Online Motion Planning, SS 16
Exercise sheet 2
University of Bonn, Inst. for Computer Science, Dpt. I

- *You can hand in your written solutions until Wednesday,* 27.4., 14:15*, postbox in front of room E.01 LBH.*
- *We allow (and recommend) fixed groups of 2 students.*
- *Please subscribe to our mailing list: https://lists.iai.uni-bonn.de/mailman/listinfo.cgi/vl-online*

Exercise 4: Expected Lower Bound (4 points)

In the lecture we presented a simple lower bound construction for the exploration of simple gridpolygons which results in a competitive ratio of at least $\frac{8}{7}$, the corresponding alternatives are shown in Figure 1 Consider an arbitrary randomized algorithm that shuffles with a fixed probability for any step.

Present a lower bound on the expected value of the competitive ratio if the adversary is aware of the corresponding probabilities.

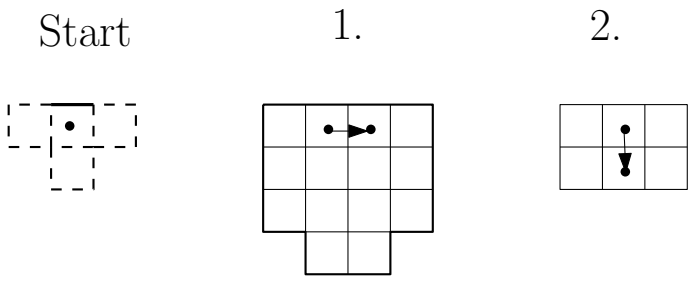

Figure 1: A simple lower bound construction for simple gridpolygons.

Exercise 5: SmartDFS Example (4 points)

Recapitulate the differences between the algorithms *DFS*, *Improved DFS* and *SmartDFS*. What is a *split cell*, and how is the *layer* of a cell defined?

Explore the grid graph shown in Figure 2 using the *DFS*, *Improved DFS* and*SmartDFS* algorithms. How many moves are made during the exploration (which includes returning to the start point s)? For the first occurrence of a split-cell in the *SmartDFS* algorithm, draw the polygons, P_1, P_2 and Q and explain its interpretation!

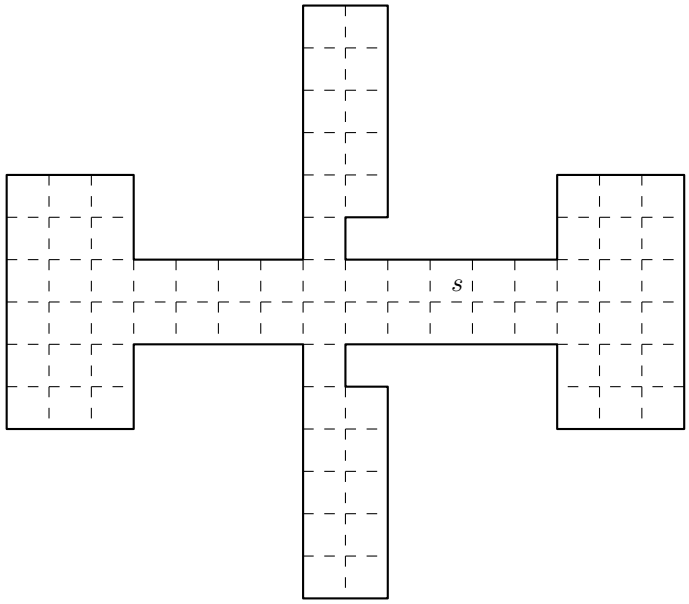

Figure 2: The grid graph for exploration with various DFS Algorithms.

Exercise 6: Union and Intersection of gridpolygons (4 points)

Give a formal proof for the following statement. For any two gridpolygons P_1 and P_2 we have:

$$E(P_1) + E(P_2) = E(P_1 \cup P_2) + E(P_1 \cap P_2).$$