Biased Randomized Algorithms and Simheuristics for Large Scale and Stochastic Arc Routing Problems

Juliana Castaneda & Javier Panadero

IN3 - Computer Science Department, Universitat Oberta de Catalunya, Spain

Email: ｛jcastanedaji, jpanaderom｝@uoc.edu

Angel A. Juan

Department of Applied Statistics & Operations Research, Universitat Politècnica de València, Spain

Email: ajuanp@eio.upv.es

Peter Keenan & Sean McGarraghy

Quinn School of Business, University College Dublin, Ireland

Email: {peter.keenan, sean.mcgarraghy}@ucd.ie

This work reviews the use of biased randomized algorithms and simheuristics in solving different large-scale and stochastic arc routing problems (ARPs). Biased randomization techniques allow for transforming a constructive heuristic into a probabilistic algorithm capable of exploring the solution space without losing the logic behind the heuristic. This is achieved by employing a skewed probability distribution, which introduces random but controlled deviations from the greedy path proposed by the heuristic. These techniques have been successfully applied for solving large-scale time capacitated ARPs [1]. Likewise, simheuristics refer to the combination of metaheuristics with simulation, which extend the natural capabilities of metaheuristic algorithms to deal with stochastic ARPs, such as load-capacitated ARPs with stochastic demands [2], time-capacitated ARPs [3], or ARPs with stochastic travel times.

References

[1]   J. de Armas, P. Keenan, A.A. Juan, and S. McGarraghy, "Solving large-scale time capacitated arc routing problems: from real-time heuristics to metaheuristics", *Annals of Operations Research* 273(1), 135-162, 2019.

[2]   S. Gonzalez-Martin, A.A. Juan, D. Riera, M.G. Elizondo, and J.J. Ramos, "A simheuristic algorithm for solving the arc routing problem with stochastic demands", *Journal of Simulation* 12(1), 53-66, 2018.

[3]   P. Keenan, J. Panadero, A.A. Juan, R. Martí, and S. McGarraghy, "A strategic oscillation simheuristic for the Time Capacitated Arc Routing Problem with stochastic demands", *Computers & Operations Research 133*, 105377, 2021.