) advances as the particles' velocities and positions are modified. A particle's velocity and position are updated as follows:

$$v_{id} = wv_{id} + c_1 r_1(p_{Best} - x_{id}) + c_2 r_2(g_{Best} - x_{id});$$

$$i = 1,2,\ldots..,\ N\ ,\ and\ d = 1,2,\ldots.,D$$

$$x_{id} = x_{id} + v_{id}$$

PSO utilizes several searching points and the searching points gradually get close to the global optimal point using its pbest and gbest. Beginning positions of pbest and gbest are unlike. However, using thee different direction of pbest and gbest, every single one agents gradually get close to the global optimum.

III. LITRATURE REVIEW:

1) *Mobile Agents based Framework for Routing and Congestion Control in Mobile Ad Hoc Networks. (2006, Shekhar H M P)*

In this paper, Author present a Mobile Agents based Framework for Routing and Congestion control in Mobile Ad Hoc Networks (MAFRC). The framework uses a cross-layer design approach where multiple intelligent agents present across the network protocol stack cooperate with each other and aid in finding

efficient routes between source and destination pairs and also in controlling network congestion [2].

2) *An ACO/MAS joint approach to manage communications in wireless sensor networks. (2009, Nacer Hamani)*

This paper presents a first improvement of the MWAC model using an ant colony optimization. Author introduce the use of ant colony optimization in the context of multiagent systems and wireless sensor networks. Ants are not simply deployed on the multiagent society[3].

3) *Understanding the Wireless and Mobile Network Space: A Routing-Centered Classification. (2007, Vincent Borrel)*

In this paper Author consider the question of how to classify mobile and wireless networks with the goal of understanding what form of routing is most suitable for which network. Author develop a formal graph-theoretic classification of networks based on the theory of evolving graphs. Author next develop a routing-aware classification that recognizes that the boundaries between network classes are not hard and are dependent on routing protocol parameters[4].

4) *Rational Swarm Routing Protocol for Mobile Ad-hoc Wireless Networks. (2008, Garcia Alfredo)*

Wireless Mobile Ad-hoc networks (MANET) require dynamic routing schemes for adequate performance. In this paper, Author introduce a new dynamic routing scheme based upon stigmergy. In a analogous manner to ant-colony based dynamic routing protocols,this scheme is able to respond to link quality changes after a path is established[5].

IV. RESEARCH METHODOLOGY

Our proposed algorithm is based on **two basic** approaches:

1. Right Path Selection Algorithm
2. Swarm Optimization algorithm

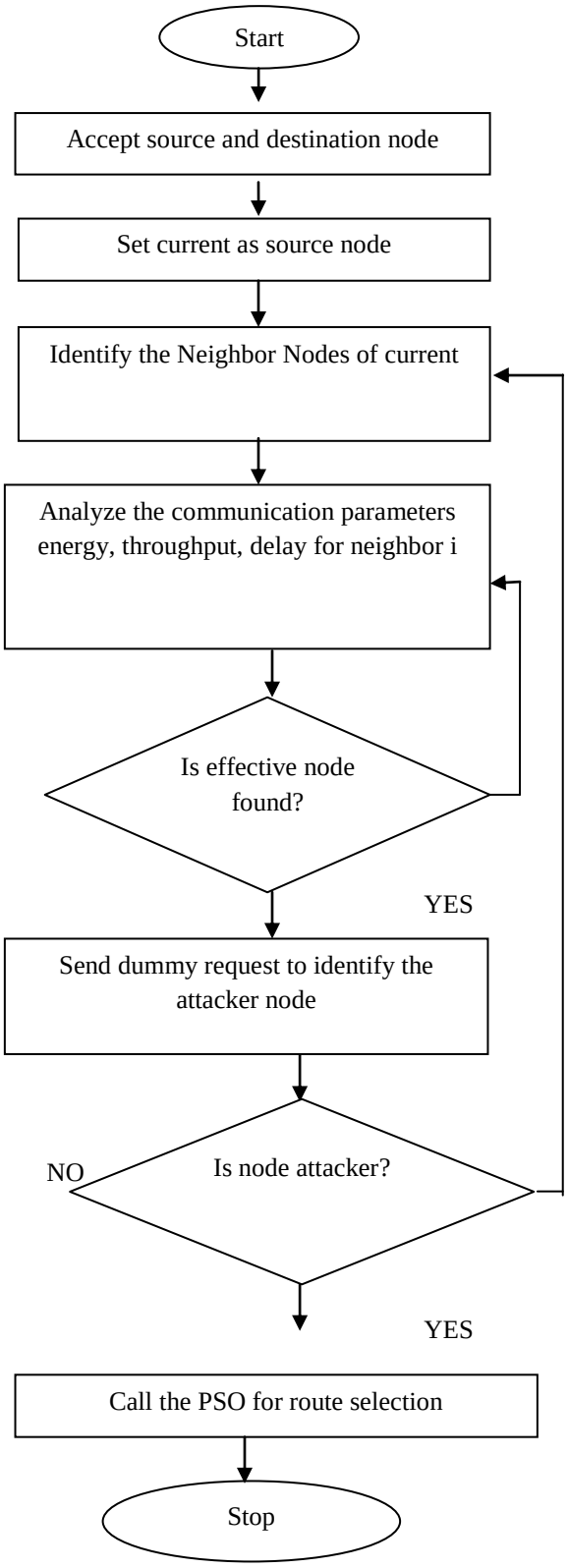

Figure 1: Effective Routing Algorithm

V. RESULTS

A. Network Architecture

Generated Path (Existing Approach)

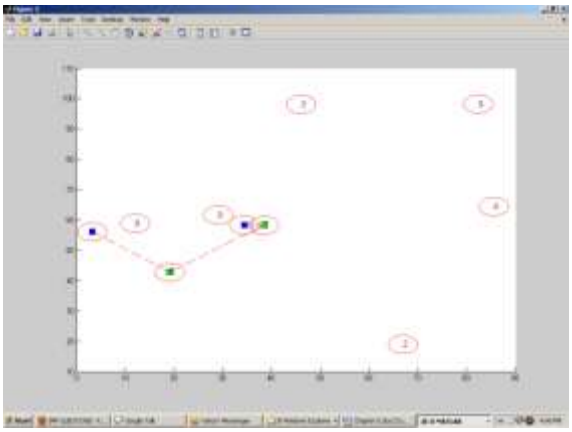

Figure 1 : FOR NODE= 10

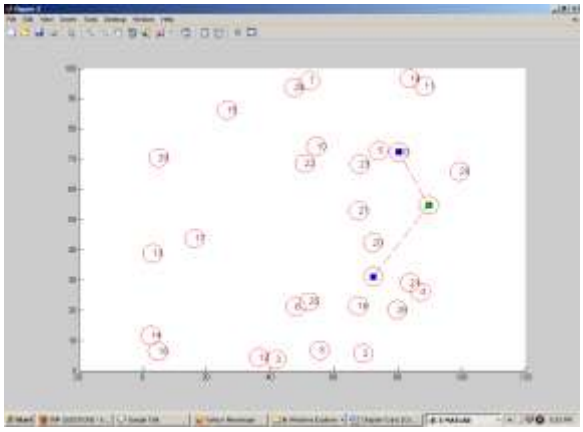

Figure 2: FOR NODE= 30

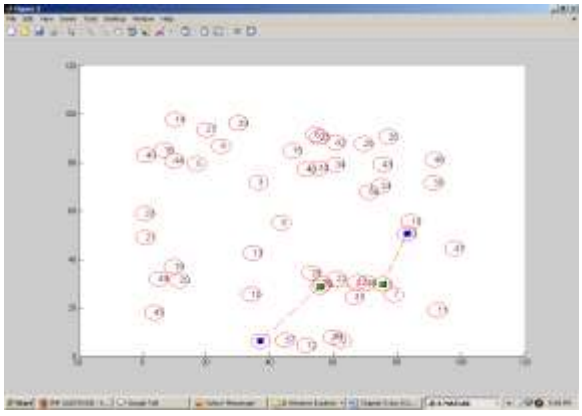

Figure 3 : FOR NODE= 50

Generated Path (Proposed Work)

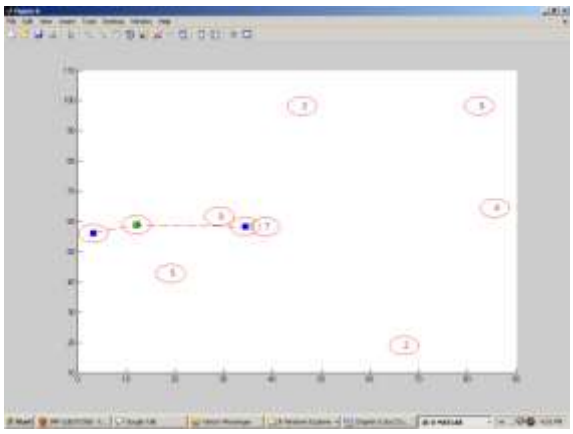

Figure 4 : FOR NODE=10

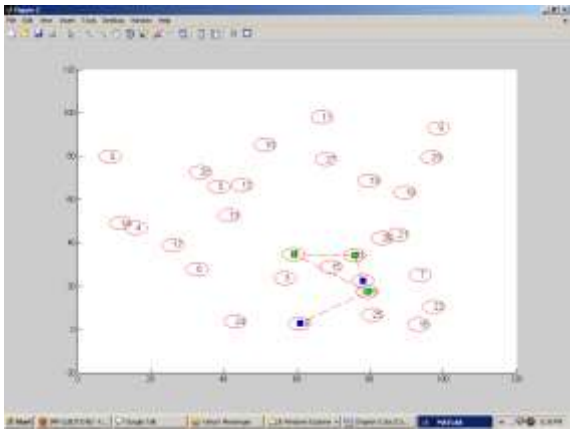

Figure 5 : FOR NODE= 30

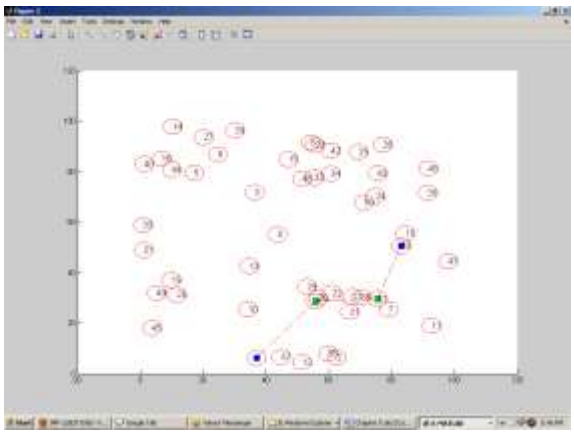

Figure 6 : FOR NODE= 50

B. *THE COMPARISON OF DISTANCE COVERED, ENERGY CONSUMED, DELAY BETWEEN EXISTING AND PROPOSED WORK IS*:

Table 1 DISTANCE

NO. OF NODES	10	30	50
DISTANCE (EXISTING WORK)	49.54	49.1774	71.2484
DISTANCE (PROPOSED WORK)	40.15	78.6763	50.1397

Table 2 ENERGY CONSUMED

NO. OF NODES	10	30	50
ENERGY (EXISTING WORK)	6.5119e + 003	7.7048e + 003	1.0697e + 004
ENERGY (PROPOSED WORK)	5.2569e + 003	1.0324e + 004	7.0162e + 003

Table 3 DELAY

NO. OF NODES	10	30	50
DELAY (EXISTING WORK)	1.4845e + 005 ms	2.0275e + 005 ms	2.6855e + 005 ms
DELAY (PROPOSED WORK)	4.8787e + 003 ms	2.3411e + 005ms	1.8551e + 005 ms

C. *THE COMPARATIVE ANALYSIS IS SHOWN IN THE FORM OF GRAPHS GIVEN AS UNDER*

Distance Analysis (Existing Vs. Proposed)

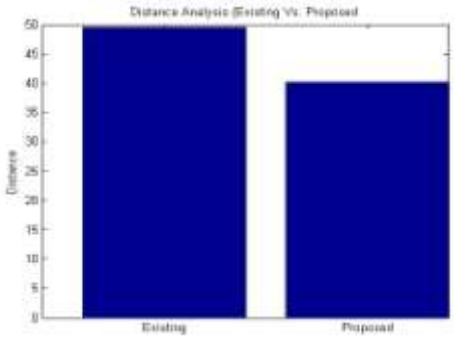

Figure 7 : FOR NODE= 10

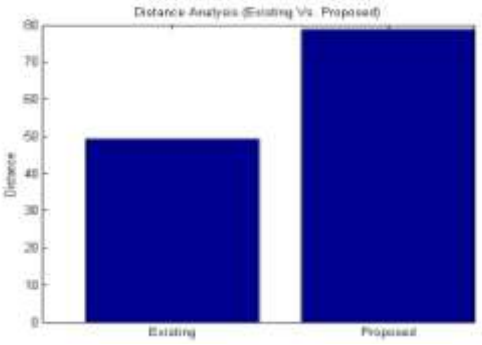

Figure 8 : FOR NODE= 30

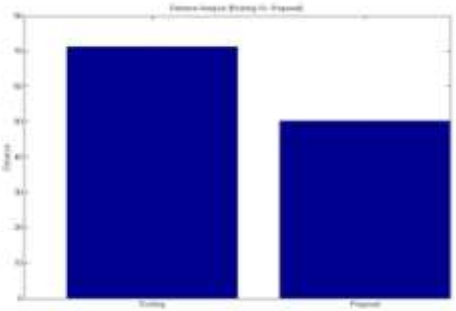

Figure 9 : FOR NODE= 50

Energy Analysis(Existing Vs. Proposed)

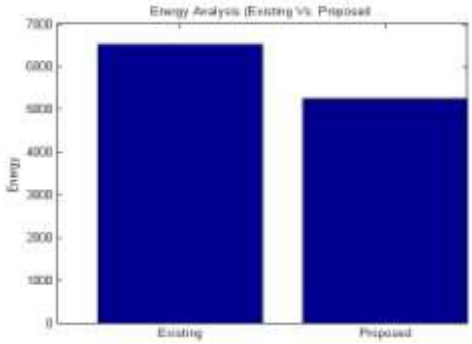

Figure 10 : FOR NODE=10

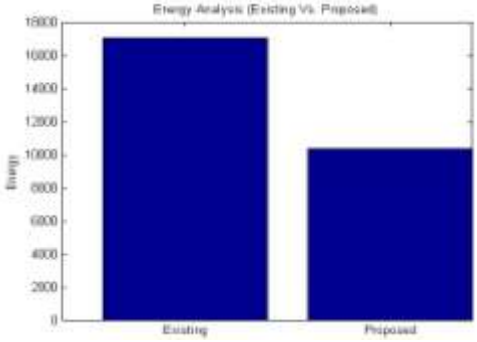

Figure 11 : FOR NODE= 30

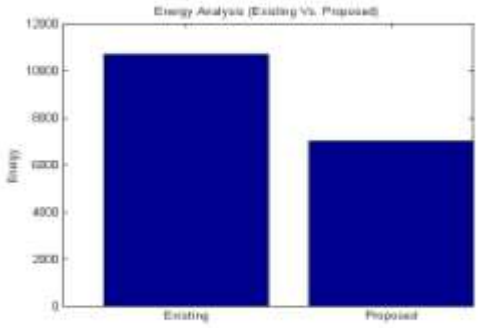

Figure 12 : FOR NODE=50

Delay Analysis (Existing Vs. Proposed)

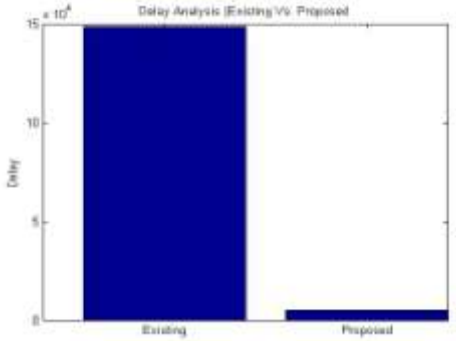

Figure 13 FOR NODE=10

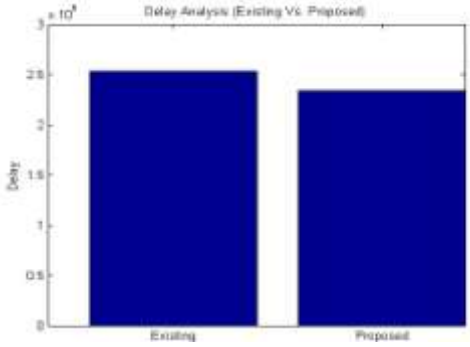

Figure 14 : FOR NODE= 30

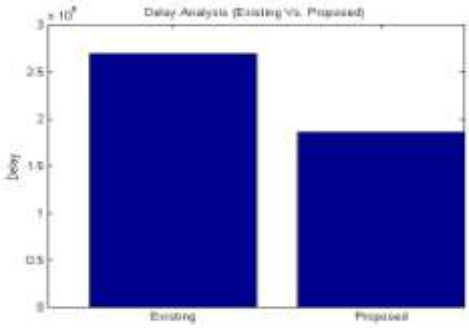

Figure 15 : FOR NODE= 50

VI. CONCLUSION

In this thesis, we have considered the routing approaches in mobile ad hoc networks from the security and congestion viewpoint. We have analyzed the threats against ad hoc routing and presented the requirements that need to be addressed for secure routing.

Existing secure routing algorithm for mobile ad hoc networks are not much secure.In this present work, we have defined a PSO improved safe routing approach to transfer data from congestion free and attack safe path. Generally, the shortest path is the most favourite area for the attackers to perform the intrusion, but the presented approach will not cover any node that is having the higher probability of the attack or the congestion.

As the communication will be performed over a congestion free path, the energy and the delay over the network will be reduced. The presented approach is effective in terms of energy and the time as well as provides a reliable route over the network. The obtained results shows that the presented approach has improve the network reliability and the energy.

The proposed algorithm intends to provide security. The Secure Compromising path Algorithm provides a foundation for governing a secure communication system for mobile ad hoc networks.

VII. FUTURE WORK

The proposed algorithm presented in this thesis considers the defend of Man in Middle Attack as well as provide the safe communication in case of congested networks.

The improvement over the work can be performed in different ways.

- In this present work, PSO is used as the optimization and safe route generation algorithm. In future, some other optimization functions can be used for the path generation such as ACO, genetics, ABC etc.

- The presented work is the generic model respective to the attack. In future the work can be performed respective to the particular attack type over the network.

VIII. ACKNOWLEDGEMENT

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