Logic programming, 2A Rob.

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https://youtu.be/ulf8L3XReqg

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

Consider the set

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

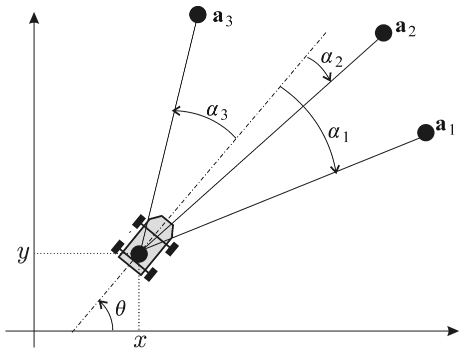
1) With PYTHON, program a contractor $\mathcal{C}_0$ for $\mathbb{S}_0 = \mathbb{S} \cap [-\frac{\pi}{2}, \frac{\pi}{2}] \times [-1,1]$ taking into account the monotony of the sine function on the interval $[-\frac{\pi}{2}, \frac{\pi}{2}]$. Using a paver, check that contractor is minimal

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

$$\begin{cases} (x_0, y) \in \mathbb{S}_0 \cup \mathbb{S}_1 \\ \frac{x - x_0}{2\pi} \in \mathbb{Z} \end{cases}$$

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



We recall the bearing equation

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

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

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

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

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