

Analysis of Ants Agent and their Characteristics

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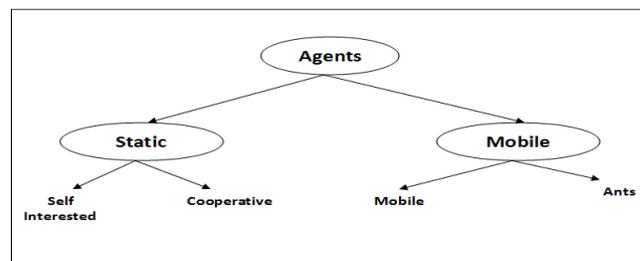
Abstract - Ants are hypothetical sophisticated agents, which done their job autonomously and has capability of learning through their experience. It makes an environment that can accomplish the vision of making node able to understand and utilize information obtainable in a given situation. It discover their tools in a broad variety of isolated optimization problems, these problems are finding dynamic shortest path in telecommunication network, sensor scheduling, continuous optimization & much more. In particular, ants have inspired a number of methods and techniques among which the most studied and the most successful is the general purpose optimization technique known as ant colony optimization. Ants track the theory of "STIGMERGY". Stigmergy is a circuitous form of communication mediated by the environment: insects exchange information by modifying their environment

Keywords – *Ants Agents*.

1. Introduction

An agent is a software entity which has the ability to act on behalf of others, can perceive the input from the environment and react according to them with the help of features like mobility, learning ability and autonomous behavior. They may react to perform their job and exhibit key attributes like learning ability, co-operation and mobility. Also they become intelligent if provided with the knowledge base, learning ability, user preferences and search patterns. The present circumstances demands the assignment of intelligence of web to a smaller but more intelligent technology of components known as intelligent agents. There are several measurements to categorize existing software agents. They can be categorizing according to the tasks they execute through their organize architecture; the range and effectiveness of their actions, the range of compassion of their senses or how much

internal state they posses. Software agent can be classified into two major categories: static and mobile agents. As shown in fig 3.2.



Static Agent

A static agent is autonomous software agent, which eternally resides on a particular host. These agents performs their jobs on its host machine like assigning resources, executing specific computing tasks, putting security policies and so forth. Static agent searched their applications by just sitting on a server or computer and actively monitoring the environment.

Mobile Agent

A mobile agent is also software agent. However it has the ability to transport itself from one server to another in a network host. The capability to mobility allows a mobile agent to transform it to a host that consist an object with agent wants to interact and then to obtain advantage of the computing resources of the object's host in order to interact with that object. The ants agent plays an important role in establishing the remote control from source server to destination server.

This paper broadly divided into four parts. Section 2 provides a brief summary of given literature; section 3

elaborates the comprehensive review of application areas of ants and final section concludes by presenting open research challenges. The next section justifies the incorporation of Ants agent in the existing model.

2. Inspiration for using Ants Agent

Ants are referred to as dynamic agents, which have capability to transform their residing locations. These agents move out of a system to achieve their task and may or may not return to the source node. Ants extend intelligence across the networks. The mobility permits them to be generated, organized and finished without disrupting the network configuration. In fact, peripheral agents that initiate at one node keep on changing their locations and may die on any other node shall be referred to as ants. Ants use the principle of "STIGMERGY". Stigmergy is a type of indirect communication through an environment. The insect ants when shift in search of food drop a hormone named as pheromones that attracts other neighboring ants. The word pheromones come from the biological aspect of biological ants.

Biologically ants are able of searching the shortest path from a food source to the nest without using visual cues. Also, they are capable of adjusting to changes in the environment. For example, finding a shortest path once the old one is no longer feasible due to a new obstacle. Common nature of ants can be explained as:

- Ants travel on a straight line that joins a food source to their nest (see fig. 2. (a)). It is well known that the prime means for ants to form and maintain the line is a pheromone trail. Ants leave a certain amount of pheromone when they walking, and each ant probabilistically prefers to follow a direction rich in pheromone.
- Rapid appearance of an unexpected obstacle interrupts the initial path (fig.2 (b)). Thus once the obstacle has appeared, those ants that are just in front of the obstacle cannot carry on to follow the pheromone trail and therefore they have to decide among turning right or left.
- That condition we can imagine half the ants to decide to turn right and the other half to turn left.

A very parallel condition can be found on the other side of the obstacle (fig.2(c)). It is interesting to note that those ants that select, by chance, the shorter path around the obstacle will more quickly reconstitute the interrupted pheromone trail compared to those that choose the longer path.

- When, the shorter path will obtain a higher quantity of pheromone per time unit and in turn a higher number of ants will select the shorter path. Due to this optimistic feedback (autocatalytic) process, all the ants will quickly choose the shorter path (fig.2 (d)).



Figure 2 (a) Biological ants Follow a Path Between Nest and Food

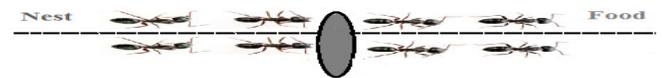


Figure 2(b) An Obstacle Appears on the Path: Ants choose whether to Turn Left or Right with Equal Probability.



Figure 2. (c) Pheromone is Deposited more quickly on the Shorter Path

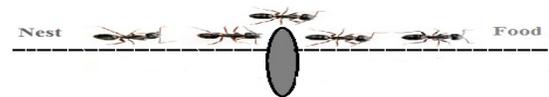


Figure 2 (d) All Ants have Chosen the Shorter Path

The inspiration aspect of this autocatalytic method is that finding the shortest path around the obstacle and this seems to be growing features of the interaction among the obstacle shape and ants distributed behavior. Although, all ants travel at around the similar speed and deposit a pheromone trail at approximately the similar rate but actually it takes longer to contour obstacles on their longer side than on their shorter side which makes the pheromone trail accumulate quicker on the shorter side. It is an ant's predilection for higher pheromone trail levels that formulates this growth still quicker on the shorter path.

Next section presents a comparison of biological ants with artificial ants.

3. COMPARISON AMONG BIOLOGICAL AND ARTIFICIAL ANTS

Artificial ants have a double nature. One side, they are a construct of those behavioral traits of biological ants that appeared to be at the heart of the shortest path finding behavior examined in ant colonies and other side, they have abilities that do not locate a natural counterpart. It is therefore practical to provide artificial ants some abilities that, although not equivalent to any ability of their analogues counterparts, build them more effective and efficient. Table 1 gives a evaluation of artificial ants with biological ants.

Table 3.1 Biological Ants Vs Artificial Ants

Characteristic/ Parameters	Biological ants	Artificial ants
Basis of Life	Food	Information on web pages
Information Used	Hunting for food	Web browsing
Fashion/Style of work	Biological pheromone trail	Recorded Web pheromone maintained by the Web server
Social Communication	Interaction	Request from the client and reply from the server
Principle of Work	Pheromone density	Popularity/importance of a Web page

4. CHARACTERISTICS OF ANTS

Unlike biological ants, artificial ants have some appealing characteristics.

- Ants can complete their job in greatly faster instant.
- It utilizes semantic tools that is a network of grammatically and semantically compatible words representing a computer readable

interpretation of the knowledge of a text. If semantic ontology explains all potential meanings of words in a domain, a semantic descriptor describes the sense of a particular text [12].

- It can arrange themselves i.e. self-organization is the ability of a system to act separately, i.e. without human interference; it can not only adjust existing but also set up innovative relationships between its components with a view to augment agreed value or recovering from a disturbance as well.
- It doesn't get distracted and thus can participate in an ongoing event for long time (for days or months) without directing their attentions anywhere else. Thus these can control critical jobs requiring attention (for long time) better as compared to human beings.
- These can be programmed to the flaws of reasoning to which humans are obviously susceptible.
- Ants are able to learning capabilities with their practical experience and they can become more and more intelligent in future.

5. APPLICATION OF ANT-BASED ALGORITHM

Ants find their application areas in different fields and make some optimum solution to solve the typical problems in appropriate ways [13]. In this section we have tried to throw the lights on the concept of ants with their application areas. Upcoming subsections lists & explain the most popular applications of ants.

A) Sensor Scheduling

The main difficulty for the sensor scheduling component is: "provides a few dissimilar ways to division a geographic area, and presented that individual partitions have priorities, which verify their significance as search targets, discover the optimal sequence in that used to search those individual partitions". Ants are superlative approach to handle these types of problems. The main difficulty of anthology management is to schedule a group of sensors advantages over a series of mission purposes in

such a way that minimizes resource usage and maximizes the likelihood that all the mission objectives will be achieved. It provides agent-based modeling of the search sources and environment to ensure realism. Ants has been extensively studied and used to a variety of scheduling problems; its application in sensor scheduling approach is straightforward. Moreover, its success in priority-based scheduling makes it uniquely suited for such a problem.

B) Telecommunication Networks

Ants system provides an efficient tool for routing problems in telecommunication networks, which systems contains the properties of the telecommunication system such as the cost of using links and availability of nodes varies over time. Ants system were first employed in routing problems of circuit switched networks (like telephone networks) and then in packet-switched networks (like local area networks or the Internet and ants system has improved that, it is one of the best technique to minimize the overhead cost and provides best transmission facilities.

C) Routing

Ants system plays an important role in routing. It uses the pheromone trail to give the best shortest path among source to destination. There are two types of routing approaches used, static routing and dynamic routing. In static routing, the routes among the nodes are pre computed based on confident factors such as mention factors and are stored in routing table. All packets between any two nodes follow the similar path. If topology of the network modify then the path among two nodes may also change. In dynamic routing policy, the routes are not saved but are generated when required. The innovative routes are generated based on the factors like traffic, link utilization etc which is aimed at having maximum performance.

D) Traveling Salesman Problem

Ants provides a best way to solving the traveling salesman problem (TSP). It generates sequentially shorter feasible

tours by using information accumulated in the appearance of a pheromone trail deposited on the edges of the TSP graph. Simulations demonstrate that the artificial ant colony is capable of generating good solutions to both symmetric and asymmetric instances of the TSP.

6. CONCLUSION

In this provides the brief introduction of ants system with their application areas. The Ants does their jobs in behalf of intelligent agent. An intelligent is a software entity, which percepts the input from the environment and analysis them and provides the output according to the environment. It used the logic of most optimize studies technique that is ant colony optimization.

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