2019

13th International Conference on Industrial Engineering and Industrial Management

XXIII Congreso de Ingeniería de Organización

Organizational Engineering in Industry 4.0

BOOK OF ABSTRACTS

Gijón, 11th-12th July 2019

Book of Abstracts

"13th International Conference on Industrial Engineering and Industrial Management" and "XXIII Congreso de Ingeniería de Organización (CIO2019)"

Book of Abstracts

"13ᵗʰ International Conference on Industrial Engineering and Industrial Management" and "XXIII Congreso de Ingeniería de Organización (CIO2019)"

COORDINADORES

DAVID DE LA FUENTE GARCÍA

RAÚL PINO DIEZ

PAOLO PRIORE

FCO. JAVIER PUENTE GARCÍA

ALBERTO GÓMEZ GÓMEZ

JOSÉ PARREÑO FERNANDEZ

ISABEL FERNÁNDEZ QUESADA

NAZARIO GARCÍA FERNÁNDEZ

RAFAEL ROSILLO CAMBLOR

BORJA PONTE BLANCO

A matheuristic approach for sourcing, production, and delivery plans optimization

Guzmán E[95], Poler R[96]

Keywords: Matheuristic, Mixed Integer Linear Programming, Genetic Algorithm.

1 Introduction

Currently attention is being paid to hybridization or integration of metaheuristics with exact methods, this combination is called "*Matheuristic*" the importance of the hybridization is due that many problems of real-world optimization are very difficult to solve, the fact is that most of these problems are NP-hard (Raidl *et al.*, 2008), therefore its resolution is generating great importance in the industry. Nowadays, increasingly cooperation schemes matheuristics are proposed, since these techniques they are able to exploit simultaneously the advantages of both types of methods. In this context the present research analyses the incorporation of matheuristic approaches, that focuses on hybrid procedures that combine metaheuristics with exact algorithms used of the operations research field.

2 Methods

There are different approaches for combining metaheuristic with exact methods, each technique has their individual advantages and disadvantages, but the aim is to benefit from synergy, several researchers expose a classification and taxonomy of this type of cooperation, such as: Cooperation between exact and local search methods, (Jourdan *et al.*, 2009) proposed by (Dumitrescu *et al.*, 2003), Combination between exact techniques and metaheuristic algorithms (Puchinger *et al.*, 2005; Raidl *et al.*, 2008), "MASTER-SLAVE" structure of a guiding process and an application process. (Caserta *et al.*, 2010).

---

[95] Eduardo Guzmán (✉e-mail: eguzman@cigip.upv.es)
Centro de Investigación en Gestión e Ingeniería de la Producción (CIGIP) Escuela Politécnica Superior de Alcoy, Universitat Politècnica de València (UPV). Calle Alarcón, 03801 Alcoy (España).

[96] Raul Poler (✉e-mail: rpoler@cigip.upv.es)
Centro de Investigación en Gestión e Ingeniería de la Producción (CIGIP) Escuela Politécnica Superior de Alcoy, Universitat Politècnica de València (UPV). Calle Alarcón, 03801 Alcoy (España).

3 Results

First stage we propose a solution approach based on a simplification of the problem, using a relaxed MILP to accelerate the search procedure, omitting integrality constraints or selecting an appropriate relaxation technique such as Lagrangian relaxation or Benders de-composition, starting with partial feasible solutions, and using a genetic algorithm for the definition of the binary variables. In the second stage, once finished the genetic algorithm phase, the binary variables result is entered in the MILP model. Then, the model is solved using a branch and bound technique for calculation the integer variables.

4 Conclusion

The aim of this work is to examine how the matheuristic approaches propose to find effectively and efficiently solutions to optimization problems, within acceptable solving time, combining the flexibility of metaheuristics with the efficiency of the exact models (MILP). The proposed approach will be implemented in the source, make and deliver plans developed in C2NET project and intensively evaluated for comparing the matheuristic approach whit the exact algorithms.

Acknowledgement

References

Caserta, M. y Voß, S. (2010) «Metaheuristics: Intelligent Problem Solving», en Maniezzo, V., Stützle, T., y Voß, S. (eds.) *Matheuristics: Hybridizing Metaheuristics and Mathematical Programming*. Boston, MA: Springer US, pp. 1-38. doi: 10.1007/978-1-4419-1306-7_1.

Dumitrescu, I. y Stützle, T. (2003) «Combinations of Local Search and Exact Algorithms», en Cagnoni, S. et al. (eds.) *Applications of Evolutionary Computing*. Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 211-223.

Jourdan, L., Basseur, M. y Talbi, E. G. (2009) «Hybridizing exact methods and metaheuristics: A taxonomy», *European Journal of Operational Research*. Elsevier B.V., 199(3), pp. 620-629. doi: 10.1016/j.ejor.2007.07.035.

Puchinger, J. y Raidl, G. R. (2005) «Combining Metaheuristics and Exact Algorithms in Combinatorial Optimization: A Survey and Classification», pp. 41-53. doi: 10.1007/11499305_5.

Raidl, G. R. y Puchinger, J. (2008) «Combining (Integer) Linear Programming Techniques and Metaheuristics for Combinatorial Optimization», en Blum, C., Aguilera, M. J. B., Roli, A., y Sampels, M. (eds.) *Hybrid Metaheuristics: An Emerging Approach to Optimization*. Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 31-62. doi: 10.1007/978-3-540-78295-7_2.