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Solving Vehicle Routing Problem by Using Improved K-Nearest Neighbor Algorithm for Best Solution

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Highlights

- (1) A comprehensive listed of active KNNACVRP.
- (2) Identified and established an evaluation criterion for KNNACVRP.
- (3) Highlight the methods, based on NNA operation, for selecting the best way.
- (4) KNNA finds a shorter distance for VRP routes.

Abstract

Context: Vehicle routing problem (VRP) is one of the many difficult issues that have no perfect solutions yet. Many researchers over the last few decades have established numerous researches and used many methods with different techniques to handle it. But, for all research, finding the lowest cost is very complex. However, they have managed to come up with approximate solutions that differ in efficiencies depending on the search space. **Problem**: In this study the problem is as follows: have a number of vehicles which are used for transporting applications to instance place. Each vehicle starts from a main location at different times every day. The vehicle picks up applications from start locations to the instance place in many different routes and return back to the start location in at specific times every day, starting from early morning until the end of official working hours, on the following conditions: (1) Every location will be visited once in each route, and (2) The capacity of each vehicle is enough for all applications included in each route. **Objectives**: Our paper attempt to find an optimal route result for VRP by using K-Nearest Neighbor Algorithm (KNNA). To achieve an optimal solution for VRP with the accompanying targets: (1) To reduce the distance and the time for all paths this leads to speedy the transportation of customers to their locations, (2) To implement the capacitated vehicle routing problem (CVRP) model for optimizing the solutions. **Approach**: The approach has been presented based on two phases: firstly, the algorithms have been adapted to solve the research problem, where its procedure is different than the common algorithm. The structure of the algorithm is designed so that the program does not require a large database to store the population, which speeds up the implementation of the program execution to obtain the solution; secondly, the algorithm has proven its success in solving the problem and finds a shortest route. For the purpose of testing the algorithm's capability and reliability, it was applied to solve the same problem online validated and it achieved success in finding a shorter route. **Finding**: The findings outcome from this study have shown that: (1) A universal listed of dynamic KNNACVRP; (2) Identified and built up an assessment measure for KNNACVRP; (3) Highlight the strategies, based KNNA operations, for choosing the most ideal way (4) KNNA finds a shorter route for VRP paths. The extent of lessening the distance for each route is generally short, but the savings in the distance becomes more noteworthy while figuring the aggregate distances traveled by all transports day by day or month to month. This applies likewise to the time calculate that has been decreased marginally in view of the rate of reduction in the distances of the paths.

***Keywords**: K-Nearest Neighbor Algorithm; Vehicle Routing Problem; Capacitated Vehicle Routing Problem*

1. Introduction

The vehicle routing problem becomes an area of research since it was studied by Dantzing and Ramser in1959. It has been investigated by many researchers for more than fifty years. The VRP has many applications in real life. It clarifies in a wide area of transportation and distribution such as transportation of individuals