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Stimulated Particle Swarm Optimization Routing Protocol – A Review

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Abstract— Energy is a scarce resource in MANET (Mobile Ad Hoc Networks), discovers the nodes are powered by non-renewable Charger. Unique multicast routing protocols are not energy aware and thus do not take energy conservation into Discuses. One approach for energy conservation is to send the messages of a communication session along the routes which Minimizes the total sum of the energy powers. Ant Colony Optimization (ACO) is swarm intelligence based method widely used for network routing. The Important objective of this paper is to focus on low power consumption during packet transmission and receiving the ant colony approaches. This paper results are very honoured and show that the proposed algorithm is capable of finding minimum energy routes for most of the problems considered which are comparable to the state-of-art algorithms.

1. INTRODUCTION

Mobile Ad Hoc Networks (MANET) is self-organizing network consisting of a collection of radio transceivers with no centralized infrastructures. The multicasting is a fundamental problem in MANETs where one node is required to transmit data to a subset of other network nodes. With the growing demand to support multimedia applications in wireless network, it is desirable that such network maintain multicast connection for the entire session. Energy efficiency is crucial for the implementation of multicast services in wireless ad hoc networks due to the limited battery life. The depletion of energy of a node results in disjoint network and consequently loss of connectivity. Thus energy guarding is crucial for all network operation. In the paper investigates the multicast routing in mobile ad hoc networks with the goal of minimizing the total transmitted power of all nodes in the multicast tree. The minimum energy multicast (MEM) problem is NP-complete [1] and can be stated as a combinatorial optimization problem. The existing solutions for MEM problem are mainly based on heuristic methods and a detailed survey on the same can be found in [2].

Proposed a sub-optimal greedy heuristic referred as Broadcast Incremental Power (BIP) algorithm for constructing minimum energy multicast trees in wireless networks. It is a "node based" approach and new nodes are added to the tree on a minimum incremental costbasis until all intended destination nodes are included. The algorithm takes into account the wireless broadcast advantage. The broadcast tree is pruned to obtain the multiple trees. Another rtechniques that have been suggested include a simulated annealing procedure by Montemanniet. All [6], Swarm based ant colony approach in [7] [8]. In the Ant Colony System (ACS) approach by Das et. al. [7] the authors employ two type of ants – Type A and Type B for exploration and exploitation. In [8], the ACO implementation is Max-Min Ant System (MMAS) in a hypercube framework. In this, the authors consider both omnidirectional and directional antenna to builda minimum energy multicast tree. The challenge in energy efficient multicasting is twofold :(i) selecting forwarding nodes and (ii) determining an appropriate transmitting range for each transmitting node. The paper presents a novel method based on Ant Colony System to build a minimum energy multicast tree. Ant colony is a swarm based optimization procedure proposed by Dorigo and Gamberdella [9] to solve the Travelling Salesman Problem (TSP). The main principle behind swarm intelligence interaction is stigmergy which represents indirect communication through the environment. The ants sense the pheromone that is a chemical, secreted by other ants as they travel along trails. Therefore, the ants tend to follow trails that have high pheromone concentration. This causes an autocatalytic reaction i.e. ants attracted by the pheromone willlay more pheromone on the same trails, causing the even more ants to be attract. In essence, swarm intelligence uses positive reinforcement as the search strategy. The rest of the paper is organization as follows. In Section II, we present to the network model and mixed integer programming formulation. The proposed method based on ant colony is discussed in the Section III. The results are presented in the Section IV and finally Section V concludes the work presented in the paper.

2. PREVIOUS WORK

[1]In Ad-Hoc network there are lot of problems, which can be categorized as an optimization problem such as energy aware consumptions, routing protocol, localizations and nodes deployed. Many more researchers having done researches to solved these mathematical problems and recently find new class of routing algorithm came up which is that based on Swarm Intelligence. Ant Colony optimization algorithm is survey process is done on various ant colony optimization based on routing algorithm for Wireless Sensor network (WSN) and Mobile Ad-Hoc Network (MANETs). A different type of comparison is various algorithm is made based on the performance measuring, pheromone functions to selected next node, simulating used, energy consumption awareness's, and etc.

[2]A Web spam is the deliberated manipulation of searching engine indexes. A web spam involves a numbers of method, such as repeated nonrelated phrases, It to manipulated this relevant or prominence of resource index

in a mannered inconsistent with the purposing of the indexed systems. Search that engine include determining whether the searching term appeared in this contents or URL on a webpage. We presented the spam host detection approaches. This content and linking features are extracting from the hosts to train a learning model based on ant colony optimization (ACO) with bee colony optimization (BCO) algorithm. The dataset algorithm has been collected the details from WEBSPAM-UK2008 and implementing by a java Environments. The optimal solution is different with the ant colony and bee colony optimization. Finally, it to providing which optimization algorithms is better than in detecting spam.

[3]In A novel Cooperative Bees Swarm Optimization (CBSO) algorithms based on foraging behaviours of honey bee is presenting. The Cooperative Bees Swarm Optimization (CBSO) employer's cooperative behaviour of multiple swarms in optimization numerical function. The proposing approaches provided different type of patterns which are using by the bee to adjust their fly trajectory. The flyer pattern provided an efficiently ways to balanced explorations and exploitations. Cooperation is the obtaining by shared information between the swarm through a leadering swarms. It Also, a colonization process is performance between their swarm. In colonization processed a portioning of an extinct swarms is replacing with their individual from a colonist swarms. The proposing algorithms were testing on set of good well-known tests function. Result have shown that the proposing algorithms is efficient, robusted, and outperformers other genetics, particle swarms, and bees algorithm examined in this paper.

[4]Multi-objective optimization formed realistic model for many more complex engineering problem. Different type of genetic algorithms solution having been providing to solved these problems. In this paper find a new particle Swarm Intelligence based on Genetic Algorithms (SIGA) is proposing to overcome the disadvantage faced in that previously approach. The exampled problems' choosing is Multiple-objective human's resource allocation problems. This problem has already been solving by hybrid genetic algorithms. They find newly proposing SIGA outperformers the previous process one. The simulating result providing at the end of this paper process proved this works.

[5]In a novel algorithms to finding optimal reactive power markets scheduled in the deregulated and electricity markets. There are many more factors which can be impacting on the optimal process system operating a point. Furthermore, this numbers of controlled and decisions variable in optimization problems in a general power system is highly very large. Therefore, find the optimal reactive power marketed scheduled may be very high time consuming. In order to the overcoming this deficiency, there is proposed algorithms suggested using to Artificial Neural Networks (AANs) to fast up the marketing clearance process. In this algorithm, at 1st, many different typing samples should be produced by traditional marketing clearance process. Then, used this sample in ANN will be trainer to fine to optimal reactive power marketing scheduled. The proposing algorithms are testing on IEEE 24-bus testing systems with satisfactory result.

[6]In The process of verified the modifying software's in the maintenance phase is called Regression Testing. These sizes of the regressions test suited and its selection process is a complexion task for regressions tested because of timing and budget constraint. In this researching papers, the Bees Colony Optimization (BCO) algorithms for the fault coverage regressions testing suited prioritization has been presenting process. In these natural bees colony, there are of 2 types of worker bee; The Scout bee and forager bee, who are the responsible for the development and maintenance of the colonies. The BCO algorithms develop for the fault coverage regressions test suited is based on the behaviours of these two bees. The BCO algorithms has been formulating for fault coverage's to attained maximum fault coverage's in minimum unit of executions time of each test cases, using 2 example whose result are comparable to optimal solutions. Average Percentage of Fault Detection (APFD) measure and chart has been using to show the effectiveness of proposing algorithm.

[7]Ad Hoc Network is based on Ant Colony Optimization techniques. It is a hybrid algorithm that combined a reactive routing setup process with a proactive route maintenance processing. The reactive routing setup is carried out at the starting of a communication sessions or whenever that sources of a current sessions has not more route information's available for the destination. The proactiving routing maintenance is run for the entire duration of the sessions. Its aim is to keep information about existing routers up to date and explored new routers. In this work surveyed of Ad Hoc Network with the Ad hoc On demand distanced Vector (AODV) routing protocols, TORA (Temporarily Ordered Routing Algorithm), DSDV (Destination Sequence Distance Vector) and Dynamic Sources Routing (DSR) protocol is compared. Swarm Intelligences is inspired network are one engineering fields which has many concept in biology and hence the solution of biology can be using to solved the problem of computer network.

3. SWARM INTELLIGENCE

Swarm intelligence (SI) is the behaviours of decentralizing, self-organizing system, natural process and artificial. This concept is employed to in working on artificial intelligences. In the context of cellular's robotics systems SI system consisted typically of a population simple agents interacting local with 1 other and with their environments. This inspiration often comes from natures, especially biological system. The agent followed very simple rules follows, and although there is no centralizing controlled structures dictating how individually agent should behaved, locally, and to a certain degrees random, interaction between such as agent leading to the emergency of "intelligent" global behaviours, unknown to the individual agent. Example in natural system of SI included ant colony, birds flocking, animals herding, grow thing, and fishes schooling. They definitions of swarm intelligences are still none quite clearing. In a principle, it should be multi-agent systems that have self-organizing behaviours that show some intelligence behaviours.

This application of swarm's principle to robots is called swarms robotics, while 'swarms intelligence' refer to the many more general set of algorithm. 'Swarms predictions' has been used to the context of forecasting problem

A. Example Algorithms

- Altruism algorithm
- Ant colony optimization
- Artificial bee colony algorithm
- Artificial immune systems
- Bat algorithm
- Gravitational search algorithm
- Glowworm swarm optimization
- Intelligent water drops
- Particle swarm optimization
- River Formation Dynamics
- Selfpropelled particles
- Stochastic diffusion search
- Multi swarm optimization

- *Applications*
  - Ant based routing
  - Crowd simulation
  - Swarm art
- In popular culture
- Notable researchers
- See also
- References
- Further reading
- External links

B. Ant colony optimization

Ant colony optimization (ACO), introducing by Dorigo in his doctoral dissertation, is a classes of optimizing algorithms modelled on that action of an aco. ACO is a probabilistically technique useful in the problem that deal with findings better path through graph. Artificial 'ant' simulating agent located optimal solution by moving through parameters to space represented all possible solution. Naturals ant lay down pheromones directed each other to resource while exploring there environmental. The simulating 'ant' similarly recording their positions and the quality of their solution, so that in later simulating iteration more ant located better then solution.

C. Artificial bee colony algorithm

An artificial bee's colony algorithm (ABC) is a meta-heuristic algorithm introduced by Karaboga in 2005, and simulating the foraging behaviours of honey bee. The algorithms have three phases: The employed bee, onlooker bee and the scout bee. In the employer bee and the onlooker bees phase, bee exploited the source by local search in the neighbourhoods of the solution are selected based on the deterministic selections in the employee bees phases and the probabilistic selections in the onlooker bee phase. the scout bee phases which is an analogy of aband exhausted foods source in the foraging process, solutions that are not beneficial anymore for searches progressing are abandoned, and find new solution are inserted instead of them to explored new regions in the search spaces. The algorithm has a well-balancing exploration and exploitation skills.

D. Particle swarm optimization

It is a global optimization algorithms for deal with problem in which a good solution can be represent as a point or surfaces in an n-dimensional spaces .the Hypotheses are plotted in this space and see with an opening velocity, as well as a communication channels compares the particle. The Particle then moved thronging the solution spaces, and are evaluating according to some Correctness criterion after each time steps.

E. Multi-swarm optimization

Multi-swarm optimization is several of particle swarm optimization (PSO) based on that using of multiples sub-swarming instead of one (standard) swarms. These generally approach in multi-swarms optimization it is that each sub-swarms focused on a specific regions while a specified diversification method decided where and when to launching the sub-swarm.

F. Applications

Swarm Intelligence-based techniques can be used in a number of applications.

G. Ant-based routing

Telecommunication Networks has to been researching, in the Application of Ant colony optimization these uses of Swarm Intelligence in based routing. Basically these uses a probabilistic router table rewarding/reinforcing the router is successfully traversing by each "ants" (a small control packet) which flooding the networks. Reinforcement are of the routing in the forward, reversed directions and both simultaneously have been research: backward reinforcement requiring a symmetric network and couple the 2 direction together; forward reinforcement it rewarding a routing before the out coming is known. The locations of transmission infrastructure for wireless communication network are an importance of engineering problems involved competing objective.

H. Characteristic of Swarm

- Composed of many individual
- Individual are homogeneous
- Local interaction based on the simple rule
- Self-organization

4 ANT COLONY OPTIMIZATION

In a computer science and operation research, the ant colony optimization algorithm(ACO) is a probabilistically techniques for solved computational mathematical problem which can be reduce to find good path through a graph. The algorithm is a member of the ant colony algorithm group root family, in swarm intelligence method, and it constitute some metaheuristic optimizations. the 1st algorithms was aimed to searching for an optimal paths in a graphs, based on their behaviours of ant seeking a best path between their colony's and a sources of the food. The original idea has since diversified to solve a wider class of mathematical numerical problem, and as a results, several problem have emerging, drawled on various aspect of the behaviours of the ant. The Ant colony optimizing algorithms is inspiring from the food searching behaviour of ant.

A. Basic Ant Colony Algorithm

The basic idea of ant colony algorithms is taken from food searching behaviours of ant. When ants are in searches of their foods, they deposited the pheromone on the way which makes route for them. In the pheromone is nothing but the liquid which evaporated as a time passes. Therefore that pheromone concentration on the paths is nothing but indication of probability usage of the feasible path.

As shown in diagram there are 3 routers from nest to destination. At intersection the 1 ant select path randomly. The path A is the minimum shortest one therefore the ants which takes paths A reached first to food.

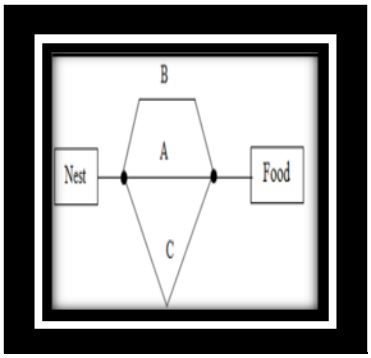

Fig. 1 Ant Colony mechanism to find shortest path

Now ant while coming back to nest again ant has to selects path. Here ants decided the path depending on pheromone concentrations and it is obvious that the pheromone is concentration in shortest path will be big or higher than the others. After then sometimes pheromone concentrations on shortest paths will be highest and all ant will take shortest paths only .In these behaviours of finding the shortest paths is used in communication network. Due to its dynamically and probabilistically natured, this algorithm is used for MANET where topology changed frequently. In the Simple Ant colony optimization meta-heuristics algorithms is given which show why this kind of algorithm could perform well in MANET

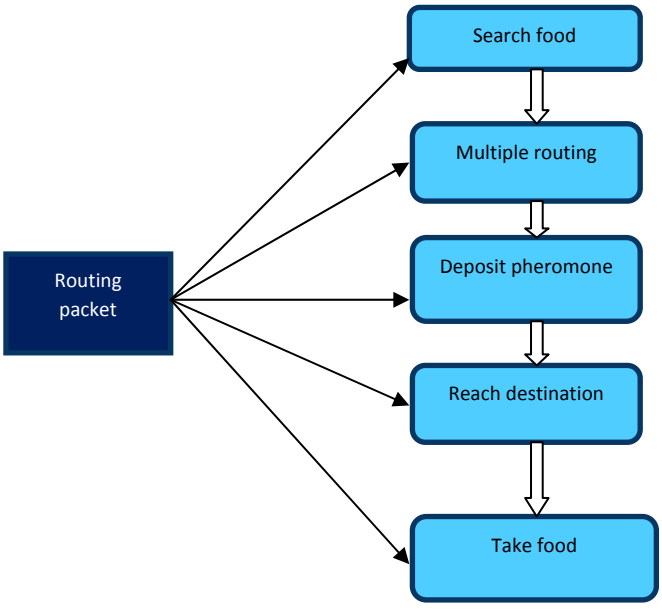

Fig. 1 Ant colony optimization routing protocol

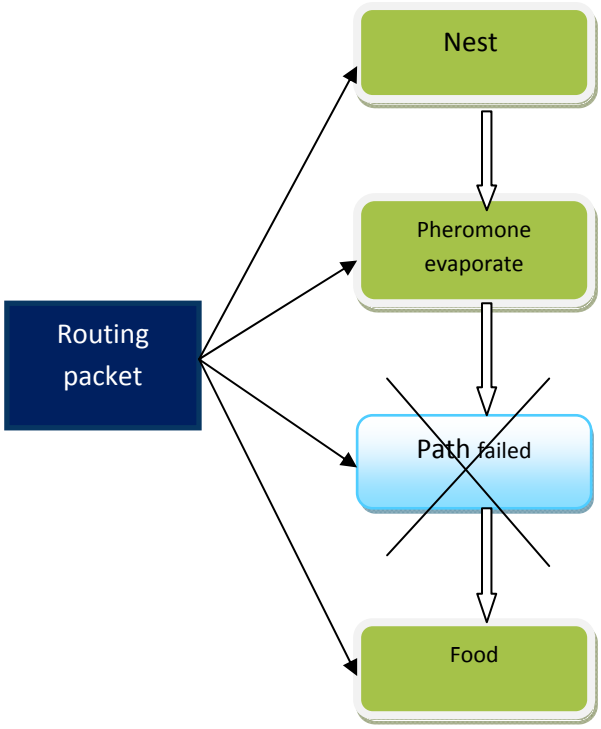

Fig. 3 continued Ant colony optimization routing protocol

B. ACO Based Routing Algorithms for MANETS and WSN

ACO based routing protocol for mobile ad hoc network and WSN give better result due to followed aspect

- availability of the multiple paths
- links failures backup
- self-organization behaviors
- Adaptived to topological change
- simple to designed i.e less overhead.

The paths optimizing between the sources and destinations is achieving by artificially ant by exploiting the pheromone values. Depending upon the how to algorithms initialized the pheromone different Ant colony optimization basically approached is deriving. Here we presented that some Ant colony optimization based routing algorithm proposing for Mobile ad hoc network and Wireless sensor network.

C. ARA (Ant Colony Routing Algorithm)

In an Ant colony routing algorithm has been introducing for MANET. This is the very1st routing algorithms is based on Ant colony optimization which is aims to reduced routing overhead. The proposing routing algorithms consists of 3 phase

- Routing Discovery
- Routing maintenances
- Routing failure Handling. These proposed Ant colony routing algorithm is testing used simulator and the result obtaining for the different mobility

D. Ant Hoc Net

In the Ant Hoc Net algorithm has been proposing which consist of both reactive and proactive component. The paths has been set in reactive mannered by using reactive F ant and after then multiples path has been set between their source to destination. The communication sessions is monitoring in proactive mannered by proactive F ant. In the algorithm are reactive F ant search's paths from the source and destination and on the arrivals of, when it the arrives at destination, it becoming the B ant which tracking back to the same paths to updated the routing tables.

E. ARO (Ant Routing Optimization)

In ant routing optimization is redundant nodes can be relayed node or sensors node, by the selecting suitable relays node lifetime of the sensing node it can be increasing which in turn improving the overall lifetime of the networks. dislike other algorithm it consider energy consumption for the sensing, transmission and the reception of data, and it find to the set of all possible routing path that can balanced the energy consumption. These process is continues untilled any one of the sensors or relay nodes drains out. To do so is authors proposing a lifetime in model for Wireless sensor network.

5. BEE COLONY OPTIMIZATION

The basic behaviour of bee is defined with its mimics the foods foraging behaviours of the swarm of honey bee. In its basic version, these algorithms performed a kind of neighbourhoods searches combining with searches and can be using for both combinatorial optimizations and functionality optimization.

A. Contents

- The foraging processing in natures
- The Bee Algorithms
- Applications and In Job Shop Scheduling

1.The foraging process in nature

A colony of honey bee can be extended itself over the long distance and in multiple direction are simultaneously to exploited a large numbers of food source. A colony prospers to by deployed its foragers to best field. In process, flowers patch with the plentiful amount of nectars or pollen that can be allowed collected with the less efforts should be visiting by more bee, where as the patched with less nectars or pollens should be received fewer bee.

B. The pseudo code for the bee algorithms in its simples form

1. Initialised population with the random solutions.
2. Evaluated fitness of this population.
3. While (stopping criterion not met) //Forming finding new population.
4. Selected site for neighbourhood searches.
5. Recruited bee for select site (more bees for best e site) and evaluated fitness.
6. Selecting the fittest bees from the each patch.
7. Assigning remain bee to the search randomly and evaluated their fitness
8. End the While.

In the first step, the bee algorithms starts with their scout bee (n) being it placing randomly in that searches space of fitness. In step 2, this fitness of the site visiting by the scout bee are evaluating. In step 4, bee that having the largest fitness are choosing as the "selected bee" and site visiting by them are choosing for them neighbourhood search's. Then, in the step 5 and 6, the algorithms conducted search in to the neighbourhoods of the selecting site, assigned more bee to that searches nearing to the good feasible site. The bee can be choosing directed according to their fitness associating with the site they are visitations. Changes, the fitness's value are using to determine the probability of the bee being selected.it Search in the neighbourhoods of the good e site which represented more than promised solution are made more them detailed by recruiting many bee to followed them than the another selected bee. Together then with scouting's, in this differential process recruitments is a key operations of the Bee Algorithms. In, the step 6, for each's patches only the bees with their highest finesse's will be able selected to the form the next bee's population. In the natures, there is no such process a restriction. In these restrictions is introduced here to reduce the numbers of point to be exploring. In the step 7, it the remaining bee in the population are assigning randomly a rounds the searches spaces scouting for find new potential solutions. These steps are repeated untiled a stopped criterion is on met. At the final end of each iteration, these colonies will have two parts to its newest population – those that were their fittest representatively from the patches and those are that having been sent out in randomly.

C Applications

The Bee Algorithms has been found much application in engineers, AS

- Trainings neural network for patterns recognitions.
- Forming a manufacturing cell.
- Schedule job for a product machines.
- Solving continued problem and engineering to the optimization.
- Find the multiple feasible solution to a preliminary designs problem.
- Data to clustering
- Optimization the designer of mechanical component.
- Multiple-Objectives Optimization.
- Tuning the fuzzy logical controller for a robots gymnast.
- System Visions and Image Analysis.

D. Bee in active Scheduling

The honey bee effectively foraging strategy can be applying to a job shops scheduling problem. A path feasible solutions in a job shops scheduling problems is a totally completing schedules of the operations specifying in to the problems. Each solution can be thought of as a path from these hive food source. The drawing on the right side illustrates such on analogy Using these above schemes, the naturals honey bee self organization foraging strategy can be apply to the jobs shop scheduling this problems.

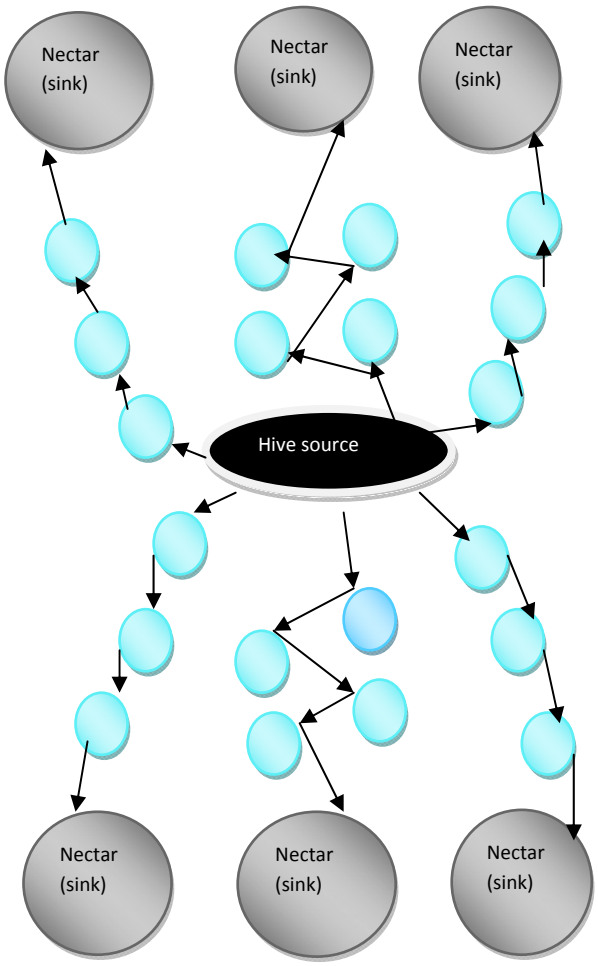

Fig. 4 the natural honey bees self organization foraging strategy

TABLE 1. Simulation Parameters

Number of nodes	40
Simulation Times	500(s)
Initial Energy Nodes	All Nodes were initiated with an equal energy value
Terrain dimension	2000 (m) x 2000 (m)
Traffic Type	CBR, with the following scenarios: CBR 17 100 1536 1S 0S 250S CBR 12 19 100 1536 1S 250S 400S CBR 14 27 100 1536 1S 400S 500S
MAC protocol	IEEE 802.11
Mobility model	Random waypoint (when applicable) or none.

TABLE 2. Simulation Scenarios

Scenarios	**Data size**	**Node speed**	**Mobility**
1	100 times Control Packet Size		
2	100 times Control Packet Size	10 m/s	Random waypoint
3	150 times Control Packet Size	10 m/s	Random waypoint

E. Agents in Bee Colony Optimization

- The Employed Bee
- The Onlooker Bee
- The Scout

1. The Employed Bee

It Stay on a food sources and provided the neighborhoods of the sources in its memory

2. The Onlooker Bee

It getinformation's of food sources from the employing bee in the hive and selecting one of the food sources to gathering the nectars

3. The Scout

The scout is responsible for finding the new food, the new nectars, Source.

6. CONCLUSION

Hence we conclude this paper with the strong knowledge in the proactive and reactive protocols in wireless environment. The conclusion is stated as that with optimization problem with the different types of difficulty indexes, 1st, the proposing PSO adds mutation mechanism beside classical or standard Particle Swarm Optimization; next secondly, the different setting of control parameter are required according to the relevant indexes of very difficult of the problems. Global solution can be found with this Particle Swarm Optimization algorithm. The final outcome of the paper is ACO and BCO plays an important role in the context of Routing in infrastructure based as well as in non-infrastructure based architecture.

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