An Effective Heuristic Approach for Multiple-vehicle Routing Problems

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Abstract

In many industries the shipping costs of a product are a major component of a company or organization's overall expenses. A well-planned delivery schedule can reduce some companies' costs by as much as 30 percent. Calculating efficient routing plans for large fleets of delivery vehicles can be a complex and time-consuming endeavor, but successful routing strategies can lead to significant economic advantages. This paper presents a new heuristic approach to large-scale, multiple-vehicle routing problems, using a grouping technique with a modified minimal spanning tree. The advantage of this approach is that it creates good-quality solutions in a relatively quick time-frame, when compared against other solution techniques. The efficiency of the proposed algorithm was confirmed by using various test problems and comparing the output of this approach versus the popular Genetic Algorithm for solving routing problems. This effective heuristic approach can be applied to many different kinds of combinatorial optimization, such as construction equipment fleet planning, construction materials delivery planning, waste collection management, and package delivery.

Keywords
Multiple Vehicle Routing Problem, Heuristic Algorithm, Decision-making, Minimal Spanning Tree

Author Biographies

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Joon-Yeoul Oh is an associate professor of mechanical and industrial engineering at Texas A&M University–Kingsville. He earned a Ph.D. and M.Sc. in Industrial Engineering from New Mexico State University, and a B.Sc. in Industrial Engineering from Chong-Ju University. Dr. Oh's research is in the area of operations and engineering management. He has worked on topics related to risk analysis, network optimization, wireless telecommunication network expansion and optimization, non-linear programming, queueing theory, information systems engineering, and algorithm development. Dr. Oh has more than 15 years of teaching and research experience, and has published more than 50 journal and conference papers. His recent projects include emergency response-time optimization, garbage collection routing, and real-time evacuation routing.

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