Heuristic approach to solve a tandem truck-dron logistic delivery problem

Pedro L. Gonzalez-R*[1], José L Andrade[2], David Canca Ortiz*[1], and Marcos Calle-Suárez[1]

[1]Industrial Engineering and Management Science, School of Engineering, University of Seville – Spain
[2]Robotics, Vision and Control Group (GRVC) – Spain

Abstract

Nowadays a great development and applications in unmanned aerial vehicles (UAVs) have succeeded. Probably, in a few years, these applications will be fully integrated into our lives and we will see them as something usual, as happened recently with the use of mobile phones or internet. The practical application and use of UAVs implies a series of problems that are of a different dimension to the technological component. Among them, the problems derived from the use of UAVs in logistics distribution tasks, in the so-called "last mile" delivery problems, stand out. In the present work we focus on the resolution of the truck-drone tandem routing problem.
The problems of tandem routing have a complex structure and have only been partially addressed in the literature. The use of UAVs raises a series of restrictions and considerations that did not appear previously. The aspects such as the autonomy of the batteries used by the UAVs and the definition of replacement points can be highlighted. This casuistry limits their mathematical modelling and resolution to small-size cases.
We propose an iterated greedy heuristic based on the iterative process of destruction and reconstruction of solutions. This process is orchestrated by a global optimization scheme using a simulated annealing algorithm. The obtained results are quite promising when comparing with the modelling and exact resolution from previous research

Keywords: unmanned aerial vehicle routing problem, UAVs scheduling, Iterated Greedy, Heuristics

*Speaker