

Parameter tuning

This supplementary material presents the parameter tuning of the HMSG and HSA algorithms.

The parameter values of the algorithms were calibrated using the *Irace* package (López-Ibáñez et al. 2016), taking into account the size of the instances. *Irace* is a statistically-based tool that returns the best values for the parameters from a set (or range) of values provided. If a set of fixed values was chosen for each parameter of the algorithms that did not depend on the size of the instance, they might only be good for one set of instances, but not for all.

In the proposed HMSG algorithm, the values of the parameters α and k were tuned to obtain its best performance. The parameter $MSmax$ was set to 5 to limit the time for decision-making. Higher values can consume an impractical computational time for the application. Of the 20 instances used for testing, three with different sizes (small, medium, and large) were selected for tuning. The parameters values tested were $\alpha \in \{0.20, 0.30, 0.40\}$ and $k \in \{0.30, 0.40, 0.50, \dots, 0.80\}$. At the end of the tuning, the values returned by the tool were $\alpha = 0.30$ and $k = 0.50$.

For the HSA algorithm, the parameters tuned were t_f , β , ψ , and k . These parameters also were obtained using the *Irace* package and those three instances. The parameter values tested were $t_f \in \{1.0, 0.1, 0.08\}$, $\beta \in \{0.99, 0.95, 0.90, 0.85, 0.80, 0.75\}$, $\psi \in \{0.25, 0.50, 0.75\}$ and $k \in \{0.1, 0.3, 0.5, 0.6, 0.8\}$. A self-adaptive method based on simulation (Souza 2022) was used to prescribe the parameter value t_i . The returned values by *Irace* were $t_f = 0.1$, $\beta = 0.80$, $\psi = 0.50$, and $k = 0.6$.

References

- López-Ibáñez, Manuel, Jérémie Dubois-Lacoste, Leslie Pérez Cáceres, Mauro Birattari, and Thomas Stützle. 2016. “The irace package: Iterated racing for automatic algorithm configuration.” *Operations Research Perspectives* 3: 43–58.
- Souza, Marccone Jamilson Freitas. 2022. “Inteligência Computacional para Otimização: meta-heurísticas.” Departamento de Computação, Universidade Federal de Ouro Preto, Ouro Preto, MG, Brazil. Available at: <http://www.decom.ufop.br/prof/marcone/Disciplinas/InteligenciaComputacional/InteligenciaComputacional.pdf>.