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,* 08.06., 14:15*, postbox in front of room E.01 LBH.*

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

Analyse the competitve 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 unkwown 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.

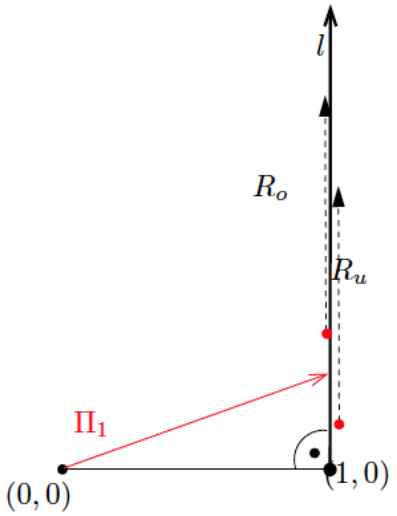

Figure 1: In this variant the ray is in parallel to l.