Proceedings of the International Conference on Industrial Engineering and Operations Management Bangkok, Thailand, March 5-7, 2019

Others\* contains other solutions methods not often used, such as a Customized heuristic algorithm; Simulation-based evaluation method; a Multi-cut L-shaped based algorithm; a Clonal selection algorithm; exact algorithm based on the trip-chain-oriented set-partitioning; a Partition algorithm; Differential evolution algorithms; and others metaheuristic algorithm.

We notice that the column generation method is the most used for solving scheduling problems, which is normal because this method solves effectively large linear optimization problems like most variants of the MDVSP; but generates the phenomenon of degeneracy, which must be combated with other methods.

Solution methods	The scheduling problems treated
	Uncertain Regional Bus Scheduling Problems; Scheduling and Delivery
	Problems; Block Transportation Scheduling; Emergency Logistics
Genetic algorithm	Scheduling; Location-Scheduling Programming; Maintenance Scheduling
	of Geographically Distributed Assets; Scheduling Trucks; Multistage
	Assignment Optimization
	A truck Scheduling Problem; Scheduling in Intermodal Transport; Inland-
2-stage heuristic	Empty-Container Depot Locations. Transit Stop Inspection and
	Maintenance Scheduling
	Inland Container Transportation Problem; Scheduling Operations based on
Tabu Search	Readiness Criteria; Schedules for Sequential Agricultural Operations; A
	Dial-a-Ride Problem
	Multi-Depot Vehicle Routing Problem; Scheduled Penalty; the Electric
	Vehicle Scheduling Problem; Bi-objective Orienteering for Personal
Variable neighborhood search	Activity Scheduling; Bi-objective Orienteering for Personal Activity
	Scheduling
	Ship Routing and Scheduling Problems; Routing and Crew Scheduling
	Planning; Planning towing processes at airports ; the Multiple-Depot
	Vehicle Type Scheduling problem; Freight Railway Operator Timetabling
	and Engine Scheduling; Delay Management in Public Transportation; the
Column generation	Train unit Scheduling Problem; The Multi-Vehicle Traveling Purchaser
	Problem ; Integrated Operational Transportation Planning Problem ; the
	Multi-Depot Vehicle Scheduling Problem; the Multi-Period Technician
	Routing and Scheduling Problem; Optimization of Periodic Crew
	Schedules; High School Timetabling.

Table 3: Solution methods and the scheduling problems treated.

## **5. CONCLUSION**

In the present time, transportation management has become increasingly important, especially when we take into consideration the increase in demography and human development, which generate high demands. Therefore, plants implantations have become exponential to meet these demands, making logistics management difficult in terms of supply, shipping, and transportation of personnel; as there are several modes of transportation, this management becomes much more complicated to manage. In our paper, we are interested in the VRP and MDVSP, because they have a common objective which is to reduce the fleet size and then to reduce the costs. The objective of this literature review is to give an idea about the solution methods that have been used to tackle such problems in recent papers in this area.

Proceedings of the International Conference on Industrial Engineering and Operations Management Bangkok, Thailand, March 5-7, 2019

## References

- Agra, A., Christiansen, M., Figueiredo, R., Hvattum, L. M., Poss, M., & Requejo, C. (2013). The robust vehicle routing problem with time windows. Computers and Operations Research, 40(3), 856–866.
- Balseiro, S. R., Loiseau, I., & Ramonet, J. (2011). An Ant Colony algorithm hybridized with insertion heuristics for the Time Dependent Vehicle Routing Problem with Time Windows. Computers and Operations Research, 38(6), 954–966
- De Armas, J., Melián-Batista, B., Moreno-Pérez, J. A., & Brito, J. (2015). GVNS for a real-world rich vehicle routing problem with time windows. Engineering Applications of Artificial Intelligence, 42, 45–56.
- Díaz-ramírez, J., Huertas, J. I., & Trigos, F. (2014). Aircraft maintenance, routing, and crew scheduling planning for airlines with a single fleet and a single maintenance and crew base. COMPUTERS & INDUSTRIAL ENGINEERING.
- Hassold, S., & Avi, A. (2014). Public transport vehicle scheduling featuring multiple vehicle types. TRANSPORTATION RESEARCH PART B, 67, 129–143.
- Ibarra-rojas, O. J., Giesen, R., & Rios-solis, Y. A. (2014). An integrated approach for timetabling and vehicle scheduling problems to analyze the trade-off between level of service and operating costs of transit networks. TRANSPORTATION RESEARCH PART B, 70, 35–46.
- Lai, Y. C., Fan, D. C., & Huang, K. L. (2015). Optimizing rolling stock assignment and maintenance plan for passenger railway operations. Computers and Industrial Engineering, 85, 284–295.
- Lalla-Ruiz, E., Shi, X., & Voß, S. (2018). The waterway ship scheduling problem. Transportation Research Part D: Transport and Environment, 60, 191–209. https://doi.org/10.1016/j.trd.2016.09.013
- Liu, M., Luo, Z., & Lim, A. (2014). A branch-and-cut algorithm for a realistic dial-a-ride problem. Transportation Research Part B: Methodological, 81, 267–288.
- Liu, S. C., & Lee, W. T. (2011). A heuristic method for the inventory routing problem with time windows. Expert Systems with Applications, 38(10), 13223–13231.
- Luiz Usberti, F., Morelato França, P., & França, A. L. M. (2013). GRASP with evolutionary path-relinking for the capacitated arc routing problem. Computers and Operations Research, 40(12), 3206–3217.
- Lysgaard, J. (2010). The pyramidal capacitated vehicle routing problem. European Journal of Operational Research, 205(1), 59–64.
- Mattos Ribeiro, G., & Laporte, G. (2012). An adaptive large neighborhood search heuristic for the cumulative capacitated vehicle routing problem. Computers and Operations Research, 39(3), 728–735.
- Min, C., & Soo, B. (2014). Expert Systems with Applications Block transportation scheduling under delivery restriction in shipyard using meta-heuristic algorithms. Expert Systems With Applications, 41(6), 2851–2858.
- Muyldermans, L., & Pang, G. (2010). A guided local search procedure for the multi-compartment capacitated arc routing problem. Computers and Operations Research, 37(9), 1662–1673.
- Ngueveu, S. U., Prins, C., & Wolfler Calvo, R. (2010). An effective memetic algorithm for the cumulative capacitated vehicle routing problem. Computers and Operations Research, 37(11), 1877–1885.
- Nossack, J., & Pesch, E. (2013). A truck scheduling problem arising in intermodal container transportation. European Journal of Operational Research, 230(3), 666–680.
- Salhi, S., Imran, A., & Wassan, N. A. (2013). Computers & Operations Research The multi-depot vehicle routing problem with heterogeneous vehicle fleet: Formulation and a variable neighborhood search implementation. Computers and Operation Research, 1–11.
- Sterzik, S., & Kopfer, H. (2013). Computers & Operations Research A Tabu Search Heuristic for the Inland Container Transportation Problem. Computers and Operation Research, 40(4), 953–962.
- Tang, J., Yu, Y., & Li, J. (2015). An exact algorithm for the multi-trip vehicle routing and scheduling problem of pickup and delivery of customers to the airport. Transportation Research Part E: Logistics and Transportation Review, 73, 114–132.

Proceedings of the International Conference on Industrial Engineering and Operations Management Bangkok, Thailand, March 5-7, 2019

## **Biographies**

**Ziyad Bahou** holds a MS degree in industrial engineering, from LORRAINE University in Metz, France. He is actually a PhD student at Department of industrial engineering with Research Team in modeling and decisions support for systems at Ecole Mohammadia d'Ingénieurs (EMI), Mohamed V University, Morocco. He is interested in operations research. His work is focused, more specifically, on fleet management and vehicle scheduling problem.

**Dr. J. Elhachmi** obtained the license in physics in 2004, the 3rd cycle diploma in informatique, Telecommunication and multimedia from the University Mohammed V-Agdal in 2006. He is currently a researcher at the Laboratory of Electronics and Telecommunications, Mohammadia School of Engineers (EMI), Rabat, Morocco. His current research interests are Telecommunication, Artificial intelligence (AI), systems information and communication, intelligent antenna.