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Ant Algoritm in AI

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Abstract

We define the algorithm of the ants and understanding its origin is how we analyze the application of this to obtain optimal results in operation where we have individual agents managing data for a common good

Supported by the Stigmergy principle the optimal decisions are made and with the Ants Colony System we take advantage of the resources to the maximum

Categories and Subject Descriptors (according to ACM CCS): Applied computing []: Operations research—Decision analysis

1. Introduction

Ant Algorithm it's a meta heuristic that can be used to find approximate solutions to difficult optimization problems based in the behavior of ants. They look for food randomly, when food is found they come back with it and leave a mark on the route for come back. On the short route the mark is stronger because is visited frequently; pheromone is condensed. A frequently route take sense when optimize it. Analyzing this algorithm for common uses, allows you the manage expenses and control inversions in traffic by avoid street or procediments that can be overfull, in other hand there's the cases where a concurrent route transforms it in save place.

2. Formal Definition

Ant Colony Algorithm is define as a set of software agents (common called artificial ants) search for good solutions to a given optimization problem.

The (Ants System) (AS, for its acronym in English) was the first ACO algorithm proposed in the literature. Initially, three different variants were presented: ant-density, ant-quantity and ant-cycle, which differed in the way they updated pheromone traces. In the first two, the ants deposited pheromone while building their solutions (that is, they applied a pheromone step-by-step online update). While, in ant-cycle, the pheromone update was carried out once all the ants had built a solution and the amount of pheromone deposited by each ant was established as a function of the quality. of the solution. This last variant was the one that obtained better results and is therefore what is known as AS in the literature (and in the rest of this work).

The (Ants Colony System) (ACS, for its acronym in English) is one of the first successors of AS that introduces three important changes with respect to this algorithm: it uses a rule of choice of action more aggressive than AS. The evaporation of pheromone and the pheromone deposit applies only to the arcs of the best global tour each time an ant uses an arc (i, j) to move from city to city j, decreases certain amount of pheromone of that arc.

Important aspects that differentiate them

An ACO algorithm generates a large number of solutions. They are iterative procedures where each of the ants of the artificial colony generates a solution in each iteration, and these occur until reaching an end condition. It is also necessary to add to the algorithm the update of the pheromone trace in each iteration in order to maintain the information obtained with the generated solutions.

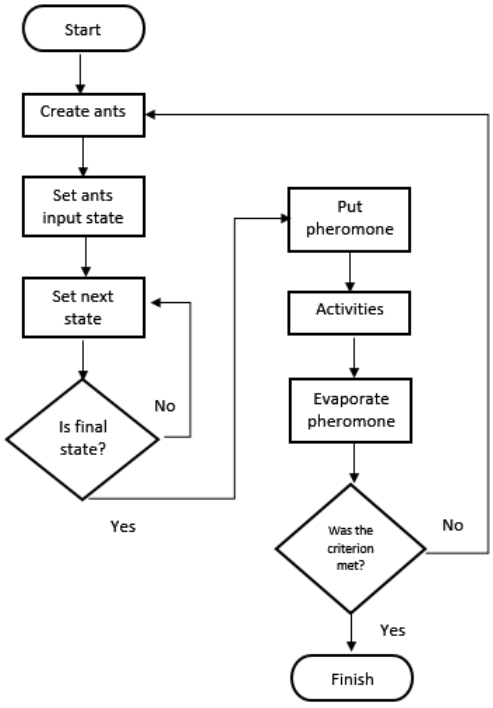
The second difference occurs in the choice of the following component: the choice is pseudo-random where each component is assigned a probability of being chosen and is based on the experience accumulated with the previous solutions. The probability is a function depends on the artificial trail of pheromones and simulates the behavior of ants in nature in the election of the routes.

Finally, the ACO algorithms can also incorporate a local search process to the procedure to improve the generated

solutions.

Categorized as probabilistic solution for an combinatorial optimization problem. Define as a triplet **(S,Ω, f)** where **S** refers a search space defined over a finite set of discrete decision variables, Ω refers a set of constraints among the variables and **f** is an objective function to be minimized.
A solution is called a global optimum if and only if:

$$f(s*) \leq f(s) \forall s \in S\Omega$$



Flow diagram of the ants algorithm

3. Stigmergy Algorithm

To follow the principle of Stigmergy, the collaboration between different independent agents, in a form of organization where collaboration plays a key role in sustaining the well-being of a community.
Set value to the edges between lines draw as route help for take a better decision of which lines ignore based on the reason of they are not enough valuable.

4. Use for

This algorithm is used for problems with a large amount of data, where "simulated ants" walk around the problem to be solved. There are great uses to set itineraries - for example in urban transport systems -, behavior of machines or even to create optimal routes for sellers.

Essentially the route algorithm is based on leaving traces and the attractiveness of the routes, so that each ant builds a piece of the solution. The evaporation of the route plays a role by avoiding sticking in local solutions. The farthest places tend to have stronger roads than the far ones. This algorithm has many uses to set itineraries or to analyze behaviors of machines or distribution systems of products with limited resources, but the most obvious use of this algorithm is to draw almost optimal routes for sellers.

5. Ants in Electronics

Electronic communication networks can be categorised as either circuit-switched or packet-switched. Packet-switched networks work quite differently, however, and all data to be transmitted is divided into segments and sent as data-packets.

6. References

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