Chapter 5

PROPOSED WORK

5.1 Introduction

Semantic web brings the idea of structuring information available across the web in a meaningful way improving search mechanisms and thus resulting in user satisfaction. This work initially explores the literature that has been done to improve the performance of semantic web through ants where ants are hypothetical sophisticated agents that carry information and moreover have the tendency of learning through experiences. Semantic web along with ants creates an environment that can achieve the vision of making node able to understand, relate and use information available in a given situation. The work presents a simple blueprint of ant-based control of semantic web and throws the ideas of open challenges for future research.

The proposed work describes a mechanism to search for resources in unstructured ants based control using ant algorithms implemented through software agents. Traditional resource search algorithms in web use an uninformed or blind search among the various nodes of the network. In contrast, the resource search algorithm described in this work performs an informed search using the ant agent. Usually ants have been implemented as software agents and are created in response to a user’s relevant search query. An ant reinforces the route that yields a successful search for directing ants in the future towards nodes with higher probability of locating resources.

Literature in the previous chapter indicates they researchers have thought of employing ants in semantic web; however the concept has not been used very frequently.
Therefore, aim of this work would be to incorporate ants in semantic web addressing the explored shortcomings. A high-level view of Ant-Based Control (ABC) of semantic web in given in figure 5.1.

![High Level view of Ant-Based Control](image)

**Figure 5.1: High-Level view**

### 5.2 The Proposed Work

The idea is to deploy ants in semantic web which, would then be responsible for

- Executing the task delegated to them.
- Providing a quicker & relevant response to avoid delay in response time.
- Diverting the traffic/tasks to other server in case of congestion.
- Providing more accurate and subject relevant data.

The foraging behavior of ants and their ability to find the shortest paths between destination and their source have attracted wide attention of academicians in a number of disciplines. While traveling from destination to the source and back, ants deposit a chemical substance, called pheromone, at some places on the way. This deposition forms a sort of trail, which helps an ant to find the path back from destination to the source and can also be followed by other ants while searching for destination. As shown in figure 5.2, when an ant has to choose a path to travel, it chooses a path with high pheromone
concentration with greater probability. After a while, the pheromone concentration on the shorter path will be greater than the longer path, because the ants using the shorter path will increase the pheromone concentration faster. Thus, eventually all ants will only use this path. It has been observed that this pheromone trails following behavior allows ants in a colony to find the closest located destination.

Initially when there is no pheromone trail to follow path with higher pheromone concentration. Taking into account the pheromone decay as well, this has been mathematically formulated as follows. Let take $N_1$ and $N_2$ be the number of ants that have used path $P_1$ and $P_2$ respectively, after $M$ (total number of ants) ants have crossed the decision point ($N_1+N_2=D$), the probability $S$ with which the $(M+1)$ ant chooses the path $P_1$ [76].

$$S = \frac{(N_1+k)^h}{(N_1+k)^h + (N_2+k)^h}$$  \hspace{1cm} (1)

Where, $h$ and $k$ are parameters picked to allow the model to fit in to experimental data. This behavior of ants needs to be incorporated into artificial ants to find solutions to relevant and meaningful information. Flowchart and algorithm describing the same is given in figure 5.3 and 5.4 respectively.
Figure 5.3: Flowchart Depicting ABC Algorithm
1. Initialize
   Ants = N₁, N₂ = M;
   Path = P₁, P₂;
   Destination = D;

2. While (N₁ = D) && (N₂ = D) repeat
   Flow path P₁, P₂ by N₁, N₂ ants repeat until ants reach destination D.

3. If (check probability)
   \[ S = \frac{(N₁+K)^h}{(N₁+K)^h + (N₂+k)^h} \]  \hspace{1cm} (1)

4. P₁ is a shortest path.
5. Ants agent find relevant result.
   End if
   End LOOP

6. While (1) repeat cycle
   Find relevant and meaningful result.

7. If (relevant-result)
   Provide result to user otherwise repeat cycle
   Break;
   End IF
   End LOOP

Figure 5.4: Algorithm Depicting ABC Algorithm
5.3 Conclusions

This chapter explained our proposed work which provides a mechanism to search for resources in unstructured ants based control using ant algorithms implemented through software agents. Literature indicated that researchers have thought of employing ants in semantic web; however the concept has not been used very frequently. Incorporation of ants based framework in semantic web provides much faster and more relevant search results.