

**DESIGN OF A SELECTIVE PARALLEL
HEURISTIC ALGORITHM FOR THE
VEHICLE ROUTING PROBLEM ON
AN ADAPTIVE OBJECT MODEL**

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To my family who supported me

To my mentor who inspired me

To my colleagues who endured me

To my twins who motivated me

To my wife who loves me

To God

ABSTRACT

Title: Design of a Selective Parallel Heuristic Algorithm for the Vehicle Routing Problem on an Adaptive Object Model.

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The Vehicle Routing Problem has been around for more than 50 years and has been of major interest to the operations research community. The VRP pose a complex problem with major benefits for the industry. In every supply chain transportation occurs between customers and suppliers.

In this thesis, we analyze the use of a multiple pheromone trail in using Ant Systems to solve the VRP. The goal is to find a reasonable solution for data environments of derivatives of the basic VRP. An adaptive object model approach is followed to allow for additional constraints and customizable cost functions. A parallel method is used to improve speed and traversing the solution space. The Ant System is applied to the local search operations as well as the data objects. The Tabu Search method is used in the local search part of the solution.

The study succeeds in allowing for all of the key performance indicators, i.e. efficiency, effectiveness, alignment, agility and integration for an IT system, where the traditional research on a VRP algorithm only focuses on the first two.

Key words: Vehicle Routing Problem; Meta-heuristics, Hyper-heuristics, Memetic Algorithm, Ant System, Tabu Search; Multiple constraints; Multiple Time Windows; Supply Chain Management; Compatibility Matrix, Parallel

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Glossary

ABM	Agent-based Models
ACO	Ant Colony Optimisation
AOM	Adaptive Object Model
AMP.	Adaptive Memory Programming.
GA	Genetic algorithms
IRP	Inventory Routing Problem
MA	Memetic Algorithm
MAP	Meta-heuristic Agent Processes
MDVRP	Multi-Depot Vehicle Routing Problem
NP-hard	Non-polynomial hard
PFSIH	Push Forward Sequential Insertion Heuristic
SA	Simulate annealing
SIH	Sequential Insertion Heuristic
TS	Tabu search
TSP	Travelling Salesmen Problem
VFM	Vehicle Fleet Mix
VRP	Vehicle Routing Problem
VRPHE	Vehicle Routing Problem with Heterogeneous Fleet
VRPM	Vehicle Routing Problem with multiple uses of vehicles
VRPMC	Vehicle Routing Problem with Multiple Constraints
VRPTW	Vehicle Routing Problem with Time Windows