A General Ant Colony Model to solve Combinatorial Optimization Problems

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Abstract
An Ants System is an artificial system based on the behavior of real ant colonies, which is used to solve combinatorial problems. This is a distributed algorithm composed by a set of cooperating agents called ants which cooperate among them to find good solutions to combinatorial optimization problems. The cooperation follows the behavior of real ants using an indirect form of communication mediated by a pheromone. In this work, we present a new distributed algorithm based on Ant System concepts, called the General Ant System, to solve Combinatorial Optimization Problems. Our approach consist on mapping the solution space of the Combinatorial Optimization Problem on the space where the ants will walk, and on defining the transition probability of the Ant System according to the objective function of the Combinatorial Optimization Problem. We test our approach on the Graph Partitioning and The Traveling Salesman Problems. The results show that our approach has the same performances than previous versions of Ant Systems.

Keywords: Combinatorial Optimization Problem, Ant System, the Graph Partitioning and The Traveling Salesman Problems.