

Robotiks WS17/18

Assignment 12

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Repo: https://github.com/al-eax/robotik_ws1718

A* Tree

Step	Open {g+h}	Closed
0	H{0+19}	
1	G{10+1} , E{10+20}, D{10+35}, C{10+42}	H{0+19}
2	E{10+20} , F{20+18}, D{10+35}, C{10+42}	H{0+19}, G{10+1}
3	F{20+18} , D{10+35}, C{10+42}	H{0+19}, G{10+1}, E{10+20}
4	B{30+9} , D{10+35}, C{10+42}	H{0+19}, G{10+1}, E{10+20}, F{20+18}
5	A{40+0} , D{10+35}, C{10+42}	H{0+19}, G{10+1}, E{10+20}, F{20+18}, B{30+9}

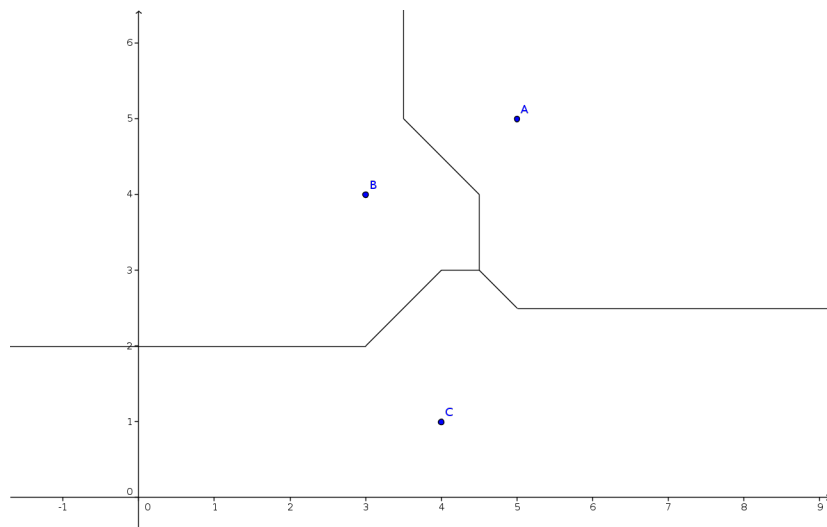
Shortest way under consideration of alphanumerical values: $h \rightarrow g \rightarrow e \rightarrow f \rightarrow b \rightarrow a$.

This heuristic is **not** optimistic. Some heuristics are higher than the actual path costs. Have a look at C to A. This means, the graph is not consistent.

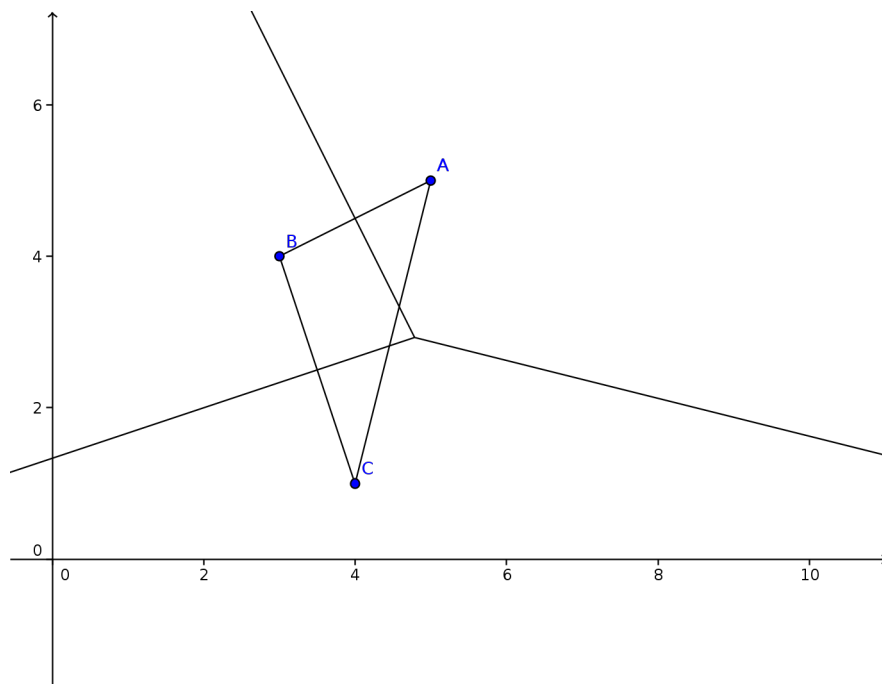
A non consistent graph doesn't find the optimal path, as you can see.

2. Voronoi-Diagrams

l1 metric



l2 metric



3. Potential Fields

$$F_G = d_G^2 = \left(\sqrt{(x-3)^2 + (x-4)^2} \right)^2 = (x-3)^2 + (y-4)^2$$

$$F_O = \frac{3}{d_O^2} = \frac{3}{(x-2)^2 + (y-3)^2}$$

derivation of F_G

$$F'_{xG}(x, y) = 2x - 6$$

$$F'_{yG}(x, y) = 2y - 8$$

derivation of F_O

$$u = 3; u' = 0$$

$$v = (x - 2)^2 + (y - 3)^2$$

$$v'_x = 2x - 4; v'_y = 2y - 6$$

$$F'_{xO}(x, y) = \frac{-3*(2x-4)}{((x-2)^2 + (y-3)^2)^2}$$

$$F'_{yO}(x, y) = \frac{-3*(2y-6)}{((x-2)^2 + (y-3)^2)^2}$$

force vectors

$$\vec{F}_O = (F'_{xO}(1, 1), F'_{yO}(1, 1))^T = (\frac{6}{25}, \frac{6}{25})^T$$

$$\vec{F}_G = (F'_{xG}(1, 1), F'_{yG}(1, 1))^T = (-4, -6)^T$$

$$\vec{F} = \vec{F}_O + \vec{F}_G = (-3.76, -5.76)^T$$