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# Routing drones in the interior of a factory using a new version of the VRP

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## Abstract

In this paper we analyze the feasibility of using drones in a manufacturing factory that requires multiple transports from the warehouse to the workstations. Considering low cost drones it is understood that they have little autonomy and low load capacity. To minimize energy consumption a mathematical model of vehicle routing type is used, in three dimensions, which is a new formulation of the VRP and it is solved using an optimization method. The problem is complex because is a new problem named VRP min takeoff and it is a NP-hard problem, like the VRP, moreover the routes must be planned in order to avoid collisions, therefore they must follow time windows in the deliveries.

**Keywords:** drones, vrp, heuristic, LHS

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