

<https://youtu.be/ulf8L3XReqg>

For this exercise, you should not use *Ibex*, but your own interval library.

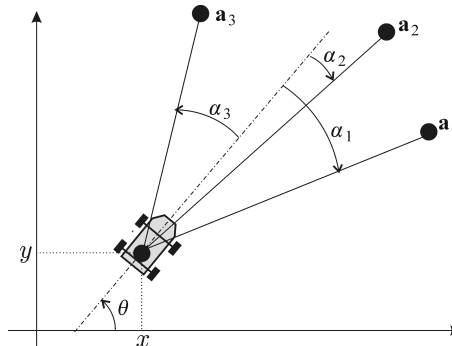
Consider the set

$$\mathbb{S} = \{(x, y) \in \mathbb{R}^2 \mid y = \sin x\}.$$

- 1) With PYTHON, program a contractor \mathcal{C}_0 for $\mathbb{S}_0 = \mathbb{S} \cap [-\frac{\pi}{2}, \frac{\pi}{2}] \times [-1, 1]$ taking into account the monotony of the sine function on the interval $[-\frac{\pi}{2}, \frac{\pi}{2}]$. Using a paver, check that contractor is minimal
- 2) From \mathcal{C}_0 build a contractor \mathcal{C}_1 for $\mathbb{S}_1 = \mathbb{S} \cap [\frac{\pi}{2}, \pi] \times [-1, 1]$, taking into account the symmetry of \mathbb{S} with respect to the line $x = \frac{\pi}{2}$.
- 3) Using the symmetry of \mathbb{S} with respect to any x -translation of 2π , build a contractor for \mathbb{S} . For this, you should for build a contractor for the constraint “ x is an integer”. Then, you take into account the fact that the constraint $(x, y) \in \mathbb{S}$ can be decomposed as

$$\left\{ \begin{array}{l} (x_0, y) \in \mathbb{S}_0 \cup \mathbb{S}_1 \\ \frac{x-x_0}{2\pi} \in \mathbb{Z} \end{array} \right.$$

- 4) A robot measures the *bearing* angle α_i between its axis and the vector pointing towards the i th landmark, $i \in \{1, 2, 3\}$.



We recall the bearing equation

$$(x_i - x) \sin(\theta + \alpha_i) - (y_i - y) \cos(\theta + \alpha_i) = 0,$$

where (x_i, y_i) are the coordinates of the landmark \mathbf{a}_i and θ is the robot's heading.

The robot, which is static, measures its heading $\theta \in [1, 1.1]$ rad. Moreover

$$\begin{array}{ll} \alpha_1 \in [1, 1.4] & \mathbf{a}_1 = (2, 3) \\ \alpha_2 \in [-0.5, -0.2] & \mathbf{a}_2 = (3, 3) \\ \alpha_3 \in [-1.5, -2] & \mathbf{a}_3 = (4, 2) \end{array}$$

Draw the set of all feasible positions (x, y) for the robot.

Remarque. Pendant l'épreuve, je pose des questions personnalisées.