CHAPTER I

INTRODUCTION

This chapter describes the background, the objectives and scope of work and outlines the structure of the thesis.

Background

One of the most famous way of maximizing profit is to minimize cost. Costs may be split into two types, variable cost and fixed cost (Cox & Blackstone, 1998). Variable cost is an operating cost that varies directly with a change of one unit in the production volume. Fixed cost is an expenditure that does not vary with the production volume such as rent, property tax and salaries of certain personnel. These costs always find on the logistic chain network problems.

The problem of logistic chain network (LCN) is usually concerned with the allocation strategy from suppliers via plants and warehouses/distribution centres to customers with finite capacity constrains in order to meet the client demand at minimum cost or maximum profit (Syarif, et al., 2002), (Simchi-Levi, et al., 2003). The transportation problem within LCN may therefore be referred to a multiple stages capacitated transportation/allocation problem known to be NP-hard (Gen & Cheng, 1997).

There has been a growing interest of applying genetic algorithms (GA) to solve production and operation management (POM) problems, for example, supply chain and logistics (Syarif, et al., 2002), production scheduling (Pongcharoen, et al., 2004), facility layout (Hicks, 2004) and course timetabling (Wang, 2003). However, some areas in POM such as transportation problem in supply chain have not received much attention in GA-applied research (Aytug, et al., 2003).

In this thesis, an alternative strategy for applying matrix based genetic algorithms (GA) to minimise the total costs between all parties with capacitated facilities

in the logistics chain network is described. Two different types of objective functions, the first function is to minimize total transportation cost and another function is the minimum total costs were solved in GA and Linear Programming (LP). Two different types for each of crossover and mutation operations and two different selection techniques for each of roulette wheel selection and stochastic universal sampling are proposed and investigated regarding to the influence on the performance on GA.

Objectives

The objectives of this work are to:

1. Develop a Genetic Algorithm (GA) to solve logistics chain network problems with minimizing total cost (Transportation Costs, Material Costs, Manufacturing Costs, Holding Costs and Facility Costs).
2. Determine the GA parameters in small, medium and large sizes of logistics problem that achieve the best results.
3. Investigate the efficiency of GA performance by comparing the results obtained from GA with the optimum solution, which were initially identified by LP

Scope of work

This work considers three sizes of logistics problems;

1. Small problem consists of four suppliers, six plants, six Distribution Centers (DCs) and four customers.
2. Medium problem consists of eight suppliers, ten plants, ten DCs and eight customers.
3. Large problem consists of eight suppliers, sixteen plants, sixteen DCs and eight customers for testing only GA model.

Outline of the Thesis

The remainder of this dissertation contains the following chapters:

Chapter 2 reviews the literature on supply chain and logistics (SCL), genetic algorithm (GA), linear programming (LP) and Statistical Background.

Chapter 3 includes three parts, the required research equipment, Linear Programming (LP) and applying matrix-based Genetic Algorithm (m-GA) for Logistics Chain Network and testing problems.

Chapter 4 describes a series of experiments designed to identify an appropriate genetic algorithms configuration in terms of operators, parameters and fitness functions for two experiments.

Chapter 5 presents the conclusion and recommendation of this thesis, suggestions for further work in this area and related fields.