Online Motion Planning, SS 17
Exercise sheet 3
University of Bonn, Inst. for Computer Science, Dpt. I

- *You can hand in your written solutions until Tuesday,* 9.5., 14:15*, post-box 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 7: Example STC (4 points)

Explore the gridpolygon of Figure 1 starting from the bottommost $2D$-cell.

a) Construct the spanning tree of 'Spiral STC'

b) Build the path of the tool.

c) For any $2D$-cell categorize and count the number of double-visits and compare the sum to the number of boundary sub-cells.

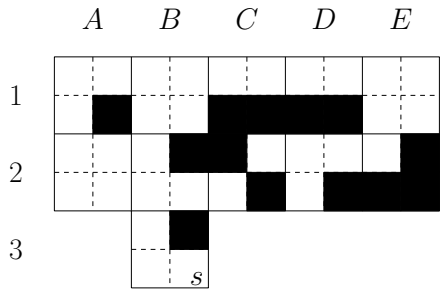

Figure 1: Start the exporation at the bottommost $2D$-cell.

Exercise 8: An example for the CFS algorithm (4 points)

Use the CFS algorithm to explore the graph G shown in Figure 2, starting in vertex s. Use the values $r = 4, \alpha = 1$ and $\ell = (1 + \alpha)r = 8$.

Run the algorithm using the following assumptions.

- Any call of the subroutine *BoundedDFS*$(s, 8)$ will first start in the direction indicated by the arrow, i. e., visit the vertices $v_1, v_2, \ldots$ before vertex v_{10}.
- When constructing a spanning tree of a newly explored graph G', and G' contains edge (v_4, v_5), then the spanning tree of G' is constructed by removing edge (v_4, v_5) from G'.

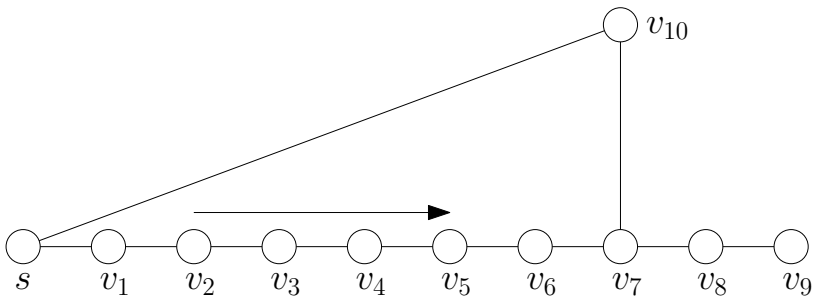

Figure 2: The "bad example" for *BoundedDFS*.

Exercise 9: Offline-Accumulator/Tether-simulation (4 points)

a) Assume that your tool has an accumulator of size $3r$ and a graph G of depth r is given. Design and analyse an Offline-Algorithm for G which is only C times worse than any optimal algorithm. Give a precise analysis of the corresponding C.

b) Assume that you have an accumulator of size $2(1 + \beta)r$ for some $\beta > 0$ and a graph of depth r. For some $\alpha > \beta$ transform this algorithm to a tethered variant with cable length $2(1 + \alpha)r$ which has only $f(\beta, \alpha)$ times more cost than the accumulator strategy. Give a precise analysis for $f(\beta, \alpha)$.