

Online Motion Planning, SS 16
Exercise sheet 7
University of Bonn, Inst. for Computer Science, Dpt. I

- *You can hand in your written solutions until Wednesday, 01.06., 14:15, postbox in front of room E.01 LBH.*

Exercise 19: Analysis of 2-ray search strategies (4 points)

Analyse the competitive ratio of the following strategies for the 2-ray search problem:

1. $x_i = (i + 1)2^i$
2. $x_i = 2 \cdot 3^i$

Exercise 20: Maximal reach calculations (4 points)

- a) Implement the strategy for attaining the optimal reach for the 2-ray problem for $C \in [3, 9)$.
- b) Present the optimal strategy (max. reach) for $C = 8.5$ and $C = 7.5$.
- c) Compute the best strategy (smallest ratio C) if the goal is at most 15 steps away from the start.

Exercise 21: Window Shopper special (4 points)

Consider the following Window-Shopper variant. The shopper is step one (orthogonal distance) away from the line l and would like to find the source of a ray. The origin of the unknown ray lies on l and has coordinates $(1, y)$ for $y \geq 0$; see Figure 1.

The unknown ray has slope $+\infty$ and runs in parallel with l see for an example Figure 1. Any reasonable strategy will first hit l at some point p . If the rays is detected the agent has to move downwards to the origin. If the ray is not detected yet, the strategy moves upwards to the origin.

- a) Analyse the worst-case ratio of the strategy that moves on the shortest path to l (this means $p = (1, 0)$) and then upwards.
- b) Analyse the worst-case ratio of the following strategies:
1. The strategy visits l in $p = (1, 0.2)$ on the shortest path. Then the strategy moves either upwards (ray not detected) or downwards to the origin.
 2. The strategy visits l in $p = (1, 0.3)$ on the shortest path. Then the strategy moves either upwards (ray not detected) or downwards to the origin.
- c) Find the overall optimal strategy and the worst-case ratio.

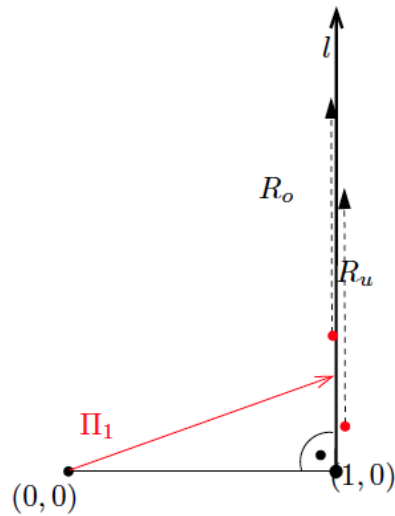


Figure 1: In this variant the ray is in parallel to l .