Abstract

Ant System (AS) is a general purpose heuristic algorithm inspired by the foraging behaviour of real ant colonies. AS and its improved versions have been successfully applied to difficult combinatorial optimization problems such as travelling salesman problem, quadratic assignment problem and job shop scheduling. In this paper, two versions of multi-colony ant systems that are extensions to the AS are proposed for the multi-hose routing. In both versions, each colony of ants searches for an optimum path between two end points (or commodities). While each colony searches for optimum paths, they try to maximum use of other colonies paths (sharing paths, or bundling) for easy handling of multiple paths. The first version uses a single pheromone matrix for all colonies and the second version uses different pheromone matrices for each colony and a modified random propositional rule to attract ants toward foreign pheromones. The tessellated format of the obstacles was used in the algorithm instead of the original shapes of the obstacles. As a result of using this format, the algorithm can handle freeform obstacles and speed up the algorithm when checking the collision detections. The experimental results show that there is no significant difference in the quality of the solutions produced by two versions and the first version takes less computation time. Further first version needs low computer memory and one parameter lesser than of the second version.
References

Multi-Colony Ant Systems for Multi-Hose Routing


Index Terms

Computer Science

Keywords

Algorithms
Multi-colony ant system  Hose routing  Shared paths  Bundling  Foreign pheromone
Tessellated format

Freeform obstacles if x