



Analysis of Swarm Intelligence Optimization Techniques used in MANETS: A Survey

Heena Rani

Department of Computer Engineering
Punjabi University,
Patiala, Punjab, India

Jasvir Singh

Assistant Professor
Department of Computer Engineering
Punjabi University, Patiala, Punjab, India

Abstract- WANET is a Wireless Adhoc Network, in which central access point is needed to interact with other nodes. In WANET there are various limitations like it has high bandwidth, more energy consumption, sometimes routing is not secure, sometimes packets are loss. So, to overcome the limitations of WANET, MANET is come which is highly flexible, Scalable and more secure. MANETs are the Mobile Adhoc Network in which nodes are communicating without any centralized control. In this various routing algorithms are used for the optimal solution like AODV, DSDV, ZRP, OLSR etc. They are used for providing heuristic solution for the problem. But they are not suitable for metaheuristic problems. To improve this drawbacks of MANETs routing protocols new nature based Swarm Intelligence Optimization techniques are introduced like ACO, PSO, ABC, BFOA, CSO and GSO etc. In this nodes are directly communicate with each other and they are Self Organized Techniques. In this paper we describe the various Swarm Intelligence Optimization techniques and Survey of these techniques, on the basis of survey some research issues are given in this paper. This paper also provides the Comparison of these techniques and conclusion of the overall paper.

Keywords: MANETs, Swarm Intelligence.

I. INTRODUCTION

WANET is a Wireless adhoc Network which is used in various networking fields like Smart Phone Adhoc Network, MANET etc. But due the disadvantage of there is no access point to manage the nodes. MANET provide various functions while routing. In MANET nodes are randomly choose their path to move because there is no need of Central device to communicate.[1] MANETs are the Mobile Adhoc Network. They are communicating with each other without any centralized control system.

In this various Mobility Models are used for communication. Mobility Models tells how the movement between the nodes is carried out. These are Random based Mobility Models (Random Walk Mobility Model, Random Direction Mobility Model and Random Way Point Mobility Model), Models with Temporal Dependency (Gauss Markov Mobility Model and Smooth Random Mobility Model), Models with Spatial Dependency (Reference Point Group Mobility Model and Set of Co-related Model), Model With Geographic Restriction (Pathway and Obstacle based Mobility Model). Based on Real Life (Human Based and Vehicular Based Mobility Models).

For efficient communication we need Routing Protocols. Routing Protocols for MANET are Reactive, Proactive and Hybrid routing algorithm. [2] In Reactive Routing Protocol, in this node find a route when needed. In this there is no need to maintain a routing table in advance, in according to the request routing table is create like AODV, ABR, WRP and DSR. In Proactive, need to maintain a routing table in advance like DSDV, LSP and OLSR. Hybrid Routing Algorithm combines the features of Reactive and Proactive Routing algorithm. But in these routing problems are come like large routing overhead, delay, latency, bandwidth overhead, more energy consumption. In case of nature inspired algorithm today work is going on ANTNET and ANT HOC NET which is

type of ANT Colony Algorithm and it is come under the Proactive Routing Algorithm and Reactive Routing Algorithm.

For efficient communication and to improve the optimization of routing. Swarm Intelligence Optimization techniques are come. Swarm Intelligence firstly developed by G.Beni and J.Wang. Swarm Intelligence is a type of Artificial Intelligence based on self generated behavior. Swarm Intelligence is come form the inspiration of nature based things like ants, honey bees, cats, glow worm etc. because ant, honey bees, cats and glowworm they search their own route to travel and they search their shortest route near the destination. It provide fast and quick solutions to Complex Problems.[3][4].

This Paper is divided into Sections. Section 2 gives detail about the various Literature Survey of Swarm Intelligence Optimization techniques. In Section 3 gives detail about the Analysis of these Techniques.. In Section 4 gives detail about gaps from literature survey and In Section 5 gives Conclusion of the whole paper.

II. LITERATURE SURVEY

Mehtab Alam, Asif Hameed khan and Ihtiram Raza Khan, [1] In this paper review of swarm intelligence techniques is given. According to this paper swarm intelligence come to improve the limitations of Wireless Adhoc network

Dr. Ravi Sindal and Nidhi Jaiswal, [5] they discussed about various mobility models and also about its Comparison for MANET. There are various types of mobility pattern. Each mobility pattern has their own effect on different networking applications. According to the nature of mobility pattern network performance will be affected. There are various types of mobility metric's are available to check the performance of network like how they work, output is according to input etc. In mobile

opportunistic network mobility plays an important role to understand the nature with respect to humans, vehicles and wild animals. For any type of research base part is, its performance modeling.

Benslama, et al. [6] wireless Adhoc Networks (WANETs) are decentralized network with no infrastructure and access point to control the nodes. Since the topologies in WANETs are dynamic the routing becomes the challenging task as nodes are moving with low bandwidth and traditional routing algorithm doesn't work with WANETs. This paper gives the systematic literature review of techniques and routing algorithm that exists in WANETs, also the applicability of Swarm Intelligence (SI) in MANETs. The aim of performing the survey is to gain better knowledge of Swarm Intelligence and techniques that are applied to the WANETs.

Nazir, et al. [7], in their work they examines different techniques to manage congestion control, security issues, different layers attacks, routing protocols and challenges that are faced by MANET.

Abdolreza Mohajerani and Davood Gharavian [8], this paper presents a new ant colony optimization based routing algorithm that uses special parameters in its competency function for reducing energy consumption of network nodes. In their proposed algorithm called life time aware routing algorithm for wireless sensor networks (LTAWSN), a new pheromone update operator was designed to integrate energy consumption and hops into routing choice. Finally, with the results of the multiple simulations they were able to show that LTAWSN, in comparison with the previous ant colony based routing algorithm, energy aware ant colony routing algorithms for the routing of wireless sensor networks, ant colony optimization-based location-aware routing algorithm for wireless sensor networks and traditional ant colony algorithm, increase the efficiency of the system, obtains more balanced transmission among the nodes and reduce the energy consumption of the routing and extends the network lifetime.

Ismail, et al. [9], in this paper, they analyzed and comprehend different nature based algorithms to find optimal solution. They work on different algorithms like Bacterial Foraging Algorithm (BFOA), firefly algorithm, Ant Colony Optimization (ACO), bee colony optimization, cuckoo optimization *etc.* Which have been used in power load balancing, cost estimating, optimal routing, color segmentation were discussed. This paper also highlights the constraints and convergence properties of each algorithm to solve certain problems encountered in various fields of application. From there comparative analysis they found that Ant colony algorithms were successful in finding solutions within 1% of known optimal solutions. Optimal solution was found in BFOA by adjusting chemo taxis step size. Also, this paper analyzes results of various research works done in numerous fields using the swarm intelligence techniques.

K. Kanaka Vardini and T. Sitamahalakshmi[10], In today's world, finding a feasible solution for combinatorial problems becoming a crucial task. The main objective of this paper is to analyze and comprehend different nature based algorithms enabling to find optimal solution.

Archana Sarangi , Shubhendu Kumar Sarangi, Madhurima Mukherjee and Siba Prasada Panigarhi,[11], to improve the convergence speed, to Local and diverged solutions new Cat Swarm Optimization Technique is given which is Crazy cat Swarm Optimization which is verified by Infinite Impulse Response systems. This technique has better performance than other Swarm optimization techniques.

Tiang Zeng, Yu hua, Xian Zhao and Tao Liu,[12], In this paper latest version of GSO is given which is GSOL(Glowworm Swarm Optimization Localization) which is used for wireless sensor network. It will come to improve the localization of unknown nodes. It has high accuracy and better convergence.

III. Comparison of Swarm Intelligence Techniques

Name	Parameters	Selection criteria	Advantages	Disadvantages
ACO [13],[14]	Ants, Iterations, Pheromone substance Exporation and Update Exporation	Based on pheromone chemical substance. Select path where highest amount of pheromone.	It is useful in solving optimization problems and also help in solving the NP Hard Problems, Clustering Problems etc.	It consume more energy. And It is only for Global Optimization problems not for local.
PSO [14]	Particles , Fitness value, particle position and Velocity	Particles tell their neighbor-ing birds about the position of food	It gives potential solution of the problem. Secondly in this overlapping is not done. Thirdly It helps to detect the brain tumor through magnetic resonance imaging	It is not suitable for local solutions and also for non coordinate systems

ABC [15], [16]	Bees, (Employes bees , Onlooker bees and Scout bees) , Fitness value, Number of iterations	By waggle dance bees understand other bees location.	Easy to implement, Used to improve software cost estimation problem, Used for solving discrete optimization problems, It has fast convergence speed.	Exploitation process of bees is poor, And bees have no knowledge about the location of food
GSO [17] [12]	Glowworms, luciferin and Iterations.	Depend on luciferin quantity (highest amount is chosen for better result)	Used to solve complex continuous problems, Solve the problem of energy consumption, Used for clustering, and multicast routing problem.	It faces the convergence problem.
CSO [18],[19],[20],[21],[22]	Cats, velocity, flag, fitness function, Seeking mode, Tracing mode, Mixed Ratio and Iterations	Depend on the fitness value and flag.	Used for solving job scheduling problem, used to solve continuous problems, and used for finding the global solution.	It takes long time to converge

IV. GAPS FROM LITERATURE SURVEY

From the literature Survey, some issues are observed in Swarm Intelligence Optimization Techniques. To overcome the issues , A.. In future, use Bacterial Foraging Algorithm to solve the problem of execution time in case of parallel computing. B. In Future work of Artificial Bee Colony Algorithm, Hybrid optimization techniques that using ABC algorithm to be developed for the optimization of Manets. C. In future, To check the accuracy of each algorithm add some parameters like delay, Congestion etc while routing. Now new technique of swarm intelligence which is Artificial Immune System which is now trending, which is need to explored .

V. CONCLUSION

In this paper, I describe various swarm intelligence optimization techniques and its comparative analysis. In ACO to find best path , organize cost to each route for finding the shortest route to the destination. PCO gives the potential solution of the given problem. In ABC, bees move to find out the location of food source. It is used for solving discrete optimization problems. In GSO, luminance quantity known as luciferin is calculated to find the location. It is best for multicast routing problem, rectangle layout optimization problem. In CSO, In this fitness value of nodes are calculated. It has two modes seeking and tracing mode. Flag tells the mode of node. It is best for finding global solutions.

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