A prototype of truck-drone route optimization based on agent modelling and simulation

Jose M. Leon-Blanco*†[1], Marcos Calle-Suárez‡[1], Pedro L Gonzalez-R§[1], and David Canca Ortiz¶[1]

[1]Industrial Engineering and Management Science, School of Engineering, University of Seville – Spain

Abstract

In recent times, the optimization of the use of unmanned aerial vehicles (UAVs) or drones in the last-mile delivery of goods is receiving increasing interest from the research community. In this work, we study the routing problem of finding the best time needed by a truck-drone tandem to visit a set of locations or customers to deliver a set of goods. Due to limitations in drone payload, each client will receive only one parcel.
This problem, like other routing problem is NP-Hard and we propose a multiagent simulation methodology capable to find good quality solutions in polynomial time. This methodology has been little used in logistics. In our system, each location needed to be visited, is modelled as an agent, competing with others for the delivery of one parcel as soon as possible, with the constraints imposed by the environment.
Results obtained by our model and those obtained by exact resolution are compared. We have found good quality solutions in case of a high number of clients, but they are not as good in case of small problems, where an exact solution can be found in reasonable time. In addition to that, our method easily shows the real path of the tandem truck-UAV and simplifies sensitivity analysis, i.e., when new clients are added or removed from the mission, or there are closed or saturated roads

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*Speaker
†Corresponding author: migueleon@us.es
‡Corresponding author: mcalle@us.es
§Corresponding author: pedroluis@us.es
¶Corresponding author: dco@us.es