

Matheuristic Algorithm for the Dynamic Problem of Location and Dispatch of Medical Emergency Vehicles

Juan Camilo Paz

Department of Civil and Industrial Engineering
Pontificia Universidad Javeriana Cali
Valle del Cauca, Colombia
juan.paz@javerianacali.edu.co

John Willmer Escobar

Department of Civil and Industrial Engineering
Pontificia Universidad Javeriana Cali
Valle del Cauca, Colombia
john.wilmer.escobar@correounivalle.edu.co

Cesar Augusto Marín Moreno

Integra S.A., Universidad Tecnológica de Pereira.
Pereira Risaralda, Colombia
cmarin@integra.com.co

Abstract

This work considers the Dynamic Problem of Locating and Dispatching Emergency Medical Vehicles (PDL DVE). The problem considers three decisions sequentially: location of the fleet of emergency vehicles, the assigning and dispatching of the available vehicles, and finally the relocation of available vehicles, by considering a heterogeneous fleet of vehicles. The objective of the PDL DVE is to maximize coverage in terms of time of response depending on the type of service requested. In this work, a matheuristic algorithm is proposed addressing the three problems: location, dispatch and relocation. The problem of location is mathematically formulated with a vertex approach which is oriented towards the maximum coverage; the dispatch problem is solved through a heuristic based on the preparedness index for multiple servers; and, finally, the relocation problem is approached in two stages: in the first stage, a mathematical model related to maximum coverage is solved, and the second stage minimizes the maximum time need for the displacement of the vehicles in order to relocate the available fleet. Computational experiments generated in a simulation of discrete events based on real information for the city of Bogotá, Colombia, show that the proposed algorithm is able to obtain good solutions within short computing times.

Keywords

Emergency Medical Vehicles, Matheuristic Algorithms, Hybrid Algorithm, Simulation of Discrete Events.

Biographies

Juan Camilo Paz is Industrial Engineering from University of Valle, Cali Colombia. Currently, he has a master degree on Engineering in Pontificia Universidad Javeriana Cali. He is professor of Pontificia Universidad Javeriana Cali.

John Willmer Escobar is full time professor of Pontificia Universidad Javeriana Cali, Colombia. He has a PhD in Operations Research from University of Bologna, Italy. Currently, he is working on Combinatorial and Stochastic problems seeking applications in logistic and financial issues.

Cesar Augusto Marín is a PhD Candidate of PhD in Engineering from University Tecnológica de Pereira, Colombia. Currently, he is working on combinatorial problems for problems related with vehicle routing problems.