Online Motion Planning, SS 16

Exercise sheet 8

University of Bonn, Inst. for Computer Science, Dpt. I

- *You can hand in your written solutions until Wednesday,* 15.06., 14:15, *postbox in front of room E.01 LBH.*

Exercise 22: Rays inside polygons (4 points)

Assume that we are searching for a ray inside a simple polygon P.

1. The agent can only move inside the polygon and only detects the ray when the ray is visited. The online agent competes against the shortest path to the ray as shown in Figure 1.
2. The agent can only move inside the polygon but detects the full ray, if some portion of the ray gets *visible* inside the polygon. The online agent competes against the shortest path to the ray.

For both configurations: Design a simple competitive strategy or prove that the competitive ratio cannot be bounded by a constant.

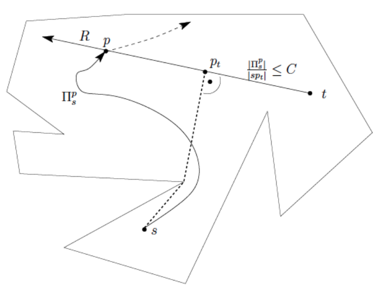

Figure 1: Searching for a ray inside a polygon. In this example, the ray has to be visited for detecting the ray. The agent need not move toward the origin.

Exercise 23: Spiral search (4 points)

Similar to the configuration discussed in the lecture, we are searching for a ray in the plane. Analogously, we would like to design a spiral strategy with some eccentricity β. Different from the situation in the manuscript the ray only has to be detected as in the previous exercise part 1.

Design the optimal spiral strategy and calculate the ratio, present a lower bound!

Exercise 24: Star-shaped streets (4 points)

A Polygon P is called *star-shaped*, if there is at least one point p in P that can see every other point q in P. The set of all those points p in P is called the *kernel* of P.

Let P be a star-shaped polygon. Prove that for every point s on the boundary ∂P of P there is a point $t \in \partial P$ such that (P, s, t) is a street.