Abstract

There has been increasing interests among the scientists to mimic the human intelligence and to solve the problems that are complex and dynamic in nature. This has led to the evolution of various metaheuristic algorithms and one promising approach is Ant Colony Optimization (ACO). The ACO emulates the food hunting behaviour of the tiny ants and this has been the inspiration to attack various combinatorial problems.

This thesis investigates the nature of ant algorithms like how almost blind creatures establish the short path from food source to their nest and will suggest conventional and unconventional techniques to improvize the search behaviour.

The conventional approach restricts the search space exploration and thereby making ants to look for quality solution in favourable region. Similarly, unconventional approach emphasizes more on exploitation with the hope that optimal solutions are located near the best solution. The unconventional approach suggests a mechanism to enhance the decision making ability in ants, so that better communication among the ants leads to quality solution.

The thesis also presents certain ACO related mathematical expressions and short discussion on runtime analysis for ACO algorithms.

The nature inspired computations are increasingly finding its applications in real world problems. In this context, a real life example is included to illustrate the theory. The thesis demonstrates the superiority of ACO algorithms by proposing a solution to the train scheduling problem using an Orienteering Problem as a benchmark program.