The Mixed-Constrained Routing Problem - A Combination of CEARP and CETSP

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The *Close-Enough Arc Routing Problem* (CEARP) is a generalization of the *Rural Postman Problem*. It consists of finding a minimum cost tour starting and ending at the depot, traversing a subset of arches such that all the targets are in the neighbourhood set as the arches in the solution. The *Close-Enough Travelling Salesman Problem* (CETSP) is a variant of the Euclidean Travelling Salesman Problem in which the traveller visits a node (target) if it passes through the neighbourhood set of that node. Both these problems are used to model many real-world applications, such as routing of drones. Unfortunately, in many real applications, the drones are restricted to fly along the streets, or moving corridors, in certain areas and they are free to move to other areas. To model this scenario we define the *Mixed-Constrained Routing Problem* (MCRP). This generalization considers the concept of *Flight Zone*, in particular this formulation distinguishes between the *Free Flight Zone* and the *Constrained Flight Zone* – in other words, zones where the flight is free or is constrained to specific moving corridors. In this paper, we define two possible approaches to face the new generalization, based on the conversion of the defined problem in the CEARP and CETSP. Finally, on this transformation approaches, we defined a heuristic algorithm, based on a local search procedure, and a Genetic Algorithm. For this new problem, we have created a set of benchmark instances and performed several preliminary computational experiments. The results show that our approach is able to produce effective solutions in reasonable running times.

References

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