<div align="center">

Referee report on:
"The Hampered Travelling Salesman Problem with Neighbourhoods."

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Content

The paper focuses on two problems: The Hampered Shortest Path Neighbourhood Problem (H-SPPN) and the Hampered Travelling Salesman Neighbourhood Problem (H-TSPN). These are extensions of the two classical routing problems which are the shortest path and travelling salesman problems where one has to visit a set of regions (neighbourhoods) rather than points. Moreover, going from one region to another one may be hampered by some obstacles (barriers). The authors consider a special kind of neighbourhood hampered by polygonal barriers. They propose exact mathematical formulations assuming that neighbourhoods are second order cone representable. On one hand, the authors prove that H-SPPN can be solved by a polynomial time combinatorial algorithm. Then they give an exact formulation for this problem which will help to state the formulation for the more difficult travelling salesman problem. Computational experiments were handled where neighborhoods are balls or segments and barriers are segments. Along this study, the authors show the difficulty of mixing neighbourhoods with barriers for the travelling salesman problem.

Comments

This is an interesting and difficult problem. There are, however, many parts expressed in vague terms. Furthermore, the authors often rely on results from the literature. I think these results need to be stated and their interpretation has to be explicitly written in the studied framework , not by just citing references.

~~Assumption A3: Which kind of union is operated between two overlapping barriers. Is it a convex union? But in case of segments, the resulting barrier is not a segment!~~

~~Second Order Cone seems to be an important property but here a very few information is given about it. Please, try to give more details in Subsection 3.1 (definition, properties...)~~

Page 14: The first sentence is about computing the dominating sets, the construction algorithm must be specified.

The single-commodity flow formulation is considered for the Steiner Travelling salesman problem for two reasons: the fictitious vertices associated to barriers and the shortest path problem formulation. This is an example where the explanation of this motivation is scattered throughout many paragraphs. Try to summerize and to shorten the text.

Page 20: The difference between H-TSPHN and H-TSPN is given but the authors have to describe the α-constraints, specially the product of continuous variables obtained for this case.

Decision

The authors have to make some clarifications and in the same time they need to shorten the paper.

The paper needs to be revised.

Minor corrections

Page 3:

~~2nd paragraph, last line : "obStacles"~~

~~last paragraph: 6 sections~~

Page 5:

Use "endnodes" of an edge instead of vertices

Page 11:

~~In the definition of E_X replace $\wedge$ by a comma~~

~~Figures 1 and 2: add a), b), c) for each case.~~

Page 12:

~~In the mathematical formulation: the last set of constraints is (N−C) or (U−C)? Make it~~ clear.

Page 23:

~~Figure 7: Keep the same notation as in the algorithm 1: barrier B_1 and corresponding points denoted $P_{B_1}^1$ instead of P_1^1 for example.~~

Page 27:

~~Proof of Proposition 6: Define exactly the visibility graph, its vertices and edges.~~

Algorithm 3: Is step 2 defined by Algorithm 4? same thing for step 3 and Algorithm 5? Explain the connections between the different algorithms.

Page 29: In the second experiment, the number of instances is ten, isn't it?

Indicate that the unit time is the second

Tables 2 and 3, column $|\mathcal{B}|$: are the values average?