

1 Description of the Problem

In this section, it is described the two problems that are considered in this paper: the Hampered Shortest Path Problem with Segments H-SPP-S and the Hampered Traveling Salesman Problem with Segments H-TSP-S .

In H-SPP-S , we have a source neighborhood $N_S \subset \mathbb{R}^2$ and a target neighborhood $N_T \subset \mathbb{R}^2$, that we assume to be convex sets and a set \mathcal{B} of line segments that plays the role of barriers that the drone cannot cross. In this model we state the following assumptions:

- A1** The line segments of \mathcal{B} are located in general position, i.e., the endpoints of these segments are not aligned. Although it is possible to model the most general case, it is beyond of the scope of this paper.
- A2** The line segments of \mathcal{B} are opened, that is, it is possible that the drone visits the endpoints of the segments, but it cannot be located in the interior points of them. Otherwise, we can take a small quantity to enlarge these segments to make them opened.
- A3** If there are two barriers that have a common portion of them, it is only considered the smallest line segment that contains both barriers.
- A4** There is not a rectilinear path to go from N_S to N_T . Otherwise, the problem becomes straightforward and the solution is the minimum distance between both neighborhoods.

The aim of the H-SPP-S is to find the best pair of points $(P_S, P_T) \in N_S \times N_T$ in the source and target neighborhoods that minimize the length of the path that joins both points without crossing any barrier of \mathcal{B} by assuming **A1-A4**.

The H-TSP-S is an extension of the H-SPP-S where a neighborhood set \mathcal{N} is considered that plays the role of source and target neighborhoods in the H-SPP-S . The aim of the H-TSP-S is to seek the shortest tour that visits each neighborhood $N \in \mathcal{N}$ exactly once without crossing any barrier $B \in \mathcal{B}$ by assuming again **A1-A4**.

The Figure 1 shows an example of the problem that are being solved. In the left picture, the blue neighborhood represents the source, the green one, representing the H-SPP-S , the target and the red line segments show the barriers that the drone can not cross. In the right picture, an instance of the H-TSP-S is shown, where the neighborhood are balls and the barriers are, again, the red line segments.

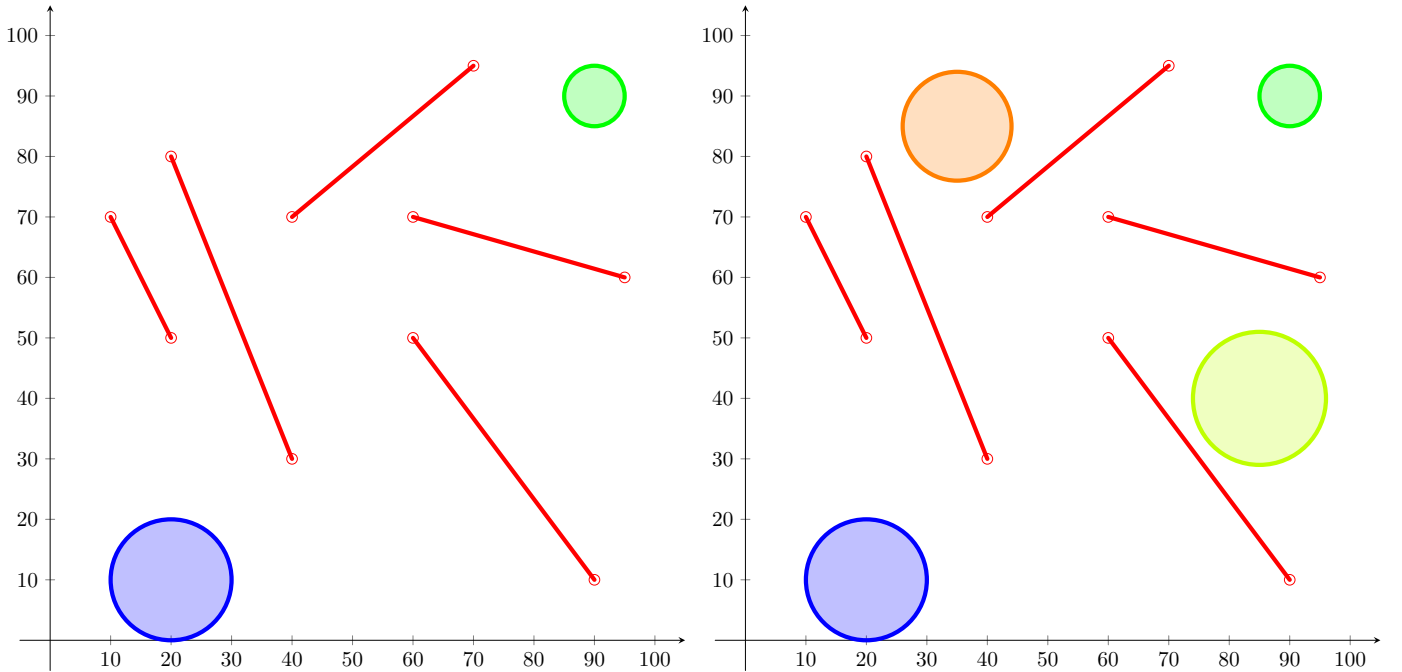


Figure 1: Problem data of the H-SPP-S and H-TSP-S