Chapter VII


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Abstract

Genetic algorithms have been applied in solving various types of large-scale, NP-hard optimization problems. Many researchers have been investigating its global convergence properties using Schema Theory, Markov Chain, etc. A more realistic approach, however, is to estimate the probability of success in finding the global optimal solution within a prescribed number of generations under some function landscapes. Further investigation reveals that its inherent weaknesses that affect its performance can be remedied, while its efficiency can be significantly enhanced through the design of an adaptive scheme that integrates the...
crossover, mutation and selection operations. The advance of Information Technology and the extensive corporate globalization create great challenges for the solution of modern supply chain models that become more and more complex and size formidable. Meta-heuristic methods have to be employed to obtain near optimal solutions. Recently, a genetic algorithm has been reported to solve these problems satisfactorily and there are reasons for this.

Introduction

During the early eighties, when Supply Chain Models just began to take shape, many important problems in logistics such as the Facility Planning and Vehicle Routing Problems were found to be NP-hard. The conventional mathematical programming methods fail to solve these complex problems satisfactorily, especially when they are under time constraints. Researchers began to use meta-heuristic methods such as genetic algorithm, simulated annealing and the Tabu search to handle these problems, since they are often able to find a near global optimal solution in a reasonable time.

Recently, due to the intensive efforts in globalization undertaken by the big corporations, the modern supply chain models at both the strategic and operational level are becoming more complex and size-formidable with thousands of variables. The computation complexity of most of the analytic algorithms are at least of the order $n \log n$ so that the computation time is really enormous.

The advent of the age of advanced information technology and e-commerce call for distribution models to be more dynamic and readily responsive to all changes in market situations. Because of this immense increase in complexity, one would encounter great difficulty in formulating these models so that they can be solved by well known analytic methods. Furthermore, the requirement of close to real-time solution of supply chain models imposes further restrictions to the application of these methods. This leads to the development of powerful meta-heuristic algorithms that are more appropriate to be applied in this circumstance.

The organization of this chapter is as follows. The first section describes the real case scenarios where meta-heuristics have to be employed in solving present-
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