Modelling and Optimization of Asymmetric Vehicle Routing Problem using Particle Swarm Optimization Algorithm

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Abstract. Various problems related to vehicle routing problem attract interest of researchers and industry. Specific optimization model and algorithm were developed to solve the problem. This intensive effort aims to reduce logistics costs and number of vehicle usage. In this context, most articles focus on different optimization method approaches. Asymmetric vehicle routing problem (AVRP) appeared when the const of delivering and returning route using the same path were difference. It was used in practical applications to solve AVRP problems identified for specific application. This paper used a well-known metaheuristic optimization method, Particle Swarm Optimization (PSO) for solving AVRP models. To optimize AVRP, three optimization objectives were recommended; the total travelling time, efficiency of the route and the number of vehicles. This is to optimize the number of targets visited. The performance of PSO is evaluated by comparing its results with other popular metaheuristics. The computational experiment was conducted using five test problems with different sizes. The optimization results indicated that this algorithm able to offer good solutions with the best answer for the practical problem. Finally, this study shows that the algorithm can significantly reduce travel costs via number of bus needed to serve all the stop points.

Keywords: Asymmetrical vehicle routing problem, Particle swarm optimization, Vehicle routing problem.

1 Introduction

Public transportation sector is in high demand from time to time as it covers many aspects of transport, such as buses, trains between city trains, subways and high-speed trains. It is very active in regional and local passenger transport systems with regular routes and regular schedules. Public transport has the potential to provide people with mobility and low safety risks, promote a well environment and strong urban areas by reducing overcrowding and pollution. As per the population and the urban economy grow, the demand for public transport is growing rapidly.

Various types of studies have been conducted to ensure the efficiency of public transport. One of the studies focused on public transport is optimizing routing problems. Research area of this common problem is known as Vehicle Routing Problems (VRP).

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