Title : MINIMIZING TOTAL COST IN LOGISTICS CHAIN NETWORKS USING GENETIC ALGORITHMS

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## Abstract

Supply chain and logistics management has been rapidly increasing of interests in the last decade. Lot of literature in many aspects in this area including planning, modeling and operation have been found. However, application of genetic algorithms to solve a transportation problem in supply chain network has not received much attention.

The logistics chain networks problems often approach to the transportation or the distribution of products problems. The logistics chain networks problems were aimed to reduce costs or to improve service level. Therefore this work was aimed to minimizing total costs in logistics chain networks using genetic algorithm (GA).

In this work, a matrix-based genetic algorithm (m-GA) was developed to minimizing two types of cost functions in logistics chain network problems. First, the m-GA was applied to minimize the total transportation cost occurred within the logistics chain network problem that consists of four suppliers, six manufacturers, six distribution centres and four customers. Second, the proposed algorithm was applied to minimize the total cost occurred within the logistics chain network problem that consists of three sizes. In the proposed algorithm, the chromosome initialization that always produces feasible solutions was developed. Two types for each of crossover and mutation

operations that guarantee feasible offspring were also developed and investigated. Half fractional factorial design with five replications was carried out with aimed to investigate the influence of alternative crossover and mutation operations by varying GA parameters.

A general linear form of analysis of variance and main effect plots were used to analyze the experimental results. Some factors including the combination of population size and number of generations, probability of mutation and types of crossover operations were statistically significant. The recommended best setting of GA parameters was identified and illustrated by using main effect plots. The best setting was therefore applied to those parameters in the further experimental runs with the same set of random seeds used previously. The optimal solution (best result), which was initially identified by Linear Programming method, was also found in the further runs.

According to the minimizing total transportation cost, the best solution of LP and GA were found at 25,750 ฿ but GA found the number of products flow which were distributed in difference routes on the small size problem.

For the small size problem with minimizing total cost, the percentage of the near optimum solutions of GA was found about 0.74%. For the medium size problem, the percentage of the near optimum solutions of GA was found about 5.96%. It can be seen that the percentage of the near optimum solution is greater with the problem size. This means that the change of getting optimum solutions is low when the solution space is increased.

From both experiments, it can be seen that the amount of significant factors were not affected by problem size. However, the best setting of all significant factors found in each problem size were in agreement, which are P/G, and COP of 50/20 and type I crossover, respectively. Significant and insignificant factors were found the P/G, %M, COP and CS of low, high, low and low, respectively. Therefore, the combination of population size and number of generation (P/G) was the most important parameter of GA since the parameter was significant in all problem sizes whilst the probability of crossover (%C) has no influence.