

# A hybrid approach using an Artificial Bee algorithm with mixed integer programming applied to a large-scale capacitated facility location problem

Cabrera G. G.

Cabrera E.

Soto R.

Rubio L.J.M.

Crawford B.

Paredes F.

We present a hybridization of two different approaches applied to the well-known Capacitated Facility Location Problem (CFLP). The Artificial Bee algorithm (BA) is used to select a promising subset of locations (warehouses) which are solely included in the Mixed Integer Programming (MIP) model. Next, the algorithm solves the subproblem by considering the entire set of customers. The hybrid implementation allows us to bypass certain inherited weaknesses of each algorithm, which means that we are able to find an optimal solution in an acceptable computational time. In this paper we demonstrate that BA can be significantly improved by use of the MIP algorithm. At the same time, our hybrid implementation allows the MIP algorithm to reach the optimal solution in a considerably shorter time than is needed to solve the model using the entire dataset directly within the model. Our hybrid approach outperforms the results obtained by each technique separately. It is able to find the optimal solution in a shorter time than each technique on its own, and the results are highly competitive with the state-of-the-art in large-scale optimization. Furthermore, according to our results, combining the BA with a mathematical programming approach appears to be an interesting research area in combinatorial optimization. © 2012 Guillermo Cabrera G. et al.