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Ant Colony Optimization and Water Optimazition Algorithm

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Abstract *- In resent the most emerging trend is evolution computing, evolutionary computation is a family of algorithms for global optimization inspired by biological evolution, and the subfield of artificial intelligence and soft computing studying these algorithms. In technical terms, they are a family of population-based trial and error problem solvers with a metaheuristic or stochastic optimization character. Two methodologies are there to find shortest path one is ant colony optimization and another is water optimization algorithm. it also fix no of problem in real life are Scheduling problem, Vehicle routing problem, Assignment problem, Set problem, Device sizing problem in Nano electronics physical design, Image processing and TSP (Traveling sales man problem).*

Keywords- *Ant colony optimization (ACO), Water optimization algorithm, Evolution computing (EC), Traveling salesman problem (TSP), Swarm*

I. INTRODUCTION

Ant colony optimization is a technique for optimization that was introduced in the early 1990's. The inspiring source of ant colony optimization is the foraging behavior of real ant colonies. This behavior is exploited in artificial ant colonies for the search of approximate solutions to discrete optimization problems, to continuous optimization problems, and to important problems in telecommunications, such as routing and load balancing [1].it also fix no of problem in real life are Scheduling problem, Vehicle routing problem, Assignment problem, Set problem, Device sizing problem in Nano electronics physical design, Image processing and TSP (Traveling sales man problem).

Here we going to find better technique for solving all above the problem which methodology is better ant colony optimization and water optimization. The way both are works are described below.

II. ANT COLONY OPTIMIZATION APPROACH

2.1. Ant colony optimization

This algorithm is a member of the ant colony algorithms family, in swarm intelligence methods, and it constitutes some met heuristic optimizations [2]. The first algorithm was aiming to search for an optimal path in a graph, based on the behavior of ants seeking a path between their colony and a source of food. The original idea has since diversified to solve a wider class of numerical problems, and as a result, several problems have emerged, drawing on various aspects of the behavior of ants. From a broader perspective, ACO performs a model-based search [4].

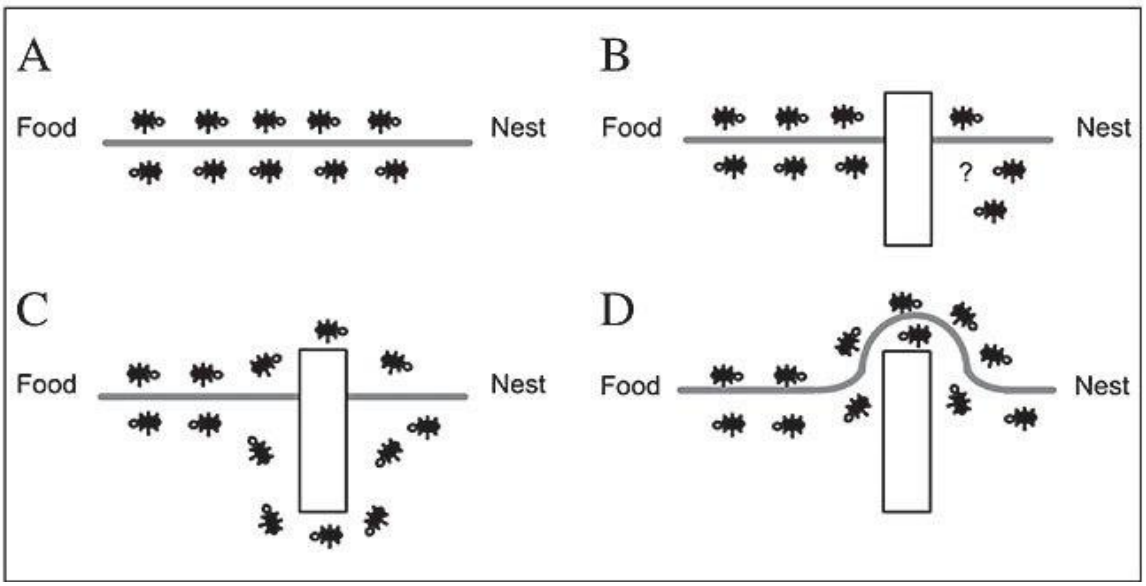

Figure 1 Ant colony optimization

Figure 1 there are 4 portions described as below. In figure it shows how ant colony optimization approach works.

1. Ants in pheromone trail between nest and food
2. An obstacle interrupts the trail.
3. Ants find two paths to go around the obstacle.

4. A new pheromone trail is formed along the shorter path.

The ACO is inspired by the food search behavior of real ants and their ability in finding the optimum paths. It is a population-based general search technique for the solution of difficult combinatorial optimization problems other ants follow one of the paths at random, also laying pheromone trails. Since the ants on the shortest path lay pheromone trails. Faster, this path gets reinforced with more pheromone, making it more appealing to future ants. The ants become increasingly likely to follow the shortest path since it is constantly reinforced with a larger amount of pheromones [6] [7]. The pheromone trails of the longer paths evaporate.

Scheme:

Construct ant solutions
Define attractiveness τ, based on experience from
Previous solutions
Define specific visibility function, η, for a given
Problem (e.g. distance)

2.2 Pseudo Code of Ant Colony Optimization [6] [7]

Initialize the base attractiveness, τ, and visibility, η,
For each edge;
For i < IterationMax do:
For each ant do:
Choose probabilistically (based on previous equation)
The next state to move
Into;
Add that move to the tabu list for each ant;
Repeat until each ant completed a solution;
End;
For each ant that completed a solution do:
Update attractiveness τ for each edge that the ant
Traversed;
End;
If (local best solution better than global solution)
Save local best solution as global solution;
End;
End;

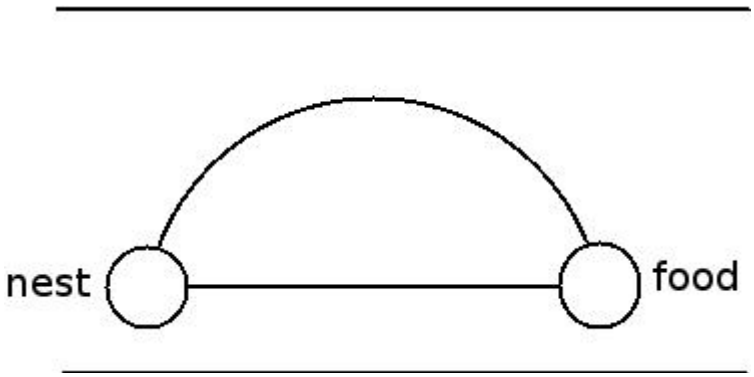

Figure 2 Ant colony optimization

Routing is the problem of discovering and selecting paths in a network along which to send network traffic. Same it use concept of the ACO in ant colony optimization the ant want to its destination from the source. And it wants to find shortest path. But starting from source node the ant choose first no of path to rich the destination and then the, and select the shortest path using its pheromones. Because on the long path it evaporate early and on the shortest path there are more pheromones so all ant select that which is shortest. And all other ants follow that path. If any problem occurs on that path it finds another shortest path to rich destination.

They have an advantage over simulated annealing and genetic algorithm approaches of similar problems when the graph may change dynamically; the ant colony algorithm can be run continuously and adapt to changes in real time. This is of interest in network routing and urban transportation systems.

These concept are used many current application like routing vehicles, Travelling salesman problem, scheduling problem,, Assignment problem, classification, connection oriented network routing, connectionless network routing, Swarm Intelligence etc.

III. WATER OPTIMIZATION APPROACH

3.1. Water optimization Algorithm

The new concept of water optimization is quite similar the ant colony optimization. It also find path from its source to the destination.

We can take example of river, water fall, and rain water it start from its source it dynamically choose the path using huge moving swarms. Water in which they flow is the part of the environment that has been dramatically changed by the swarm and will also be changed in the future. We know that in nature, most paths full of twists and turns. Still it is believed that water swarm in have no eyes so that by using those eyes, they can find their destination. So simple water flow decide its path its own on which cover less obstacle, less difficulties, essay to flow to rich its destination. And it find shortest path from its source to destination like ACO.

This concept is also useful to solve no of problem like assignment problem, travelling salesman problem, network routing and many problem can be solved using water optimization algorithm.

The no of matter which observed in water flow optimization:

1. The velocity of a water swarm increases more on a path with low soil than a path with high soil.
2. A water swarm prefers a path with less soil than a path with more soil.
3. A high speed water swarm gathers more soil than a slower water drop.

IV. CONCLUSION

Ant colony optimization is helpful for solving many real life problem like Scheduling problem, Vehicle routing problem, Assignment problem, Set problem, Device sizing problem in Nano electronics physical design, Image processing and TSP (Traveling sales man problem). TSP is NP hard problem and we can find nearest solution for such problem and Water optimization approach may be more helpful for research in such problem.

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