On the K–Drones Arc Routing Problem

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In this talk we introduce the K–Drones Arc Routing Problem (KDARP). Given a set of lines, each one with an associated service cost, and a point called the depot, assuming that the cost of deadheading between any two points is the Euclidean distance, and given a constant L, the KDARP consists of finding a set of tours starting and ending at the depot and with lengths no greater than L, such that they jointly traverse all the given lines completely with minimum total cost. Traffic monitoring, infrastructure inspection, and surveillance along linear features are some of the applications of this problem. Since drones can travel directly between any two points in the plane without following the edges of the network, a drone route may traverse only part of an edge, with multiple routes being used to cover the entire edge. This problem is really a continuous optimization problem. Here, we introduce an Integer Linear Programming formulation using only binary variables for a discretization of this problem, as well as several families of valid inequalities. A preliminary polyhedral study and a branch-and-cut algorithm are also presented, and some computational results are reported.