A Variable Neighborhood Search to Solve the Three-Dimensional Routing-Packing Problem with Heterogeneous Fleet Considering Fuel Consumption

Juan Esteban Rojas-Saavedra and David Álvarez-Martínez
Department of Industrial Engineering, Faculty of Engineering
Universidad de Los Andes
Bogotá, Colombia
je.rojas16@uniandes.edu.co, d.alvarezm@uniandes.edu.co

Luis Miguel Escobar-Falcón
Program of Systems Engineering
Universidad Libre
Pereira, Colombia
luism.escobarf@unilibre.edu.co

Rubén Iván Bolaños and César Augusto Marín-Moreno
Research, Development & Innovation Department
Integra S.A.
Pereira, Colombia
rbolanos@integra.com.co, cmarin@integra.com.co

Abstract

In this work, a method based on the variable neighborhood search metaheuristic (VNS) is proposed to solve the integrated routing-packing problem. The method considers three-dimensional packing constraints, heterogeneous fleet and environmental impact. Using the Split coding proposed by Prins (2004), the routes satisfying the Capacitated Vehicle Routing Problem’s capacity constraints are selected. The GRASP algorithm proposed by (Martínez et al., 2015) is used to validate the packing constraints of the Three-Dimensional Single Knapsack Problem associated to the selected routes. Environmental impact is included in the optimization scheme, adding a fuel consumption term in the objective function. Additionally, a similar implementation that does not consider the fuel consumption was developed, in order to measure the impact of having a green vehicle routing approach. Computational results show that a mixed integer programming (MIP) solver is capable of obtaining optimal solutions for each of the aforementioned scenarios in reasonable computing times.

Keywords
Vehicle Routing Problem, Packing, Fuel Consumption, Variable Neighborhood Search and Heterogeneous Fleet.

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References

**Biographies**

**Juan Esteban Rojas-Saavedra** has a degree in Industrial Engineering from the University of Los Andes, Bogotá, Colombia (2019) and he is currently doing his M.Sc. in Operations Research at the same university.

**David Álvarez-Martínez** is an Associate Professor, his main scientific activity area is Operation Research and Computer Sciences. Within Operations Research David focuses on the problems modeling, solution and application related to supply chain management, manufacturing and production, logistics and transport, as well as cutting stock problem, staff recruitment, goods packaging, vehicle routing, among others. From a technical point of view, David’s research focuses on specialized software development, through the use and development of accurate and approximate optimization methods. Profile: Postdoctoral Fellow, Applied Optimization Systems Group, Polytechnic University of Valencia - UPV (Spain); Ph.D. in Electrical Engineering (Automation Science), São Paulo State University - UNESP (Brazil); M.Sc. in Electrical Engineering (Computer Science), Technological University of Pereira - UTP (Colombia) and B.Sc. in Systems and Computer Engineering, Technological University of Pereira - UTP (Colombia).

**Luis Miguel Escobar-Falcón** has a degree in Computer Science Engineering (2007) and a M.Sc. degree in Electrical Engineering (2012) from the Technological University of Pereira, Colombia. He has a Ph.D. in Engineering (2019) in the same university, having his abroad period in the University of Bio-Bio, Chile and the University of Bologna, Italy (2016). Currently is the Research Coordinator of Integra S.A, operator of the Bus Rapid Transit System of Pereira, Colombia, and Professor in the Program of Systems Engineering of The Free University in the same city. Has experience working and implementing solutions for operations research problems such as Packing Problems, Vehicle Routing Problems and Scheduling Problems.

**César Augusto Marín-Moreno** is the Manager of the R+D+i department at Integra S.A, the operator of the massive transit system in the city of Pereira, Colombia. He recently completed his Ph.D. in the Technological University of Pereira (2019), working problems oriented to Tactical and Operational Planning. He is expert in project formulation and PMP certified.

**Rubén Iván Bolaños.** is currently the Development Coordinator of Integra S.A. Ph.D. student at the Technological University of Pereira, working Vehicle and Crew Scheduling Problems, and Rostering for BRT (Bus Rapid Transit) operators.